Chapter 4
Environmental Consequences

This chapter forms the scientific and analytical basis for comparisons of the alternatives. The Resource elements are discussed in the same order as in the previous chapter. The effects of the proposed activities and the alternatives are treated resource by resource rather than activity by activity. For example, the relationship between burning and vegetation is discussed under Vegetation rather than Fire. Mitigation for each resource is presented in Chapter 2.

The discussion centers on the impacts (effects) that are direct, indirect, or cumulative. These impacts can be either beneficial or adverse. They are defined as follows:

- Direct impacts are caused by the action and occur at the same time and place (40 CFR 1508.8(a)).

- Indirect impacts are caused by the action and occur later in time or farther removed in distance, but are still reasonably foreseeable (40 CFR 1508.8(b)).

- Cumulative impacts are those which result from the incremental impact of the action when added to other past, present, and reasonably foreseeable actions (40 CFR 1508.7).

In addition to past events that have occurred, ongoing activities, and project area- wide activities occurring in the proposed burn areas, the effects of the activities in Table 4 - 1 are considered as reasonably foreseeable and their effects are estimated in this analysis.

Table 4 - 1. Reasonably foreseeable future actions within specific proposed burn areas.

Proposed Unit	Project	Activity Type	Status
4A	Clean Slate	Timber Sale/restoration	Proposed
8	Boulder Heli	Timber Sale	Proposed FY 2004
9	Lockwood	Timber Sale	Proposed FY 2002
10	Lockwood	Timber Sale	Proposed FY 2002
11	Partridge-Kelly	Timber Sale	Proposed FY 2003
12	Carey-Fall	Timber Sale	Proposed FY 2003
14	Warren Mixed Conifer	Timber Sale	Proposed FY 2005
21A	Colson Helo	Timber Sale	May be reoffered
23	Indian Timber Sale	Timber Sale	Planned
24	Boulder Springs Timber Sale	Timber Sale	Sell spring 99

In addition, wildland fires cannot be predicted as to timing or location. Therefore, this analysis can only consider the potential vegetative conditions associated with continued fire suppression. However, much of this analysis includes potential impacts that may occur in the event a wildland fire did burn through the planning area.

In accordance with 40 CFR 1502.16, the discussion will include any adverse environmental effects which cannot be avoided, the relationship between short-term uses and long-term productivity, and any irreversible and irretrievable commitment of resources.

EFFECTS OF ALTERNATIVES ON AREA FIRE REGIMES

A model was developed to estimate the effects of DEIS Alternatives on the amount and distribution of area fire regimes. The Non- Lethal regime, which occupied 37 percent of the planning area historically, now occupies just 14 percent---declining by an average 3900 acres per year since 1900. At that rate, the nonlethal regime essentially would cease to exist 60 years after implementation (i.e., 2059 A.D.) of Alternative A (i.e., no action). That is, most of the acreage previously in the Non-Lethal regime would continue to shift into the MS I (mixed severity) and other more severe fire regimes. The stand replacement regime, which occupied 18 percent of the planning area historically versus 49 percent at present, has been increasing by an average of 5300 acres per year since 1900. At that rate the Stand Replacement regime theoretically would occupy 67 percent of the planning area by 2059 A.D. Moreover, 80 percent of the planning area would be dominated by the two relatively severe fire regimes (i.e., MS II, SR) --- as opposed to 50 percent historically and 68 percent today. Similar percentages apply to the acreage within the burn units (Fig 4 - 2).

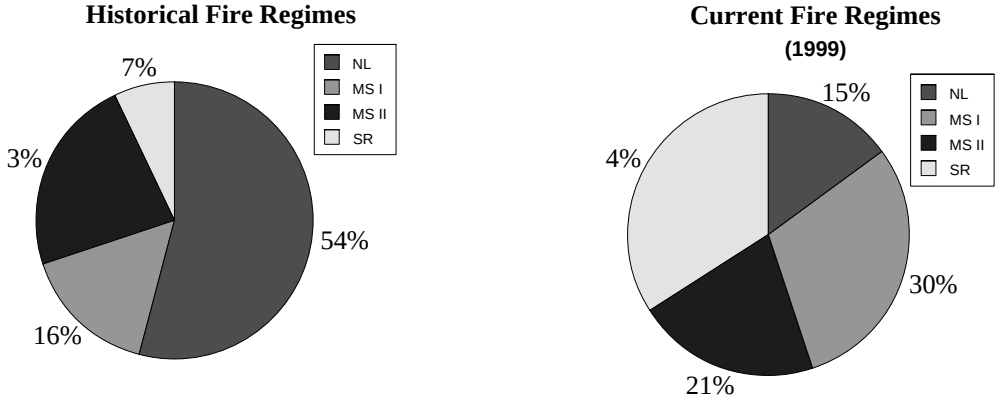

Figure 4 - 1. Current vs. Historical Fire Regimes in Salmon River Canyon Burn Units

For alternatives using prescribed fire, potential fire regimes were estimated using a method similar to that for estimating the historical and current fire regimes. Specifically, potential regimes were subjectively estimated for each stand in the proposed burn units based on cover type, historic regime, current fire regime, fuel model, and predicted prescribed fire severity. The modeling occurred for year ten of program implementation, when prescribed burning has been completed.

Note that the model assumes only potential fire regimes as of 2009 A.D. One fire entry would not immediately restore a historical regime, but could initiate the requisite fuels reduction. The model also assumes that the Non-Lethal fire regime cannot be restored where sites are now occupied by unnaturally heavy fuels (i.e., fuel model 10). A final assumption was

that prescribed burning would not promote negative changes in fire regimes (i.e., will not accelerate current trends).

For example, the model suggested a potential Non Lethal regime when a ponderosa pine stand exhibited the following characteristics: 1) historical fire regime: NL; 2) current fire regime: MS I; 3) current fuel model: Two; 4) prescribed fire severity: Low. However, when a ponderosa pine stand had shifted into fuel model 10 and the MS II fire regime, the potential regime would likely remain MS II. Subsequently, the results for the proposed burn units were incorporated into those for the rest of the planning area (i.e., potential fire regimes outside of the burn units.)

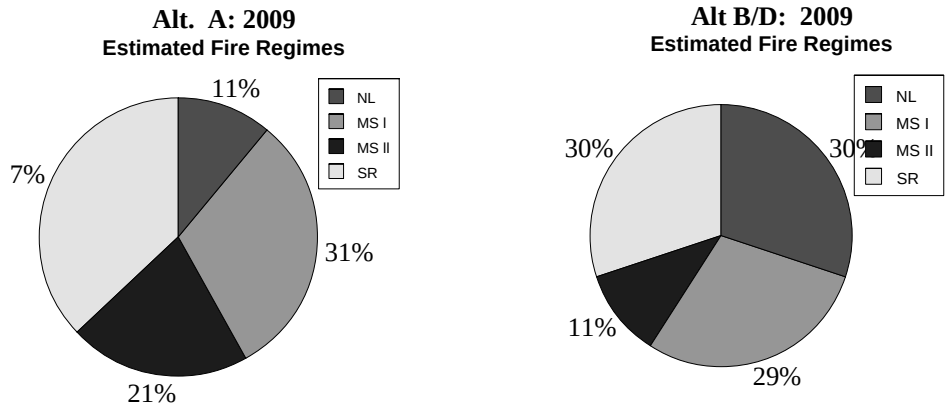

Figure 4 - 2. Estimated Fire Regimes (2009) in Salmon River Canyon Burn Units, Alt. A vs. Alt. B/d.

Results for Alternative B (the proposed action) suggest that prescribed burning could help slow the rate of change from historical fire regimes**.** However, because the proposed burn units occupy just 12 percent of the planning area, the overall effect would be small. By year ten of the program, for example, the Non-Lethal fire regime would total an estimated 14 percent of the planning area -- the same percentage as today. Without prescribed burning, the NL regime would occupy an estimated 12 percent of the planning area in 2009 A.D.

Although Alternative B has potential for affecting overall trends in the planning area, prescribed burning could substantially affect the mix of fire regimes within the burn units. When results for all burn units are totaled, for example, the model predicts substantial potential for reversing the current trend**.** Coverage by the Non-Lethal fire regime, which had declined from 54 percent to 15 percent between 1900 and 1999, would potentially rise to 30 percent by 2009 A.D. Coverage by the Stand Replacement regime, which had increased from 7 percent to 34 percent between 1900 and 1999, potentially would revert to 30 percent by 2009 A.D.

Among the various Alternatives, Alternative B likely has the most potential for slowing the rate of change from historical fire regimes. Alternative D proposes burning a similar amount of land, but limits prescribed burning to the dormant season. Alternatives C and E would exert even less influence on area fire regimes, since those proposed burn units occupy less than 2 percent of the planning area.

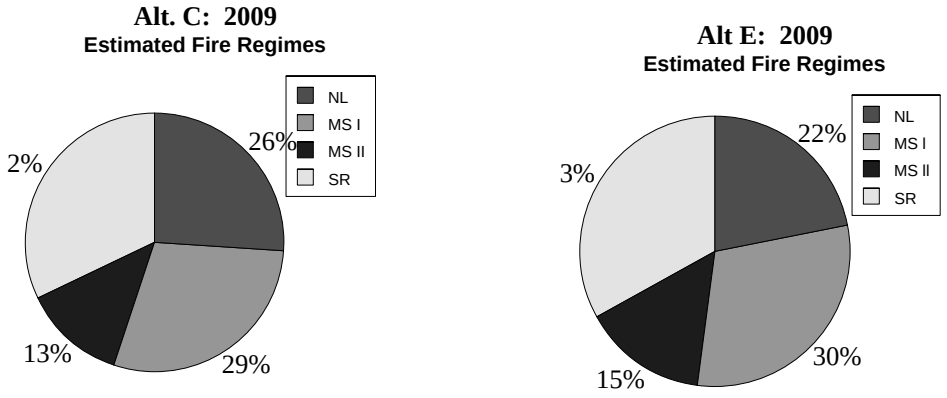

Figure 4 - 3. Estimated Fire Regimes (2009) in Salmon River Canyon Burn Units, Alt. C vs. Alt. E.

Alternatives C and E have other implications for management. For example, because Alternative C precludes burning in Wilderness, such lands would not experience the potential benefits of burning during non-threatening conditions (e.g., restoration). Currently, unscheduled prescribed fires in Wilderness occur largely during summer, when burning conditions are capricious. By contrast, the Alternative E units occur only in Wilderness and RARE II areas. The rest of the planning area -- likely the most heavily impacted by fire exclusion -- would therefore continue to be affected primarily by wildland fires. Because Alternatives C or E would promote geographically skewed prescribed burning, such fires have even less potential for influencing the area's changing fire regimes.

Figure 4 - 4 *(below)* illustrates the expected fire behavior for current fuel conditions in the Squaw Creek Watershed (one of the areas included in the Proposed Action) under normal August weather and compares predicted fire behavior using the same weather conditions after prescribed fire has been applied. This shows that under current conditions with normal August weather this area would exhibit a Stand Replacement regime, but after application of prescribed fire under the same August weather it would exhibit more of a Non-Lethal regime that occurred under historic conditions (Barrett 1998, Papoose Fire History Study).

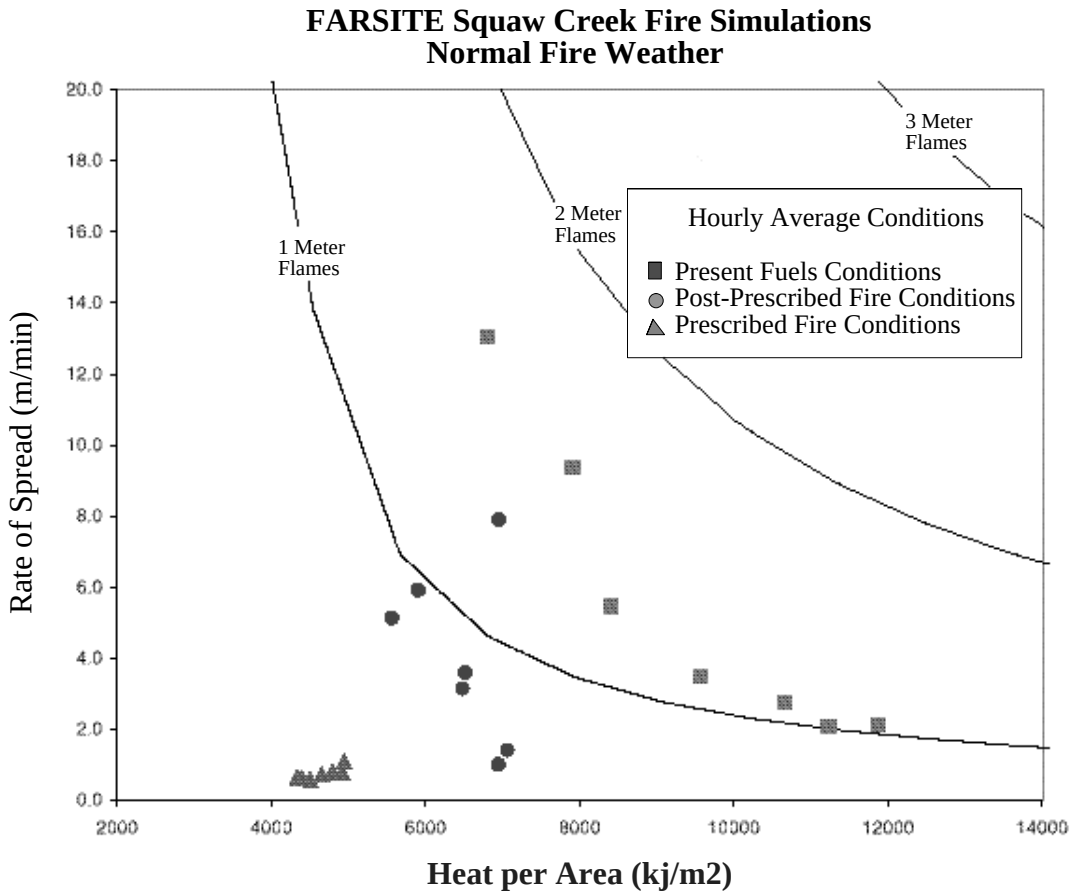

Figure 4 - 4. FARSITE Fire Simulation.

FIRE MANAGEMENT ECONOMICS

The National Fire Management Analysis System (NFMAS) requires incorporation of fish, wildlife, recreation, timber, wilderness, and environmental values into calculation of the dollar amount of Net Value Change (NVC), based on wildland fire intensities. Forest Service Region Four has recently developed a prescribed fire cost benefit formula that ranks prescribed fire projects according to their cost/benefit ratios. This formula is linked to NFMAS through historical fire occurrence, suppression costs, and NVC, and evaluates economic efficiency from a fire protection standpoint. The basic economic principle of this formula is that if prescribed planning and treatment costs do not exceed expected Cost + NVC, then the prescribed fire is economically efficient. Cost/benefit ratios calculated for the Payette N.F. show positive ratios ranging from $4.37 to $27.10/acre for prescribed fire projects planned for fiscal year 2000. The Salmon River Canyon Project can expect a similar range of cost/benefit ratios when using this formula to evaluate cost effectiveness from a fire protection standpoint for the non-wilderness areas of the project. The proposed projects on the Payette have a direct relationship in planning/implementation costs and values/costs associated with calculations of NVC for the proposed non-wilderness acres of the Salmon River Canyon Project.

Proposed prescribed burns in wilderness are always subject to scrutiny for economic efficiency. Because non-commodity values like wilderness are very difficult to place an economic value on, this analysis will focus on the actual costs of applying fire management strategies in the wilderness portions of the planning area. In August and September, 1998, fires burned within wilderness areas both within and adjacent to the Salmon River Canyon project planning area. Many of these fires were managed as Wildland Fires for Resource Benefits, and allowed to burn freely unless they threatened private property, historical structures, or administrative sites. Costs associated with managing these fires varied according to the amount of private property or other sites involved that needed protection (Zimmerman, 1999). The costs associated with wilderness fires which were a similar size to the proposed action units ranged from $3.30 per acre for the Rock Rabbit Fire, which needed very little resource protection, to $54 per acre for the West Fork Complex and $74 per acre for the Kootenai Fire, both of which required structure protection.

For this project, the areas proposed for burning in wilderness include similar private inholdings and historic structures, and have current fuel loadings that restrict our ability to manage wildland fire for resource benefits. The expected costs to implement Wildland Fire Use for Resource Benefits around Campbell's Ferry, Lemhi Bar, and Five Mile Bar are expected to average $57.33 per acre. Cost for planning and implementing prescribed fire around the inholdings to allow more Wildland Fire Use for Resource Benefits is $25 per acre, so from a pure cost/benefit standpoint without considering values for non-commodity resources like wilderness, we can expect a positive cost/benefit ratio of close to $30 per acre. Fire management costs after implementation do not go away, but should be reflected by much lower expenditures for Managing Wildland Fire Use in these areas and are expected to be similar to the costs associated with the Rock Rabbit Fire of 1998.

VEGETATION

EFFECTS ON THREATENED, ENDANGERED, AND SENSITIVE PLANTS

Direct, Indirect, And Cumulative Fire Effects

Native plant species have evolved with and adapted to natural fires. These fires varied in intensity and frequency depending on vegetation, fire regime, and weather conditions. In the Salmon River Canyon, lightning fires occur from late spring to late fall. As a result of adaptation to natural fire regimes, native plants differ in their response to different fire intensity and timing. For example, following a spring fire, individuals of certain annual species may not produce seed. Certain native grasses, shrubs, and forbs are more vulnerable during the spring while they are actively growing, but are not affected by fires during their dormant season. Other species require fire for seed germination. Still other early seral species require the bare mineral soil and open canopy created by moderate to severe intensity fires to recolonize burned areas. Wildland fire patterns over the landscape maintain this habitat; fire exclusion has resulted in a loss of early seral habitat.

Unfortunately, many noxious and exotic plant species are also early seral species and often benefit from fire. Because much of the proposed action area is infested with these species,

there may be indirect effects from the proposed action on the native plant communities and ecosystems. Species such as spotted knapweed, sulfur cinquefoil, and rush skeletonweed, which readily colonize disturbed areas, can be expected to increase after burning in low-elevation open forests and grasslands, especially where there are existing infestations and seedbeds. Cheatgrass is notorious for increasing after fire. This can inhibit recolonization by native bunchgrasses (such as bluebunch wheatgrass), which leads to altered plant communities, changes in fire regimes, increased erosion, and a reduction in wildlife forage (USDA-PNW 1997). Increases in noxious weeds infestations can also threaten the known populations and habitat of rare plant species (Rosentreter 1992). The cumulative effects of agriculture, grazing, noxious weed invasion, herbicide use, and fire exclusion have also contributed to a loss of this habitat for several rare plant species in the planning area.

The Fire Effects Information System (FEIS) database, developed by the US Forest Service, presents substantial information on what is currently known about fire's effects on various native and non-native plant species. That information will be incorporated here as much as possible. However, data is lacking for fire effects on most rare plant species. Mitigation for the effects on threatened and endangered plants has been included in the effects analysis and is included in Chapter Two.

General Effects of No Action

As described in chapter 3, the species composition of native plant communities may be outside the historic range of variability because of fire exclusion. Early seral plant species may become under-represented because of a lack of potential habitat. In some cases, this has led to a special designation by state and federal agencies (e.g. Forest Service/BLM Sensitive Species). Other late seral species may be over-represented. This shift in species may affect ecosystem structure and composition, and enhance invasion by exotic species. Also, as a result of increased fuel loadings, stand-replacing fires become more frequent than historically normal, creating larger areas of bare soil which further helps non-native species to dominate. In addition, fire suppression activities such as fire line construction will result in ground disturbance that may adversely affect rare species and permit noxious weeds to become established.

Predicted Burn Intensities

To aid in analyzing the effects of the proposed action on TES plant species and noxious weed infestations, burn intensities were predicted using fuel models for each proposed unit. Table 4-2 presents the burn intensity predictions for the action alternatives, and the predicted intensities for No Action (natural ignition wildland fire during summer and fall).

Table 4 - 2. Burn intensity predictions.

Alternative	Season of Burn	Burn Intensity over % of Area Burned			
		Low	Moderate	High	Unburned
Action Alts.	Spring	35-80	1-3	0	18-51
	Fall	37-69	13-23	10-25	6-21
A (no action	Summer/fall	41	21	33	2

THREATENED AND ENDANGERED PLANT SPECIES

Macfarlane's Four O'Clock

Macfarlane's four o'clock has a deep taproot which allows it to withstand natural fires during its dormant period, from mid-summer through winter. It has been observed to be unaffected by a low elevation "hot" fire in late June (C. Johnson, pers. comm.). Specific effects of historic and current fire regimes are unknown. The Draft Recovery Plan for this species states that high quality grassland habitat maintained by ecological processes such as natural fire regimes is important for the long-term survival of McFarlane's four o'clock (USFWS 1999). However, cheatgrass invasion of the plant's habitat has altered fire regimes and in some areas is resulting in larger fires. Competition from cheatgrass and other exotics can also limit suitable habitat for Macfarlane's four o'clock, thus preventing expansion of the known populations.

Surveys were conducted during spring 1997 and 1998 in suitable habitat in the Mackey Bar vicinity, North Fork District, and on BLM lands on the west side of the Salmon River from White Bird to Lucile. Surveys were also conducted in June 1996 between Riggins and Spring Bar. No new populations were found. There are no known populations or occupied habitat in the proposed action units. Suitable habitat occurs in those units which have dry grassland PVT, for a total of 20,293 acres. Because the known range of the species is so limited, the likelihood of new occurrences should decrease as the distance from known populations increases. In other words, the proposed units in the west half of the planning area which are closest to known populations (2, 4, and 25-35) have the highest probability of being actual potential habitat.

Direct, Indirect, and Cumulative Effects

The burn intensity in most units in the western half of the planning area is predicted to have more low intensity fire, from 50-80 percent low intensity *(Predicted Burn intensites - SRCP*, Appendix E), than the 35-80 percent low intensity predicted over the entire proposed action area (Table 4-2). Ignition will occur in both the spring and the fall. Light intensity burning in potential habitat during Macfarlane's dormant season (mid-summer through winter and very early spring) should have no effect on this species. Non-dormant spring burning could negatively affect flower and seed production. Wildland fire as a consequence of No Action may possibly have the indirect effect of increased weed and cheatgrass spread in potential habitat due to increased fire severity. Elsewhere on Forest Service and BLM lands in the Salmon River Canyon ecosystem, occupied and suitable habitat for Macfarlane's four o'clock is being protected and restored by noxious weed control and prescribed fire. In general, a return to historic fire regimes should have a cumulative beneficial effect on Macfarlane's four o'clock and its habitat.

Effects by Alternative:

Alt. A: No effect to species, except that the future severe wildland fire may cause an increase in noxious weeds, resulting in reduction in potential habitat.

Alternative B: Not likely to adversely affect during non-dormant spring burning, no effect during dormant season.

Alt. C : same as B

Alt. D: No effect

Alt. E: same as B

Water howellia

Water Howelia has no potential habitat or known occurrences in the proposed action units, and no occurrences are known in the planning area, and potential habitat is questionable. Therefore there will be no direct, indirect, or cumulative effects on this species. Mitigation is not required.

Effects by Alternative

No effect for all the alternatives.

Ute ladies-tresses

Little is known about fire ecology and fire effects on this species. No fire effects data is available for other orchid species in FEIS (Fire Effects Information System). The majority of grass and forb species in the lower elevations of the planning area have become dormant by late July. However, this orchid flowers from August through September. Many orchid species can sustain prolonged dormancy; that is, can remain underground for years without producing leaves, stems or flowers (Lesica 1994). the rhizomes of this species may be protected from light intensity fire by wet soil, similar to wet sites sedges and other riparian species (Elzinga and Rosentreter 1998).

According to USFWS Sec. 7 Guidelines 1998, p. 12, most of the planning area has disqualified habitat for this species, i.e. steep stream banks with an abrupt transition from stream margin to upland areas, and riparian areas or stream banks vegetated by dense rhizomatous species such as reed canarygrass (*Phalaris arundinacea*). Surveys for Ute ladies-tresses in possible potential habitat throughout the planning area were conducted in August and September 1998. No populations were found.

Surveyed areas included alluvial sand and gravel bars within the high-water banks of the Salmon River. On BLM lands, surveys took place along US Highway 95, in the Little Salmon and Main Salmon watersheds. The predominant vegetation includes sandbar willow *(Salix exigua)* and dense stands of reed canarygrass. Some large meadows along lower Panther Creek, Clear Creek, and Trail Creek on the Salmon National Forest more closely approach potential habitat criteria, with redtop *(Agrostis stolonifera)* and sandbar willow present. Again, dense stands of reed canarygrass were common, as were sedge species which indicate standing water, such as *Carex utriculata*. These meadows are at an elevation of 3400-3600 feet, and are within proposed unit 3.

Direct, Indirect, and Cumulative Effects

Fire intensity in riparian areas and wetlands is expected to be mixed, with 80-90 percent low intensity fire and 2-15 percent overstory canopy removal (refer to Fisheries section in this chapter). Therefore, fire effects from this project are not expected to alter the hydrologic regime or vegetative structure or composition in riparian grasslands, which are included as potential habitat for Ute ladies-tresses. The timing of ignition is important, however. Spring burning (including spring dormancy) would occur during wetter conditions, which could prevent fire from affecting plants or potential habitat. Burning during the fall, however, could have more effect on habitat. In addition, because the plant flowers during August and early September, burning of potential habitat during the early fall dormant season could have an adverse effect on seed production. However, since establishment by seed is probably minimal, as with many orchid species (FEIS), wildland fire as a consequence of No Action may have the indirect effect of increased alteration to the hydrologic regime and vegetative structure of potential habitat due to increased fire severity. Throughout the Salmon River Canyon ecosystem, potential habitat for Ute ladies-tresses is being protected and conserved as part of Riparian Habitat Conservation Areas. Mitigation for this species may include early spring dormant season burning only, if additional surveys determine that the species is present.

Effects by Alternative:

Alt. A: Large severe wildland fires may adversely affect potential habitat.

Alternative B: No impact during spring and fall dormancy; may impact during non-dormancy, especially late summer/fall.

Alt. C: same as B

Alt. D: No impact

Alt. E: same as B

Payson's milkvetch, puzzling halimolobos, and Lemhi penstemon

These species are found in PVTs 6 and 3 (conifer/grasslands and warm dry forest with ponderosa pine). Payson's milkvetch is known from the central portion, puzzling halimolobos from the western portion, and Lemhi penstemon from the eastern portion of the planning area, according to Idaho Conservation Database Center (ICDC) records. They are early seral species which have been observed to colonize areas previously burned by fire (Cochrane, pers. observation, USDA-USDI 1997). Preliminary results from monitoring Lemhi penstemon following prescribed fire show a net gain in established plants after burning (Heidel and Shelly 1999). All three species flower and set seed from May through June; dormant season is before and after that. Because these species are perennials, a light-intensity dormant season burn may burn individual plants, but should not affect population viability.

Direct, Indirect, and Cumulative Effects

Burn severity is predicted to be 50-80 percent low intensity in the western proposed action units, 40-65 percent low intensity in most central portion units, with 35-65 percent low in the Salmon National Forest units *(Predicted Burn Intensities - SRCP***,** Appendix E). These figures are close to the predictions for the entire proposed action area (Table 4-2). Ignition is proposed for both spring and fall. The cumulative effect of the proposed action should enhance potential habitat for all these species by restoring the natural fire regime, especially if implemented during the spring and fall dormant seasons. However, a possible increase of noxious weeds following prescribed fire would have a negative indirect effect on these species and their habitats. Wildland fire as a consequence of No Action may possibly have the indirect effect of increased weed and cheatgrass spread in potential habitat due to increased fire severity. Cumulative fire effects for rare early seral species and their habitats are discussed at the beginning of this section. Although habitat for these species is being threatened by noxious weed infestations in the Salmon River Canyon ecosystem, integrated weed management is occurring in many places (see Noxious Weeds section in chapter 3). Lemhi penstemon populations in Regions One and Four are being managed under an interagency Habitat Conservation Assessment and Strategy.

Effects by Alternative

Alt. A: No impact.

Alternative B: No impact during spring and fall dormancy, may impact during non-dormancy.

Alt. C : same as B

Alt. D: No impact.

Alt. E: same as B

Spacious monkeyflower and bank monkeyflower

Both of these annual species prefer moist microsites within dry grasslands and more mesic conifer/grasslands. They both flower and seed from May to July. Nothing is known about the specific effects of fire. Presumably the moist microsites would be somewhat resistant to fire within the low-intensity frequent fire regimes, especially during the spring. Light intensity fire should have less chance of affecting these moist habitats, because it would be less likely to sterilize the soil and adversely affect the species' seed bank.

Direct, Indirect, and Cumulative Effects

Ignition during the dormant season should not affect flowering and seed production, if done early enough in the spring. Wildland fire as a consequence of No Action may possibly have the direct effect of destroying the seed bank, and possibly jeopardizing viability in the long-

term. There is also the possibility of increased weed and cheatgrass spread in potential habitat due to increased fire severity. Cumulative fire effects for rare early seral species and their habitats are discussed at the beginning of this section. Although habitat for these species is being threatened by noxious weed infestations in the Salmon River Canyon ecosystem, integrated weed management is occurring in many places (see Noxious Weeds section in chapter 3).

Effects by Alternative:

Alt. A: No impact.

Alternative B: No impact during early spring and fall dormancy, may impact during late spring and non-dormancy.

Alt. C: same as B

Alt. D: same as B

Alt. E: same as B

Candystick

This species can survive a low-intensity fire which does not kill the host tree. However, because it is found in seral fire-created lodgepole pine stands in central Idaho, this may indicate adaption to fire through good dispersal mechanisms and establishment success (Lichthardt 1995). Although candystick is not an early seral species, it will benefit from fire, since any increase in lodgepole pine habitat from the proposed action will correspondingly increase potential habitat. Also, ignition in the higher elevations will most likely take place later in the summer (which more closely mimics natural ignition), and should not adversely affect the species. If the lodgepole pine habitat is increased, the long-term effects of the action alternatives should be beneficial.

Direct, Indirect, and Cumulative Effects

This species is now being managed under a Conservation Strategy in Region One Forests. Habitat restoration, including prescribed fire, is occurring on the Nez Perce NF. There are known populations in the wilderness portions of all four National Forests in the planning area. Throughout the planning area, cumulative effects to this species from habitat reduction through activities such as logging have been minimized.

There is a relatively small amount (7000 acres) of potential habitat for this species in the proposed action areas. This lodgepole covertype is within PVTs 1 and 2, which will have little, if any, fire from the proposed action. For example, in unit 5, which has a substantial amount of PVT 1 and 2, approximately one-half (2500 acres) of the unit is expected to remain unburned. Stand-replacing wildland fire as a consequence of No Action could actually benefit the species in the long-term by creating more lodgepole pine stands, thus increasing potential habitat. Dormant season for this species would coincide with natural ignition for higher elevations (summer into fall), so there would be no adverse effects from prescribed

fire. Noxious weed spread following fire is generally not a problem in closed canopy forests, so should not affect this species.
Effects by Alternative:

Alt. A: Beneficial impact

Alternative B: No impact

Alt. C: same as B

Alt. D: same as B

Alt. E: same as B

Giant helleborine, Buxbaum's sedge, and Henderson's sedge

These species prefer riparian habitats, as described in Chapter 3. Although giant helleborine is actually included in the Fire Effects Information System database, there are no entries for fire effects. The plant becomes dormant during late summer and fall, and so presumably could withstand fire during that time. There is one known occurrence in proposed action area, in unit 22 (ICDC database records). Henderson's sedge and Buxbaum's sedge are not known from the proposed action area. After fire, these sedges will resprout from rhizomes which are protected in wet soil. The riparian habitats of the above three species would be very moist and fire-resistant during spring burns.

Direct, Indirect, and Cumulative Effects

Fire intensity in riparian areas and wetlands is expected to be mixed, with 80-90 percent low intensity fire and 2-15 percent overstory canopy removal (refer to Fisheries section in this chapter). Therefore, fire effects from this project are not expected to alter the hydrologic regime or vegetative structure or composition. Spring burning would probably have little effect on these species, because of high moisture conditions. Likewise, the species' summer and fall dormancy would protect them from later-season fire. Wildland fire as a result of No Action would probably have little direct effect as well. However, a severe intensity fire could remove the canopy and possibly change the hydrologic regime, resulting in a loss of habitat and possibly population viability. In addition, certain "riparian" noxious weeds, such as Canada thistle, can resume growth following fire (FEIS). If present, Canada thistle could possibly outcompete these species, especially after a severe wildland fire which removes the overstory canopy. Throughout the Salmon River Canyon ecosystem, potential habitats for giant helleborine, Buxbaum's sedge, and Henderson's sedge are being protected and conserved as part of Riparian Habitat Conservation Areas.

Effects by Alternative:

Alt. A: No impact**,** but possibly may impact after stand-replacing wildland fire.

Alternative B: No impac*t*

Alt. C : same as B

Alt. D: same as B

Alt. E: same as B

Idaho barren strawberry and green bug-on-a-stick (moss)

These species prefer moist grand fir forests (PVT 5), and often are found in old growth. There is no information in FEIS on either species. Although usually found in closed canopy forests, Idaho barren strawberry has been observed to temporarily increase in timber harvest units following post-harvest burning (Crawford 1980). There are no known occurrences of either species in the proposed action area, but there is potential habitat.

Direct, Indirect, and Cumulative Effects

Moist grand fir forests (PVT 5) typically occur on mid-elevation north-facing slopes within the planning area, and burn less frequently than the habitat types which are the focus of this project. These forests will experience some fire from the proposed action, but it should be low intensity. Canopy opening from stand-replacing fire will cause a drying of the large-diameter decaying logs preferred by green bug-on-a-stick, but will probably have no adverse effects on Idaho barren strawberry habitat, at least in the short term. However, long-term responses of Idaho barren strawberry to canopy opening are unknown. Spring burning would probably have little effect on either species, because of high moisture conditions under the forest canopy. No specific information is available on the effects of fire on these species in the dormant season. Wildland fire as a result of No Action would have an adverse effect on green bug-on-a-stick habitat by opening the canopy, thus changing the habitat. Wildland fire would probably have no effect on Idaho barren strawberry habitat, at least in the short term. Throughout the Salmon River Canyon ecosystem, habitat for Idaho barren strawberry and green bug-on-a-stick in stands of old growth grand fir are being managed and conserved according to direction for old growth management areas in the Forest Plans.

Effects by Alternative:

Alt. A: No direct impact to either species, but possibly indirect impacts to green bug-on-a-stick habitat after stand-replacing wildland fire.

Alternative B: No impact

Alt. C : same as B

Alt. D: same as B

Alt. E: same as B

Clustered ladyslipper

This species is not known to occur in the planning area, but has potential habitat in warm forests with ponderosa pine (PVT 3). On the Nez Perce Forest it occurs in grand fir and western red cedar forests, and also in ponderosa pine forests with Douglas-fir understories which have grown up as a result of fire suppression.

Direct, Indirect, and Cumulative Effects

Direct fire effects to this species are unknown. Many orchid species can sustain prolonged dormancy; that is, can remain underground for years without producing leaves, stems or flowers (Lesica 1994). This may be an adaptation to fire, similar to Ute ladies-tresses orchid. As described in Chapter 3, canopy removal will reduce or eliminate clustered ladyslipper populations. However, the species does occur in frequent-fire type habitats, although these stands are more densely stocked than historical conditions because of fire suppression. Historically, populations of clustered ladyslipper in these habitat types probably "followed" patches of suitable habitat across the landscape as disturbances and successional changes occurred (Greenlee 1997). While the proposed action may cause an initial reduction in habitat, cumulative effects over the long term should be beneficial, because more suitable habitat will be created. Wildland fire as a result of No Action could have an adverse effect on clustered ladyslipper by opening the canopy, thus changing the potential habitat. In Region One National Forests, this species is being managed under a Conservation Assessment. Cumulative effects to populations and habitats from timber harvest and prescribed fire are being monitored across the Region.

Effects by Alternative:

Alt. A: No impact, but possibly may impact clustered ladyslipper habitat after stand-replacing wildland fire

Alternative B: No impact

Alt. C : same as B

Alt. D: same as B

Alt. E: same as B

Broadfruit mariposa, dwarf gray rabbitbrush, Hazel's prickly phlox, goldback fern, Simpson's hedgehog cactus, and plumed clover

These species have potential habitat in open dry grasslands and dry shrublands (PVT's 8 and 7) in or near the western portion of the planning area, although some species prefer specialized microsites within this general habitat (please refer to Chapter 3). Broadfruit mariposa also is found in fescue grasslands (PVT 14), as is fern-leaved desert p**arsley.** All of these species are perennials, and flower and fruit from May to early July, depending on elevation. Some of them are early seral species which require disturbance to produce the bare mineral soil necessary for their establishment.

Direct, Indirect, and Cumulative Effects

All of these species have evolved within a low-intensity frequent fire regime. As stated above, in most units, the burn severity is predicted to be 50-80% light intensity in proposed units in the west half of the planning area, and 35-65% light in the Salmon NF units. Proposed timing includes both spring and fall. Although a few plants may be directly affected by fire, the perennial species should be able to withstand a light-intensity burn. Dwarf gray rabbitbrush has been observed to be a vigorous resprouter after cool fire during its dormant season, but is more sensitive to a hot fire (Craig Johnson, pers. comm.). Simpson's hedgehog cactus is killed by hot fires (C. Johnson, pers. comm.). Early season burns (April/May) can be detrimental to fern-leaved desert parsley because of its early phenology, but the species is not affected by fall dormant season fires (C. Johnson, pers. comm.). The cumulative effect of the proposed action should enhance potential habitat for all these species by restoring the natural fire regime, especially if implemented during the spring or fall dormant seasons, whichever is more appropriate. However, a possible increase of noxious weeds following prescribed fire would have a negative effect on these species and their habitats. Wildfire as a consequence of No Action may possibly have the indirect effect of increased weed and cheatgrass spread in potential habitat due to increased fire severity. Cumulative fire effects for rare early seral species and their habitats are discussed at the beginning of this section. Although habitat for these species is being threatened by noxious weed infestations in the Salmon River Canyon ecosystem, integrated weed management is occurring in many places (see Noxious Weeds section in chapter 3).

Effects by Alternative:

Alt. A: No impact

Alt. B: No impact during spring and fall dormancy; may impact during spring non-dormancy.

Alt. C: same as B

Alt. D: same as B

Alt. E: same as B

NOXIOUS WEEDS AND OTHER EXOTIC PLANT SPECIES

As described in Chapter 3, certain vegetation types are inherently susceptible to weed invasion. Also, most noxious and exotic plant species increase after disturbance. Canopy opening (both forest and non-forest) and soil disturbance may allow existing infestations to increase or seedlings to develop from existing seedbanks. Very little is known, however, about how disturbance intensity, proximity of infestations, vectors of dispersal, slope, aspect, soil type, etc., can affect the rate of weed spread.

There have been many fires in the Salmon River Canyon ecosystem, but no research at all into fire effects on exotic species. Only in the past year has interest increased in possible correlations between past fires and present weed infestations. Unfortunately, without baseline

information on pre-fire vegetation, fire intensity, and proximity to weed infestations, it is impossible to draw any valid conclusions at this time. Long-term research monitoring in the Salmon River Canyon was implemented in 1998 by the Aldo Leopold Wilderness Institute to attempt some understanding of response to future fires by analyzing past disturbance, location of existing infestations, and current rate of spread. Elsewhere in the region, monitoring to determine the effects of prescribed fire on yellow starthistle populations and seed production is being conducted in the Salmon River Weed Management Area by the Nez Perce NF. Two other studies are taking place on the Lolo and Bitterroot NFs to determine the effects of prescribed fire on spotted knapweed populations in conjunction with herbicide treatment, and the differing effects of spring and fall fire application.

The Fire Effects Information System (FEIS) database, developed by the US Forest Service, presents substantial information on what is currently known about fire effects on various native and non-native plant species. Data is available for some of the noxious weed and exotic species of concern present in this project area.

Species Of Concern And Fire Effects

Rush skeletonweed

The Fire Effects Information System has no information available on fire effects to this species. Bushey (1995) states that seed can be destroyed by fire while maturing on the plants, from mid-July through frost, and that there is a reduced chance of killing seed after it is on the ground. Otherwise, fire appears to have little effect on the species. The rush skeletonweed infestations in the planning area all show signs of past disturbance: livestock or big game grazing, heavy use of adjacent trails, and past fires. Some infestations are present in areas that have experienced stand-replacing fire (B. Anderson, A. Cochrane, pers. observation). It is unknown whether the seeds were present before the fire, or whether they were dispersed by wind or other vectors, and established after fire removed the overstory vegetation.

Yellow starthistle

The FEIS database states that most fires probably kill this annual species, although the seedbank probably survives low and moderate intensity fires. The removal of existing vegetation by fire may increase survival of postfire yellow starthistle seedlings by reducing shade. Prescribed fire may be used to control yellow starthistle seed production, if plants are burned in the early flowering stage before seed matures. However, the ability to colonize a site is especially noticeable in burned areas vegetated with non-native grasses (Bushey 1995). Following accidental introduction by a private landowner, grazing and wind were the primary vectors which allowed yellow starthistle to invade thousands of acres of dry canyon grasslands -- which are inherently susceptible habitat -- in the White Bird area.

Spotted knapweed

This species probably resists low-severity fire because of its stout taproot. The seeds (viable for up to 12 years) can be killed by extreme heat. It has shown moderate increases after spring fires in dry, open Douglas-fir and ponderosa pine forests on the Bitterroot National Forest

(Rice 1995). Spotted knapweed also has appeared from 3 to 5 years after severe fires in western Montana, although it is not known whether knapweed was present pre-fire (FEIS).

Sulfur cinquefoil

This tap-rooted long-lived perennial resprouts readily after fire. Seedlings can easily establish on bare mineral soil (Bushey 1995). Observations by Peter Rice (pers. comm.) indicate that sulfur cinquefoil has increased following low-intensity spring fire in Montana grasslands. In the planning area, dense stands of sulfur cinquefoil are present in areas that have experienced stand-replacing fire at various times in the past. However, there are also areas of past severe fire activity, with similar vegetation types, aspect, elevation, etc., which currently have no sulfur cinquefoil (A. Cochrane, pers. obs.).

Cheatgrass

This is an annual exotic grass which completes its lifecycle in the spring before dry summer weather begins. It is extremely flammable, and can actually change fire regimes by increasing fire frequency, size, and rate of spread. Too-frequent fires favor cheatgrass by eliminating competing perennial vegetation. Its seeds can survive in mineral soil even if some of the litter is consumed. Conversely, burning cheatgrass may reduce the next year's plant production, although seed production may increase (FEIS).

Direct, Indirect, and Cumulative Effects

Noxious weeds and other exotic plant species can be spread by livestock grazing, road building, road use, recreation, and several other disturbances, including fire. Noxious weed management and treatment throughout the planning area is attempting to reduce the rate of spread and eradicate new invader species. Mitigation is being incorporating by Federal land managers to reduce the effects of new projects on noxious weed spread, and reduce cumulative effects on native plant habitat.

Vegetation managers at local, state, and federal levels are increasingly concerned about fire's potential to exacerbate noxious weed and cheatgrass spread, especially since much of our native perennial bunchgrass communities are being converted to annual and exotic vegetation. Fire of varying intensities may topkill annual exotic species, but their seeds will germinate the next year. Some exotics are perennials that will withstand fire. High intensity stand-replacing fires remove understory and overstory canopies and create bare mineral soil, thus greatly enhancing the potential for weed spread. Obviously, the effects of fire to noxious weed species is not so much the issue, as are the effects to native plant communities, and their ability to withstand invasion and recolonize following weed treatment.

Fire timing and intensity can affect the perennial vegetation in such a way that the weeds can outcompete the natives. For example, bluebunch wheatgrass generally survives fire, but postfire production appears to vary, being sometimes greater and sometimes less than pre-fire production (FEIS). Unfortunately, no mention is made of fire intensity or timing in this reference. If postfire production is less, then a noxious weed seedbank has ample opportunity to germinate and establish an infestation. Although FEIS states that "Idaho fescue is generally considered to be a fire-sensitive species that can be severely damaged by summer and fall

fires," a recent controlled study found that Idaho fescue was actually less sensitive to fire than bluebunch wheatgrass, and attributes the discrepancy to postfire factors such as soil moisture and plant competition. Competition from annual grasses and other exotics that regrow more rapidly than perennial bunchgrasses after fire may be a significant factor in the postfire regrowth of Idaho fescue (Robberecht 1995). Low-elevation prescribed burning by the BLM in the Salmon River Canyon takes place in the early spring dormant season to enhance native bunchgrass communities, thereby avoiding an increase in weed spread (C. Johnson, pers. comm.). Some evidence exists that there is no significant difference between the effects of early spring and fall dormant season fires on native vegetation (Robberecht 1995).

Low intensity fire in the spring and fall dormant seasons would have the least effect to native plant communities, making them more resistant to weed invasion. The proposed action is predicted to have 35-80 percent low intensity fire in the spring, and 37-69 percent low intensity fire in the fall (Table 4-2). Moderate intensity fire is predicted to occur over 1-3 percent of the area in most units for spring burning, and 13-23 percent for fall burning. For the proposed units, high intensity fire is predicted to occur in none of the areas proposed for spring burning, while fall burning predictions are for 10-25 percent severe intensity in the action units. Unburned areas are predicted to occur in 18-51 percent of the area in the spring, and 6-21 percent of the area in the fall. No distinctions were made between dormant and non-dormant season burning in these calculations. Low to moderate intensity fire outside the dormant season can have an adverse effect on native communities, thus increasing chances of weed spread. This would be lessened if burning occurred during the dormant season

General Effects of No Action

The consequences of No Action are very important in determining noxious weed spread. Wildland fire suppression activities such as fire line construction often result in ground disturbance. Because of past fire exclusion, wildland fires burning in stands that are outside the historic range of variability can be expected to have a higher intensity. With more removal of forest and understory canopy and litter, areas burned by high-intensity fires can be expected to have a higher susceptibility to weed invasion than those areas burned by low-intensity fire. According to the predicted burn intensities from fire behavior modeling (Table 4-2), the projected fire intensity for the No Action Alternative for the proposed action area is 33 percent high intensity, 21 percent moderate intensity, and 41 percent low intensity, with 2 percent of the area unburned (these figures include private land, which will not be burned in the proposed action).

Effects by Alternative

The effects by alternative were determined by comparing the predicted percentages of low, moderate, and high intensity fire, as presented in Table 4-2. Mitigation to reduce the risk of noxious weed spread from the proposed action is described in chapter 2. As explained in the preceding analysis, a greater percentage of low intensity fire should decrease the risk of noxious weed spread. A greater percentage of high intensity fire will increase this risk. Those potential vegetation types which have a high susceptibility to noxious weed and cheatgrass invasion, and those areas having an extreme risk of weed spread following prescribed fire, are described in chapter 3. Because it is impossible to predict where the amount of low,

moderate, or high intensity fire will occur in those areas, no acreage figures could be calculated.

Alt. A: Greatest chance of increased exotic/noxious weed spread, plus no mitigation for noxious weed spread will occur.

Alt. B: Less weed spread during dormant season, more during non-dormant. Overall less than Alt. A.

Alt. C: Same as B.

Alt. D: This alternative has the least chance of increased weed spread.

Alt. E: Same as B and C.

RESEARCH NATURAL AREAS

A fire history study on 3000 acres in the lower Colson Creek subwatershed found that fire frequency has changed from an average of 13 years prior to the onset of fire suppression in 1935) to 62 years post-suppression (Barrett 1998a). The effects of fire exclusion on vegetation within the planning area are described elsewhere in this document. The lack of disturbance in the RNA, including fire, may be responsible for the remarkable lack of exotic plant species in the inherently susceptible dry grassland and open dry forest habitats, despite the proximity of roads and infestations of spotted knapweed and cheatgrass. However, the increased fuels, including litter and duff accumulation, mean that future wildland fire intensity in the RNA will likely be higher than historical fire, with an increased risk of weed spread as a result, as explained in the Noxious Weeds section above. Wildland fire suppression efforts in the RNA could increase the risk of weed spread through ground-disturbing activities such as fireline construction.

Ignition is proposed for both spring and fall in unit 21, within the Colson Creek subwatershed. Predicted burn intensities for spring are 95 percent low, 0 percent moderate, and 5 percent severe. Fall predicted intensities are 62 percent low, 20 percent moderate, and 15 percent severe (with 2 percent unburned).

Direct, Indirect, and Cumulative Effects

Effects of the proposed action on dry grasslands, dry shrublands, Douglas-fir and ponderosa pine forests, spotted knapweed, and cheatgrass have been described elsewhere in this document. Prescribed fire in this Research Natural Area will help maintain natural processes by beginning a return to historic fire regimes. It will also provide research opportunities to study fire effects on native species, including two Sensitive early seral species, and exotic species such as spotted knapweed and cheatgrass. In general, a return to historic fire regimes should have a beneficial cumulative effect on Colson Creek RNA, by lessening the possibility of high intensity wildland fire and resulting suppression efforts, and by maintaining early seral habitats. Low-intensity dormant season prescribed fire would achieve the RNA's vegetation management objective of maintaining the high representative quality of the frequent fire-adapted plant communiti4es present. Wildland fire as a consequence of no action

may have the indirect effect of increased weed and cheatgrass spread due to increased fire severity and ground disturbance from suppression efforts.

Special considerations are necessary for implementation of the proposed action in the RNA. Ignition should be timed to imitate the primary season of natural lightning fires in the Salmon River Canyon, i.e. July through September. This coincides with the late summer/fall vegetation dormant season. Burning in this time period will emulate the natural response of native grasses and other species to fire and reduce the threat of spotted knapweed and cheatgrass spread into the RNA. Because areas adjacent to the Colson Creek and Salmon River Roads have an Extreme Risk of Weed Spread, as defined above in the Noxious Weeds section, mitigation as required by the RNA management prescription (as presented in chapter 2 -- Mitigation) will be implemented.

Effects by Alternative:

Alt. A : No Effect; indirect effect of increased of weed spread following future severe wildfires

Alternative B : Beneficial effect during "natural" season of ignition, including fall dormancy; may affect during "unnatural" season of non-dormancy.

Alt. C : same as B

Alt. D: Beneficial effect during "natural" season of ignition

Alt. E: same as B

WILDLIFE

Fire directly alters habitats, which influences the presence and abundance of plants and animals. In general, mixed severity fires and cooler underburns result in more complex changes to landscape vegetation. In contrast, larger stand replacement fires simplify stands from a mosaic of patch sizes, structures, ages and species to non-forest or early seral conditions (Lehmkuhl, et al. 1995).

Fires may affect wildlife populations directly by killing individuals too slow to escape or those lacking safe sites to retreat to during the fire. Under historical fire regimes of more frequent, low-intensity fires, direct mortality was not a significant problem for most wildlife. However, more recent higher-intensity fires of interior Northwest forests precipitated by altered disturbance regimes have been shown to cause direct, devastating mortality in affected areas, even for mobile mammals and birds (Lehmkuhl, et al. 1995). A primary reason for greater direct loss of wildlife from fire results from indirect changes in landscape composition, vegetation structure and processes which are outside their historical range of natural variability. Wildlife persistence at burn sites greatly influences the composition and direction of animal community development after fires, especially for species with low mobility.

General Indirect and Cumulative Effects on Wildlife

In addition to direct effects of fires, researchers have begun to acknowledge indirect and cumulative effects to species populations due to changes in landscape vegetation patterns. Large scale fragmentation and isolation of formerly contiguous habitats by fire and other land use practices may affect the local viability of surviving wildlife populations. Small, isolated sub-populations of sedentary species in unburned patches are more prone to local extirpation from environmental variability and population dynamics than larger populations. Unburned patches of vegetation resulting from large, catastrophic burns may become barriers, separating segments of regional populations into smaller, disconnected units which have increased susceptibility to local extinctions (Lehmkuhl, et al. 1995). Small, sedentary species are often most susceptible. Also, isolated habitat patches may become overutilized, with increased competition for food and cover as a result of immigration of individuals from adjacent burned areas. Subsequent recolonization of the interior areas of catastrophic burns is often hampered by the greater distances some species must travel from undisturbed areas. Additional indirect and cumulative negative effects for some wildlife species may occur when predation or hunting mortality becomes high after predators and prey are forced into smaller areas.

Recently, researchers have estimated the relative importance of habitat loss and habitat spatial pattern (fragmentation) on population extinction using simulation modelling. Results indicate that the effects of habitat loss far outweigh the effects of habitat fragmentation (Fahrig, L. 1997). Conclusions from such modelling suggest that, in fact, details of how habitats are arranged cannot usually mitigate the risks of habitat loss. From a fire management perspective, this evidence strongly supports conservation efforts aimed primarily at stopping habitat loss and restoring habitats to a condition that is more stable and resilient to disturbances, given known fire regimes.

In the Salmon River Canyon Project analysis area, fire historically played a mixed role in changing and maintaining wildlife habitats. At lowest elevations, frequent, low-intensity fires reduced the encroachment and overcrowding of conifers in diverse ponderosa pine/bunchgrass communities. These same fires helped reduce the risks of high intensity, stand- replacing fires and maintained wider spacing between trees which allowed for development of large trees over time. Fire effects vary across the landscape, reflecting topography, elevation, aspect, slope, soils, and vegetation attributes. Patches minimally affected by successive fires may be thought of as "refugia", islands of older forest in a younger forest matrix (Camp, A., et al. 1997).

At lower and mid-elevations, mixed fire intensities and intervals helped maintain a diverse mix of grasses, forbs, and understory shrubs interspersed in habitat mosaics characterized by a mixture of tree species. With rise in elevation, fire intensities tend to become more variable. Some fires were higher intensity and less frequent. These helped to create small openings in the canopy and ensured a wide range of age classes and species of trees in the landscape. Openings were in most cases relatively small in scale and helped to "break up" the continuity of the forest vegetation across the landscape, providing a wide mix of habitat characteristics including snags, grass/forb foraging sites, and shrub cover, yet maintaining a "connected" character to the landscape at the proper scale. This encouraged genetic

interchange within populations of species and helped to ensure relative long term stability of overall habitat conditions for many species.

General Cumulative Effects On Wildlife

The Salmon River Canyon Project analysis area was historically created and maintained through disturbance and recovery processes. Current disturbance regimes for fire, insects and disease have been altered by past management practices and the interruption of natural fire processes (Barrett, S. W., et al. 1997, p.15). These altered disturbance regimes result in landscape vegetation patterns which differ significantly from historical conditions. The resulting forest character has tended toward middle aged, multiple-canopy-layered dense stands disproportionately over-represented and interspersed with shade-tolerant tree species, while both early successional and old-growth forest character are relatively under-represented. Cumulatively, these conditions have affected species directly and indirectly and have predisposed many habitats to larger, more destructive fire events. These, in combination with other human activities and human encroachment, and will cumulatively result in long-term habitat loss to many species of wildlife, while in some cases producing limited, short-term benefits for others.

Forest Plan Consistency

Prescription burning of grassland as well as forested habitats is consistent with all the affected Forest Plans within the analysis area. It is used as a resource restoration tool, to reduce slash preparation for tree planting and as a means of reducing excess forest fuels. Prescription fire is also used to improve wildlife habitats for a number of species.

Irreversible Or Irretrievable Commitment Of Resources

None of the alternatives including the proposed action will result in any irreversible or irretrievable commitment of resources.

Fire effects on wildlife and their habitats relates to burn severity at given sites. Fire will not visit every acre of every unit planned for burning, and burn intensities will vary depending on variables such as season of burn, fuel moistures, fuel loading, combined with the burn prescription. Fire severities can best be described by flame lengths achieved in any given fire. Expected flame lengths in burned units will generally range from 2-6 feet, and overall vegetative effects will range from unburned, unscathed to severe burn intensities where local mortality rates of mature trees may reach 20 percent or more in some instances. Severe burn intensities are predicted to occur principally in Fuel Model 10 primarily during fall burns, compared to spring burns which usually will burn with predominantly light or moderate intensities.

Unavoidable Adverse Impacts

Application of prescription fire may directly affect and potentially injure or kill a few individual wildlife, especially by fires ignited during spring or early summer nesting seasons.

Short-term impacts of prescription burning may temporarily change or reduce habitat availability for some species but is not likely to create any unavoidable adverse impacts to any species or their long term habitats.

Table 4 - 3. Predicted Relative Positive/Negative Effects On Wildlife Species And Their Habitats By Alternative

SPECIES NAME	Rel. Positive Effect Rel. Negative Effect	ALT. A	ALT. B	ALT. C	ALT. D	ALT. E
Gray Wolf	Rel. Positive Effect	1	4	3	4	2
	Rel. Negative Effect	2	2	2	2	2
Bald Eagle	Rel. Positive Effect	1	4	3	4	2
	Rel. Negative Effect	5	2	3	1	4
Peregrine	Rel. Positive Effect	1	4	4	4	2
Falcon	Rel. Negative Effect	1	3	3	3	2
Grizzly	Rel. Positive Effect	1	4	3	4	2
Bear	Rel. Negative Effect	0	0	0	0	0
Lynx	Rel. Positive Effect	1	3	2	3	2
	Rel. Negative Effect	3	1	2	1	2
W. Big-eared	Rel. Positive Effect	1	4	3	4	2
Bat	Rel. Negative Effect	0	0	0	0	0
Spotted	Rel. Positive Effect	1	3	2	3	2
Bat	Rel. Negative Effect	0	0	0	0	0
Harlequin	Rel. Positive Effect	0	2	1	2	1
Duck	Rel. Negative Effect	0	0	0	0	0
Northern	Rel. Positive Effect	0	5	3	4	2
Goshawk	Rel. Negative Effect	4	3	2	2	1
Flammulated	Rel. Positive Effect	0	5	3	5	2
Owl	Rel. Negative Effect	5	3	3	1	2
Boreal	Rel. Positive Effect	1	2	1	2	1
Owl	Rel. Negative Effect	1	1	1	1	1
Great Gray	Rel. Positive Effect	0	3	2	2	1
Owl	Rel. Negative Effect	3	1	1	1	1
Mountain	Rel. Positive Effect	0	4	4	4	1
Quail	Rel. Negative Effect	2	2	2	1	0
Black-backed	Rel. Positive Effect	2	3	2	3	1
Woodpecker						
White-headed	Rel. Positive Effect	0	5	4	5	2
Woodpecker	Rel. Negative Effect	5	1	1	3	4
Three-Toed	Rel. Positive Effect	1	5	4	4	1
Woodpecker						
Spotted	Rel. Positive Effect	1	3	2	2	1
Frog	Rel. Negative Effect	0	2	2	1	1
Northern	Rel. Positive Effect	1	3	2	2	1
Leopard Frog	Rel. Negative Effect.	0	2	2	1	1
Boreal Toad	Rel. Positive Effect.	1	3	2	2	1
	Rel. Negative Effect.	0	2	2	1	1
CDA	Rel. Positive Effect	0	0	0	0	0
Salamander	Rel. Negative Effect	0	0	0	0	0
Fisher	Rel. Positive Effect	3	2	2	2	2
	Rel. Negative Effect	3	2	2	3	3
Wolverine	Rel. Positive Effect	0	4	2	3	2
	Rel. Negative Effect	4	2	4	3	3

Myotis bats	Rel. Positive Effect	0	4	3	4	3
	Rel. Negative Effect	4	2	3	2	2
Northern harrier	Rel. Positive Effect	0	4	2	4	2
	Rel. Negative Effect	4	2	1	2	1
Ferruginous hawk	Rel. Positive Effect	0	4	2	4	2
	Rel. Negative Effect	4	2	1	2	1
Prairie falcon	Rel. Positive Effect	0	4	2	4	2
	Rel. Negative Effect	4	2	1	2	1
Lewis wood-pecker	Rel. Positive Effect	0	3	1	3	1
	Rel. Negative Effect	3	0	0	0	0
Red-naped sap-suckers	Rel. Positive Effect	0	3	1	3	1
	Rel. Negative Effect	3	0	0	0	0
Vaux's swift	Rel. Positive Effect	0	3	2	3	2
	Rel. Negative Effect	4	1	1	1	1
Black swift	Rel. Positive Effect	0	3	2	3	2
	Rel. Negative Effect	4	1	1	1	1
Olive-sided fly-catcher	Rel. Positive Effect	0	5	3	5	3
	Rel. Negative Effect	2	0	0	0	0
Dusky fly-catcher	Rel. Positive Effect	0	5	4	5	4
	Rel. Negative Effect	2	0	0	0	0
Cordileran fly-catcher	Rel. Positive Effect	0	4	3	4	3
	Rel. Negative Effect	2	0	0	0	0
Hammond's fly-catcher	Rel. Positive Effect	0	5	4	5	4
	Rel. Negative Effect	1	0	0	0	0
Willow fly-catcher	Rel. Positive Effect	0	2	1	2	1
	Rel. Negative Effect	2	0	0	0	0
Yellow-rumped warbler	Rel. Positive Effect	0	1	1	1	1
	Rel. Negative Effect	2	0	0	0	0
MacGillvray's warbler	Rel. Positive Effect	0	2	1	2	1
	Rel. Negative Effect	3	0	0	0	0
Wilson's war-bler	Rel. Positive Effect	0	2	1	2	1
	Rel. Negative Effect	3	0	0	0	0
Solitary vireos	Rel. Positive Effect	0	4	3	4	3
	Rel. Negative Effect	3	2	1	2	1
Swainsons thru-shes	Rel. Positive Effect	0	4	3	4	3
	Rel. Negative Effect	3	2	1	2	1
Veerys	Rel. Positive Effect	0	4	3	4	3
	Rel. Negative Effect	3	2	1	2	1
Calliope hum-mingbirds	Rel. Positive Effect	0	4	3	4	3
	Rel. Negative Effect	4	0	0	0	0
Rufus hum-mingbirds	Rel. Positive Effect	0	4	3	4	3
	Rel. Negative Effect	4	0	0	0	0
Grasshopper sparrows	Rel. Positive Effect	0	3	2	3	2
	Rel. Negative Effect	4	0	0	0	0
Brewer's spar-row	Rel. Positive Effect	0	3	2	3	2
	Rel. Negative Effect	4	0	0	0	0
Idaho banded mountainsnail	Rel. Positive Effect	N/A	N/A	N/A	N/A	N/A
	Rel. Negative Effect	N/A	N/A	N/A	N/A	N/A
Boulder pile mountainsnail	Rel. Positive Effect	N/A	N/A	N/A	N/A	N/A
	Rel. Negative Effect	N/A	N/A	N/A	N/A	N/A
Whorled mountainsnail	Rel. Positive Effect	N/A	N/A	N/A	N/A	N/A
	Rel. Negative Effect	N/A	N/A	N/A	N/A	N/A
Lava rock mountainsnail	Rel. Positive Effect	N/A	N/A	N/A	N/A	N/A
	Rel. Negative Effect	N/A	N/A	N/A	N/A	N/A
Carinated striate-banded mountainsnail	Rel. Positive Effect	0	5	4	5	3
	Rel. Negative Effect	5	2	1	2	1

Rocky Mountain Elk	Rel. Positive Effect Rel. Negative Effect	1 2	5 2	3 2	4 2	2 2
Shira's Moose	Rel. Positive Effect Rel. Negative Effect	0 2	2 0	1 0	1 0	1 0
Mule Deer	Rel. Positive Effect Rel. Negative Effect	0 0	5 3	3 2	4 2	2 1
Bighorn Sheep	Rel. Positive Effect Rel. Negative Effect	0 1	5 3	3 3	4 2	2 2
Mountain Goat	Rel. Positive Effect Rel. Negative Effect	0 0	0 0	0 0	0 0	0 0
Pine Marten	Rel. Positive Effect	2	2	2	1	1
Vesper Sparrow	Rel. Positive Effect Rel. Negative Effect	0 1	4 3	3 2	4 2	2 1
Yellow Warbler	Rel. Positive Effect Rel. Negative Effect	0 1	0 0	0 0	0 1	0 1
Pileated Woodpecker	Rel. Positive Effect Rel. Negative Effect	1 0	3 2	2 2	1 2	1 1
Williamson's Sapsucker	Rel. Positive Effect Rel. Negative Effect	0 3	5 2	4 1	3 2	2 1
Ruby-crowned Kinglet	Rel. Positive Effect Rel. Negative Effect	4 0	2 4	3 3	3 3	3 2
Yellow-bellied Sapsucker	Rel. Positive Effect Rel. Negative Effect	1 3	4 2	3 1	2 1	2 1
Pygmy Nuthatch	Rel. Positive Effect Rel. Negative Effect	0 5	5 2	3 3	5 2	2 3
Pine Squirrel	Rel. Positive Effect	3	1	1	2	2
Mountain Bluebird	Rel. Positive Effect Rel. Negative Effect	0 5	5 2	4 3	5 3	3 4
Brown Creeper	Rel. Positive Effect Rel. Negative Effect	1 4	3 2	2 1	3 1	1 1

NOTE: Scale of magnitude: 5 = highest magnitude, 0 = the lowest. On a relative scale of comparison between alternatives. Where only positive effects are listed, information relating to negative effects may be unavailable or incorporated into positive effects rating, or not well researched to date. Short-term and longer term effects are incorporated.

Note: In the following disclosure of effects, the no action alternative will be evaluated based on two possible scenarios: (Scenario 1) - no management action with no occurrence of large-scale, high-intensity wildland fires in the ten year analysis period, and (Scenario 2) - no management action with occurrence of large-scale, high-intensity wildland fires in the ten year analysis period.

FEDERALLY LISTED OR PROPOSED SPECIES

For additional discussion on federally listed or proposed species, refer to the Biological Assessment in the appendix.

Gray Wolf

All units proposed for burning contain potential habitat for the gray wolf. Only units 5 and 6 contain known packs within the watersheds being burned. Units 13, 14, 15, 16, 17, 37B, and

38 are all or partially within wilderness areas and do not contain roads, or past harvest activities and human presence is minimal.

Management Strategies

Effective wolf habitat management currently focuses on avoiding impacts to wolf den and rendezvous sites while maintaining quality big game populations. In general, habitat management which maintains or benefits large ungulate species (elk, deer, moose), also benefits wolves.

Direct and Indirect Effects

There is one known wolf den within the analysis area, but no portion of the upper drainage containing the undisclosed den location is proposed for action in any alternative. The no action alternative (Scenario 1) would have no effect on any known rendezvous areas. Scenario 2 may result in potential short-term impacts on some rendezvous areas of the Selway Pack from displacement and temporary disturbance of wolves during fires as well as reduced cover values especially near roaded, developed areas but overall effects on prey would be minimal due to limited microsite openings created by prescribed fires. In total, the overall effects would likely be more positive in the long term due to improved forage availability and nutritive quality for ungulates.

While specific rendezvous site information is essentially unknown for the Selway pack, it is possible that one or more rendezvous sites used by the Selway Pack may occur within proposed treatment areas. All of the rendezvous areas used by the Chamberlain Pack are at higher elevations and are well outside the analysis area (Dick Wenger, pers. comm.). Prescription fires may nevertheless affect wolf behavior and could temporarily displace a wolf pack, but would not jeopardize wolf recovery. This displacement is more likely with Alternatives B and D because these alternatives burn the greatest total number of acres and include wilderness areas. The potential exists that thinning, prescribed burning and other associated actions may temporarily disturb or displace individual wolves that may use treated areas, but such impacts would be temporary and non-lethal. Reducing fuel levels near potential rendezvous areas would help maintain them for long term use and stabilize or reduce risks of destructive, stand-replacing, cover-eliminating fires.

Indirect effects of action alternatives include improved herbaceous plant growth, improved big game wintering habitat quality, and improvement of some summer range forage conditions for ungulate prey species.

Cumulative Effects

Portions of the analysis area have been previously affected by roading, increased human disturbances, timber harvesting, recreation, fire control, livestock grazing and other multiple use activities to different degrees . The most important cumulative effect to gray wolf recovery in Idaho is most likely incidental mortalities from shooting and vehicle strikes. This probability increases with increased road access. None of the alternatives would change

current road densities or access in the analysis area. The restoration of more stable vegetation patterns and natural fire processes would help restore declining forage availability, productivity and nutritional quality important to large ungulate prey species.

Effects Summary

No alternative would affect the dens. Wolves may be temporarily displaced or disturbed in some instances by helicopter or field crew activities, but no alternatives would severely damage the habitats most likely to be used as rendezvous sites.

The most limiting factor for gray wolf recovery (incidental, human-caused mortalities) is not expected to change significantly as a result of any alternative.

Bald Eagle

Bald eagles winter throughout the canyon area principally within one-half mile of the Salmon River. All units proposed for burning except units 2A, 2B, 2C, 2D, 2E, 4A, 4B, 8, 9, and 11 are used by bald eagles for wintering.

Management Strategies

Effective bald eagle winter habitat management includes protection and maintenance of nests and adequate food resources. Protection and maintenance of long term hunting perches and roost sites are also considered important to wintering bald eagle habitat. Controlling human disturbance in frequently used wintering areas and near perches and roosts may also be important.

Direct and Indirect Effects

The no action (Scenario 1) will increase risks of direct catastrophic fire loss of riverside perches and roosts in some areas. Indirectly, encroachment of shade-tolerant trees would also limit future growth of ponderosa pine used as perches and roosts along the Salmon River. It would also mean continued decline in forage and habitat values for elk and deer which serve as carrion on winter ranges. Scenario 2 would result in probable loss of some riverside perch and roost snags and trees. Inability of the landscape to quickly replace these structures would reduce effective habitat for wintering eagles in some areas. Although scenario 2 would improve long-term forage supplies on winter ranges, it would immediately reduce or eliminate thermal and hiding cover patches in some areas if fires were intense, and may temporarily reduce ungulate use levels due to lack of cover patches.

None of the action alternatives would directly affect the North Fork eagle nest since it is several miles away from any planned treatment areas. However, early spring and summer helicopter flights or ground ignition activities that may overlap hunting or nesting areas could potentially displace eagle hunting activities, if not appropriately planned to avoid these areas when eagles are absent. Action alternatives would help maintain and protect existing perch and roost sites through reduced risks of large, uncontrollable fires and would help restore conditions suitable for ensuring a sustainable supply of these habitats in the future. Fuel

reduction effects of all action alternatives would also help restore and maintain important ungulate winter ranges which help maintain ample food sources for wintering eagles. Helicopter and hand crew ignition activities could potentially disturb eagles wintering in the canyon if activities occurred as early as February or early March, but monitoring and scheduling can reduce or avoid most of these risks. Restrictions on helicopter flights within a half mile of the Salmon River during seasons when eagles are present will remove this risk. Eagles that use the canyon during winter and early spring generally use the areas within a half mile of the river, reducing risks that burning and/or other related project disturbances would displace or disturb their winter/spring habitat use.

Due to the number of acres treated and the areas treated, Alternatives B and D would have the largest restorative effect due to the areas treated. Alternative C would exclude bald eagle use areas in Units 6, 13, 14, 15, 16, 17, and the northwest portion of Unit 38. Alternative E would exclude bald eagle use areas in units 4C, 4D, 23, 24, and 36 as well as those units identified in the proposed action.

Cumulative Effects

The no action alternative would significantly increase the cumulative risk of perch and roost tree habitat loss should a high intensity, catastrophic fire occur. This risk would be additive to the decline in winter range conditions which have occurred within the analysis area and along with past, man-induced habitat changes (roading, timber harvest disturbances, loss of anadromous fish numbers, direct human disturbances, losses of ungulate winter range values to forest succession), would further affect the quality of ungulate habitats and thus future wintering bald eagle habitats.

The action alternatives would impose additional human activities into ungulate and eagle winter habitats. These would be cumulative in terms of human disturbance to ungulates and wintering or nesting eagles. Continued fire suppression is a reasonably foreseeable future action which would increase existing fuel loads. The effects of the action alternatives would be in addition to past timber harvest, thinning, road-building, and prescription fires.

Peregrine Falcon

Management Strategies

The goals of effective peregrine falcon species recovery and habitat management is to protect active nesting sites, adults and young from abnormal disturbances, human harassment or other environmental threats during nesting periods, and to protect the habitat of peregrine prey species.

Direct and Indirect Effects

Known Nest Sites

The Lucile nest is on private land and is at least two miles outside any planned treatment areas, but foraging habitat for this nest is within usable range of the nest. Two known nest sites (Shingle Creek and Sheep Gulch) occur on the Nez Perce National Forest and are both

within areas proposed for treatment. Unit 2A is in Shingle Creek and Unit 4B is in Sheep Gulch. However, all of Units 2A, 2B, 2C, 2D, 2E, 4A, 4B, 4C, and 4D are used for hunting prey. It is unknown if they fly as far south as units 9 and 10 to hunt. All the remaining units except units 5, 6, and 8 have habitat for peregrine falcons but they are not present in these units. Recent nesting activity at the Shingle site has been intermittent only. Incidental observations of peregrine use of the Sheep Gulch site (1995-97) and successful reproduction of three young in 1998 suggest the Sheep Gulch and Lucile eyries are being used by the same pair. The Sheep Gulch eyrie was active in 1999.

The no action alternative (scenario 1) would not increase disturbances to active nest sites . Forest succession immediately around nests would continue to favor shade-tolerant conifer encroachment in the short-term, but would reduce long-term habitat stability by increasing the risk of high intensity fires and or forest insect and/or disease outbreaks. Large-scale disturbances immediately around nests may disturb nesting pairs or otherwise impair the desirability of the sites as nests in the short term. If scenario 2 occurred around active nests, it could produce potentially significant short-term effects which could result in direct mortalities because nestling and fledging periods (July- early Sept.) coincide with seasons when wildland fires most commonly occur and secondary effects to prey habitats would be negative.

All action alternatives would modestly change habitat conditions adjacent to the sheep gulch nest. Alternatives B, C, and D would also modestly change the habitat conditions for the Sheep Creek nest. The risk of subsequent catastrophic fires would be reduced and deferred for the balance of the 10 year analysis period. With Alternatives B, C, and D, the risk of helicopter or ground crew activity disturbance of active nests and disruption of nesting exists, but coordination of activities will be carefully scheduled to avoid adverse effects. Alternatives A and E would have no direct disturbance or mortality risks but may indirectly lead to increased long term habitat losses or mortalities of nesting adults or young.

Prey Habitats

The no action alternative would result in no immediate changes to existing prey species or their habitats. This alternative would have two possible outcomes within the 10 year analysis period. Prey habitats would continue to simplify in structure and density, reduced understory vegetation and small openings would, in turn, slightly reduce prey species diversity. With scenario 2, substantial habitat impacts and direct losses of birds could occur. Scenario 2 may kill individual birds in burned areas and reduce or eliminate dense canopy habitat, replacing them with highly fragmented forest conditions. This immediate, major disruption of habitats would result in short-term changes in availability of prey species for peregrines. For example, destruction of mid and late seral timber could potentially result in immediate reductions of numbers of some species (i.e. flammulated owls, Vaux's swift, Hammond's flycatcher, hermit thrush, etc.) but would subsequently result in immigration of other woodpeckers, flickers, and seedeating birds that feed on insects in the burned and downed trees (Dobkin, 1994). From one to two years after the fires, studies have shown that in the Northern Rockies, up to 87 bird species may use post-fire habitats and a large proportion of these are migrants that winter to the south (Huto, R.L. 1995b). Species which benefit from fire-created openings and snag-rich early seral vegetation *(*for example olive-sided flycatcher, mountain bluebird, American robin, solitary vireo, yellow-rumped warbler, Western

tanager, chipping sparrow, dark-eyed junco, etc.) would respond with increases. Whether total prey availability would be higher or lower is questionable, but ease of capture would likely be enhanced due to reduction of tree canopies.

Based on the landscape-scale fire history and forest process analysis which has led to the proposed action, forest structure and function around both the Shingle and Sheep Gulch nest sites have experienced altered disturbance regimes from previous fire exclusion. Habitats of birds hunted by peregrine falcons have shifted in structural, age class and species composition over time, and have become less diverse and predisposed to large, high-intensity fires. This would inevitably create dramatic, high contrast habitat changes and result in movement barriers, isolated habitat patches, loss of some avian habitats, and an overall reduction in habitat diversity. The role of fire in perpetuating natural disturbance patterns and encouraging and maintaining avian populations and diversity is recognized by several researchers (Hejl, S. 1994; Hutto, R.L. 1995a; Behrens, M., et al. 1995).

Alternatives B, C, and D would help reestablish conditions of structural diversity, help create additional snag habitats for snag-dependent species, and would help reduce large-scale high intensity fire risks by reducing fuels. The result would have impacts on ground and shrub nesting habitats of some peregrine prey species, but would lead to protection of greater overall habitat stability for a wide array of peregrine prey. Alternative E would also reestablish these conditions where burning occurred but only in burns portions of units 2A, 2B, 2C, 4A, 4B, and 4C. Those areas not treated would continue as described in the No Action discussion.

Cumulative Effects

Known Nest Sites

Known nest sites have been protected from human harassment and man-induced habitat changes that might disrupt nesting and reproduction. However they have also experienced fire exclusion from past management activities, which have changed local vegetative conditions immediately around nests. Roading, logging, recreation, fire suppression, and other forest uses have been carefully designed and monitored adjacent to active nests to date. Effects from these activities have been minimized. Continued fire protection of these sites will add to previous incremental vegetative changes and fire -risks incurred since fire suppression began. Under the no action alternative, these effects will be cumulative.

If scenario 2 of the no action alternative (broad-scale high intensity fire) takes place during the 10 year analysis period, the effects upon peregrine nest sites and adjacent habitat will be cumulative to other minor man-caused disturbances and habitat changes near active nests.

Action alternatives will begin to reverse the effects of previously altered vegetation regimes and will not be cumulative to past changes in disturbance regimes. Activities required to implement fuel reductions will produce human activities which will be potentially cumulative to past man-induced disturbances and habitat changes from harvest, roading, and human recreation activities.

Prey Habitats

The no action alternative (scenario 1) will further alter disturbance regimes affecting vegetation for peregrine prey species and along with previous habitat changes from fire exclusion and other human activities, will be cumulative. This is also true of scenario 2. The more dramatic and contrasting changes brought on by high-intensity fires would likely have a greater cumulative affect than scenario 1.

The action alternatives will add human and vehicular disturbances to current and past human-disturbance levels and will be cumulative. Fuel reductions however, will not be cumulative to the previously altered disturbance regimes created by fire suppression activities. Action alternatives would produce some human disturbances but would not be implemented in proximity to nests during nesting seasons.

Grizzly Bear

Management Strategies

Based on a five year habitat and population evaluation completed for the Selway-Bitterroot Ecosystem in 1991, and clarification of the interim approach for considering grizzly bear habitats in or adjacent to the Bitterroot Grizzly Ecosystem (U.S. Fish & Wildlife Service letter to Michael King, Nov. 6, 1995), the Salmon River Canyon portions of the Bitterroot Grizzly Ecosystem are not considered "occupied" and preparation of a Biological Assessment for grizzlies in this area is not mandatory. Protection of suitable grizzly bear habitats will be accomplished by assuring that big game standards are in compliance with Forest Plans . For purposes of assessing environmental impacts of the proposed action and alternatives, the balance of this discussion will address related grizzly habitat relationships.

Grizzly bear habitat exists in units 5, 6, 15, 16, 17, and the wilderness portion of units 21A, 21B, and 21C.

Bear researchers agree that the most crucial element of grizzly recovery is securing adequate effective habitat for bear populations (U.S. Fish & Wildlife Service. 1993). Effective habitat is defined as that which provides all the components necessary for the survival of the species including food, cover, denning habitat, solitude, and space. Grizzly populations require some level of safety from human depredation and competitive use of habitat that includes roading, logging, mining, human settlement, grazing and recreation. Roads probably pose the most imminent threat to grizzly habitat today because the presence of open roads often leads to increased bear/human contact and conflicts which often end in grizzly mortality. "Habitat management policies such as fire suppression also can be viewed as competitive use because it may have long-term adverse effects on grizzly habitat", (U.S. Fish & Wildlife Service 1993, p. 21). Effective grizzly habitat contains an abundance of many kinds of natural foods so that random changes in the abundance of some food items are offset by the presence and availability of other items (U.S. Fish & Wildlife Service. 1993. p.21). Actions which encourage the continual development and maintenance of a diversity of foods provided by forest cover interspersed with occasional parks or small openings in conifer cover areas should be a habitat goal. Strategies which discourage natural disturbance regimes and lead to extremes of either cover- deficient or forage- deficient areas across large landscapes should be avoided.

Direct and Indirect Effects

The no action alternative would neither build nor increase access on existing road systems. It would make no changes to existing forest structures or densities. Scenario 1 (no wildland fires) would continue to encourage conifer dominance in many areas, to the general exclusion of small openings and forage producing plants. Indirect effects would include reduction in long term herbaceous forage for both grizzlies and ungulates that use winter ranges. Scenario 2 (wildland fires) would likely result in disproportionately hotter, larger fires than under historical regimes. This would result in large, cover-deficient openings in the short-term but would also result in the development of large, forage-rich but cover-deficient areas in the longer term. In total, a measure of habitat loss would occur (Brown and Bright, 1995).

Alternatives B, D, and E would not build nor increase access on existing road systems but would reduce forest fuels, creating a scattering of small openings which would begin to emulate natural disturbance regimes within the existing habitat. An interspersion of small openings and forest conditions that maintain vertical and horizontal elements in the post-fire environment with a balance of forage and cover would be encouraged, resulting in a degree of habitat enrichment (Brown and Bright, 1995). The risk of large-scale, high-intensity fires would be reduced. Human disturbances and a temporary increase in the use of existing roads would result from implementation of the actions. However, this temporary increase should have no impact because the area is not occupied by grizzly bears. Forest structure would be incrementally changed to a more stable, long-term sustainable condition respective to grizzly habitat.

Cumulative Effects

The no action alternative (intense fires deferred) would further encourage increased conifer densities which would be cumulative to those created by past fire suppression and deviation from natural disturbance regimes, but would not add human disturbances and activities to a landscape which has previously experienced considerable human intrusion from past practices. Scenario 2 (wildland fires) would create immediate, high contrast habitat changes to the landscapes in patterns dissimilar to historical regimes but would not be cumulative to previous habitat effects from past fire exclusion. Human induced disturbances from fire suppression and other activities would be cumulative to other similar activities that have taken place in the past.

Action alternatives would create additional human induced disturbances and minimal ground-disturbing actions to other historical activity levels discussed above. Changes in forest structure and reductions in fuel buildups would not be of a cumulative nature.

Effects Summary

Since the analysis area currently has no permanent occupation by grizzlies, none of the alternatives would yield effects considered significant to grizzly recovery.

Lynx

There is lynx habitat in all units within the Salmon River Canyon area. While there have been limited sightings reported, it is not known if the species is actually present within the individual units.

Management Strategies

Lynx habitat management strategies involve maintenance and perpetuation of mosaics of mixed vegetation ages and structures across the landscape. Stable old growth in relative proximity to early seral vegetative communities is considered important. Creation of patch mosaics of early seral vegetation amid contiguous moderate to high elevation mid and late seral stands is considered beneficial for species maintenance.

Direct and Indirect Effects

The no action alternative (Scenario 1) would prevent disturbance to old growth and potential denning sites in the short term. It would protect dense regeneration areas which may serve as snowshoe hare habitats. In contiguous mid and late seral stands, this alternative may forego the production of snowshoe hare habitat sites as a food supply locally. Scenario 2 would likely create large, contiguous areas of early seral habitats favorable to production to snowshoe hare production in the longer term. It may also destroy large patches of suitable denning habitat in the process, creating an imbalance to overall lynx habitat needs.

Action alternatives may remove very small patches of vegetative cover suitable as snowshoe hare habitats, particularly along the lower elevational margins of lynx habitat. Action alternatives would help provide longer term protection to patches of old growth which provide suitable denning habitats.

Cumulative Effects

The no action alternative (Scenario 1) would continue to encourage closure of natural and fire induced forest openings. It would temporarily protect the integrity of current landscape and habitat conditions from large-scale, intense fires in the short term but would contribute cumulatively to habitat imbalances for lynx in the longer term. Scenario 2 would risk losses of denning habitats by high intensity fire, and would begin to reverse cumulative landscape changes which have discouraged lynx prey, but the scale and distribution of fire-created early seral acres may become too large and therefore would be out of balance with historical scale and patch dynamics. This would result in further cumulative negative impacts on lynx habitat.

Action alternatives would begin to address cumulative changes in patch scale and landscape mosaics without inducing high intensity fire risks, which, in addition to roads, harvest, and human intrusion have and continue to cumulatively impact lynx habitats past and present. Action alternatives may pose disturbance or displacement risks to lynx at moderate elevations (greater than 4000 feet) in treatment areas.

U.S. FOREST SERVICE (REGIONAL FORESTER-DESIGNATED) SENSITIVE SPECIES

Western Big-eared bat

While habitat for the western big-eared bat exists in all units in the proposed action, it is only present in units 2A, 2B, 23, and 24.

Management Strategies

Effective Western big-eared bat habitat management relates principally to cave habitats and protection of communal roost sites from human disturbances. None of the alternatives is predicted to affect caves or cave management within the analysis area. Secondarily, long-term maintenance of large trees and a diversity of forest habitat, including small openings and forest edges as feeding zones, may be important to the species.

Direct and Indirect Effects

The no action alternative is not expected to affect caves or management of human disturbances within them. The no action alternative (scenario 1) will continue to discourage forest processes which perpetuate small forest openings for feeding or the growth of large trees as secondary roosts. Scenario 2 (wildland fire) would likely create large openings and possibly smaller islands of cover which may or may not be suitable as feeding sites. Snags created by the fires would become available as roosts but whether all the conditions suitable for their use would be in harmony is uncertain. Continuous development of conditions which create large trees and snags would be interrupted. Many sites would become dryer indirectly by the loss of overstory tree canopies and rejuvenated grass/forb/shrub communities and may or may not be suitable for production of moths which constitute much of the bat's diet.

Cumulative Effects

The no action alternative (scenario 1) would result in continued encroachment by shade-tolerant conifers, increased ground and latter fuels, and reductions in openings and other sites considered suitable as feeding habitats. This would become cumulative to forest structure and density trends created from past fire exclusion over much of the analysis area resulting in reduced large tree development and feeding site availability over the long term.

Alternatives B, C, and D would produce greater short-term human disturbance levels where the bats are present but would not likely be cumulative to current and past human disturbance levels of caves. Changes in forest structure and disturbance regimes would not be cumulative to past effects of fire exclusion actions. Alternative E does not burn units 23 and 24 but does burn the occupied portions of units 2A and 2B.

Summary and Determination of Effect

No alternative would yield serious negative effects to important habitats or bats. All alternatives "may impact individuals or habitat, but will not likely contribute to a trend toward federal listing or cause a loss of viability to the population or species."

Spotted Bat

Spotted bat habitat is present in Units 4D, 5, 12,13,14, 15, 16, 17, 21A, 21B, 21C, 23, 24, 36, 37A, 37B, and 38. However it is unknown if this bat occupies this habitat.

Management Strategies

A primary objective of spotted bat management is the protection of caves used as communal roosts from disturbances. None of the alternatives are expected to affect caves or their management. While relatively little is known about this species in the analysis area, it's preferred foraging habitat (riparian zones within relatively arid habitats) suggest that maintenance of historical disturbance regimes and dryer, more open habitat conditions may be beneficial. Maintaining warmer, dryer site species (ponderosa pine, Douglas fir) as more suitable habitat versus colder, more moist conditions perpetuated by shade-tolerant conifer invasions would better produce suitable habitat conditions for this bat. Vegetative conditions that moderate temperatures or encourage warmer environments tend to produce greater aerial insect food diversity and populations than cooler, more heavily shaded environments (Blair, G.S. pers. observ.).

Direct and Indirect Effects

The no action (Scenario 1) alternative would perpetuate continued encroachment by shade-tolerant conifers, increase the risk of high-intensity fires, and reduce the sizes of small openings, which leads to cooler, moister sites. Indirect effects would include reductions in aerial insect availability in some areas and reduction of foraging habitat suitability. Scenario 2 would likely result in dramatically altered habitat conditions, creating very large openings and drying sites out considerably. Information about the degree to which this would impair or encourage aerial insects is uncertain but short-term absence of vegetative cover across large landscapes would not likely be beneficial to habitat stability.

Action alternatives would begin to revert overdense vegetative conditions to a more historical condition. Encroaching firs would be thinned by fire and pockets of ponderosa pine and Douglas fir would be encouraged due to the reduced shading and site would tend to become slightly warmer. More of the spotted bat habitat would be impacted with Alternatives B and D. Alternative C would not burn the habitat in Units 15, 16, 17, or portions of Units 5, 13, 14, 21B, 21C, and 37B. Alternative E would not burn the habitat in Units 4D, 23, 24, and portions of units 5, 12, 21A and 36. Those areas not burned would have the same effect as the no action alternative (Alternative A). Indirect effects would include a reduction in the risk of large-scale, high-intensity fires, which would create large openings.

Cumulative Effects

The no action (Scenario 1) alternative would not add cumulatively to human disturbance risks in cave habitats. Forest structure and function would continue to become more dense

with shade-tolerant conifers which would be cumulative to past and present conditions perpetuated primarily by fire exclusion. Scenario 2 would not be cumulative to past and present structure and composition changes in the forest but would be cumulative in terms of degradation and extreme contrasts in habitat conditions. Sites would become much dryer and vegetatively deficient.

The action alternatives would begin to reverse the forest structure and composition trends which are out of balance with historical ranges of variation, but would not be cumulative. Additional human activity levels would be imposed on the area for limited periods during implementation but none of the action alternatives would likely affect caves nor add cumulatively to disturbance risks.

Summary and Determination of Effect

All alternatives "may impact individuals or habitat, but will not likely contribute to a trend toward federal listing or cause a loss of viability to the population or species."

Harlequin duck

There is habitat for the harlequin duck in units 4C, 4D, 5, 6, 12, 13, 14, 15, 16, 17, 21A, 21B, 21C, 23, 24, 36, 37A, 37B, and 38. This species is only known to be present in Unit 6.

Management Strategies

Breeding habitats are considered most critical to this species. No known breeding habitats exist within the analysis area. In non-breeding habitats, protecting buffers of uncut timber along streams, maintaining instream flows and water quality may be important to overall protection and maintenance of streams used for resting and feeding.

Direct and Indirect Effects

The no action alternative (scenario 1) would protect higher elevation stream habitats. Scenario 2 could affect these streams if high-intensity, large-scale fires removed timbered stream buffers or otherwise removed large areas of overstory cover.

Action alternatives would help reduce overall fuel levels, thereby reducing long term risks of high-intensity fires in local stream habitats. Short-term human disturbances associated with the actions could potentially or temporarily displace or disturb resting or feeding harlequins that may be residing in streams within the treatment areas. Alternatives B and D would have the greatest impact due to the higher levels of fuel reduction. Alternatives C and E would reduce the fuels in those areas burned and would have the same impact as the no action alternative in those areas not burned.

Cumulative Effect

The no action alternative (scenario 1) would further encourage invasion and densification of forest conditions by shade-tolerant species and continued fuel buildups which, cumulatively with the actions of previous fire suppression, would be additive to future risk of high-

intensity fire. Scenario 2 would result in some losses of suitable habitat along some streams, but this is not expected to be significant to the conservation of the species.

The action alternatives would add to past and present human disturbance levels with additional human activities required to treat fuels, but these effects would not be significant to conservation of the species. Changes to forest structure and habitat conditions would not be cumulative.

Summary and Determination of Effect

Alternative A would yield a "no impact" determination but other alternatives would yield a "may impact individuals or habitat, but will not likely contribute to a trend toward Federal listing or cause a loss of viability to the population or species" determination.

Northern Goshawk

All units in the proposed action contain northern goshawk habitat. The species is known to be present in units 2A, 2B, 2C, 2D, 2E, 4A, 4B, 4C, 4D, 5, and 6.

Management Strategies

Important habitat management strategies for goshawk include maintaining nest sites (i.e. large trees/late or old growth structural stages) but also providing sufficient forest structural stages that produce ample prey. (Graham, R.T., et al. 1995). The primary strategy for maintaining populations of the northern goshawk is to ensure perpetuation of the long term forest plan-designated minimum or greater amounts of old growth forest conditions.

Direct and Indirect Effects

The no action alternative (Scenario 1) would protect existing nest stands from immediate disturbance and would preclude any potential human disturbances around active nests. It would maintain the current structural conditions but encourage continued trends to high density forest areas with high canopy coverage of shade-tolerant conifers. Indirectly, in the longer term this condition would predispose many sites to very high risks of insect and forest disease conditions, as well as high intensity, large-scale fires which would simplify the forest structure, potentially eliminate many existing large trees and limit short-term development of large trees preferred for nesting. It would also discourage habitat suitability for many prey species. Scenario 2 would result in loss of suitable nesting habitats. It would potentially lead to fragmentation of the landscape in patterns less suitable to goshawk hunting and reproduction. Remaining islands of cover amid large scale burned areas would not return to prey productivity until after the 10 year analysis period.

The action alternatives would likely result in minor, short-term impacts on individuals and possible displacement or nest abandonment of some nests by associated human activities as well as fire and smoke disturbances during the breeding season. Actions could potentially affect some goshawk prey directly from fire or tree removal and indirectly from changes in vegetative structure. It would reduce fuel conditions by removing primarily the small and intermediate-sized vegetation but would not likely impair most nesting sites, but would

provide long-term improvement in prey production and reduced stand replacement risks. In areas where the species is known to be present, this effect would be greatest in alternatives B and D. There would be slightly lower impact with alternative C due to the exclusion of unit 6 and the wilderness portion of unit 5. Alternative E would have the least impact to areas the northern goshawk is known to be present because of the exclusion of units 2D, 2E, and 4D and the reduced acres burned in units 2A, 2B, 2C, and 4C.

Cumulative Effects

The no action alternative (Scenario 1) would lead to continued departure from natural disturbance regimes and higher densities of shade-tolerant conifers. The elevated risk to both nesting and foraging habitats which would be cumulative to past and present habitat changes. Scenario 2 would result in long-term cumulative vegetative changes and would increase the potential for large scale fire-induced fragmentation of landscapes, eliminate nesting stands, and temporarily destroy some foraging habitats. These effects, though opposite those created by fire exclusion, would be negative in a cumulative sense.

The action alternatives would begin to reverse long-term cumulative shifts in vegetation and encourage mosaics of different age classes, but these changes would not be cumulative to past or present changes. Restoration of more open conditions in Douglas fir stands would help reduce long-term, stand replacing fire risks, help encourage large tree growth and create micro-openings diversifying habitat for prey.

Summary and Determination of Effect

All alternatives would yield a "may impact individuals or habitat, but will not likely contribute to a trend toward Federal listing or cause a loss of viability to the population or species" determination.

Flammulated owl

Flammulated owl habitat can be found in all units proposed for burning. It is only known to be present in Units 4C, 4D, 21A, 21B, 21C, 24, 36, 37B, and 38. Presence in the remaining units is uncertain.

Management Strategies

The goal of flammulated owl habitat management is to restore or maintain "fire-climax" ponderosa pine/Douglas fir forests (Hayward and Verner 1984).

Direct and Indirect Effects

The no action alternative (Scenario 1) will have no immediate direct effects on flammulated owls or their habitat, but indirect effects of continued fire exclusion and invasion by shade-tolerant conifers will continue to further reduce grass/forb edges which produce insects and arthropods used as prey. It will also risk habitat destruction of larger trees from stand-replacing fire. Scenario 2 would likely result in direct loss of flammulated owls as well as important nesting and foraging habitats over large areas. Indirect effects of this alternative

would preclude flammulated owl presence for decades in burned areas due to absence of habitat, well beyond the 10 year analysis period until suitable habitat could become established.

The action alternatives may temporarily disturb nesting owls when implemented during the breeding season and could temporarily (1-2 years) reduce insect and arthropod prey in treated areas. Application of prescription fire would indirectly result in improved longer term foraging habitat conditions , growth of larger trees, creation of some snags, and would result in modestly reduced high-intensity fire risks that might later destroy snags used for nesting. Overall, application of prescribed fire will begin to help restore and maintain fire climax ponderosa pine and Douglas fir forest types. Alternatives B and D would do the most to improve these foraging habitats due to the number of acres treated. In areas where the species is known to be present, Alternative C would not burn a small portion of the occupied owls habitat in units 21A, 21B, 21C, and 38. Alternative E would not burn Units 4D, 24, most of units 4C and 36, and a portion of Units 21A.

Cumulative Effects

The no action alternative (Scenario 1) would have no direct impact on owls or their habitat in the short-term. In the longer term, fire-exclusion and continued successional advancement would result in further degradation of owl habitats which would be cumulative to effects from past fire exclusion and timber harvest. Scenario 2 would result in immediate losses of some snags and foraging habitat as well as possibly some nesting adults. In terms of negative trends, Scenario 2 would also be cumulative and adverse to overall owl populations and habitat degradation that previously occurred within the analysis area.

The action alternatives (human disturbance, smoke, vegetative manipulation) may modestly impact nesting owls if treated during breeding seasons and together with short-term impacts on foraging habitats, would be cumulatively negative to owls and habitat degradation from past fire exclusion, but not to an adverse degree. In the longer term, prescribed fire activity would help thin tree densities, create micro-openings encouraging grass and forb growth important to prey. It would also reduce risks of large, stand-replacing fires resulting in habitat losses and fragmentation.

Summary and Determination of Effect

Alternatives B, C, D and E would yield a beneficial impact determination but Alternative A would yield a "will impact individuals or habitat with a consequence that action may contribute to a trend toward Federal listing or cause loss of viability to the population or species".

Boreal owl

Boreal owl habitat can be found in units 4A, 4B, 4C, 13, 37A, 37B, and 38. It is uncertain if the species is actually present in these units.

Management Strategies

The goal of boreal owl habitat management is to maintain older forest conditions with larger trees and snags (preferably ponderosa pine or Douglas fir), and to maintain relatively small forest openings that encourage availability of small mammal prey (particularly red-backed voles) within higher elevation mixed conifer, spruce-fir and aspen communities.

Direct and Indirect Effects

The no action alternative (Scenario 1) would have no direct or immediate effects on owls or their habitats. Indirect, longer term effects would include progressive displacement of ponderosa pine and Douglas fir by grand fir, progressive closure of small forest openings, and increased risks for high-intensity crown fires sweeping up from lower elevation habitat types which could potentially result in elimination of some owls and their nesting habitats at the uppermost elevations of the analysis area. Scenario 2 would probably result in immediate, direct loss of owls and habitat due to stand-replacement fires. Indirect effects would further impair long term habitat effectiveness in burned areas because of large openings (avoided by boreals), and long term absence of suitable nest sites until regenerated trees achieved maturity.

Action alternatives would have very minimal if any measurable direct effects on suitable habitats of boreal owls, because most treatment zones would be below preferred owl habitats in elevation. Indirect effects of action alternatives would include reduced risks of high-intensity, stand-replacement fires moving into boreal owl habitats. Habitat protection would result from reduced potential fire spread into higher elevations. Fuel reductions and "breaking up" the contiguity of forest fuels below boreal owl habitats would begin to help reduce eventual fire intensities and crown fire risks in some areas to some degree. In limited areas where treatments may affect owl habitats, the prescription fire would not likely disturb or displace owls (Hayward and Verner, 1994; p.119). Indirect positive effects of treatments (maintenance of ponderosa pine and Douglas fir elements) would be more likely to protect overall habitat condition than be detrimental. Some nest sites (snags) could be lost, but long term conditions favoring large tree growth would be maintained. Small mammal habitats may be harmed in the short-term but would benefit slightly over the longer term. These effects would be most realized with alternatives B and D due to the areas treated. Alternative C would not treat large portions of unit 37B or the wilderness portion of unit 13. Alternative E would not treat a major portion of unit 4C. Areas not treated would have the same effect as the no action alternative. All impacts would be minor due to the elevation of this species' habitat.

Cumulative Effects

The no action alternative (Scenario 1) would allow further successional advancement of shade-tolerant conifers at elevations principally below preferred owl habitats. This would have few if any measurable cumulative effects on owls or their preferred habitats, but may result in cumulative changes in lower elevation habitats which may result in indirect cumulative wildland fire effects to some owl habitats. Scenario 2 would depend on the intensity of fires and to some degree, the effectiveness of suppression efforts in preventing the fires from reaching higher elevations and key owl habitats. Effects on owls and their habitats could range from none to catastrophic with respect to large trees, small openings, and old forest structure conditions, and would not likely be cumulative.

Action alternatives would provide positive effects to high elevation habitat through minor reductions in the risk of high-intensity stand replacement fires. Risks of disturbance or displacement of nesting owls would be relatively minimal for all alternatives.

Summary and Determination of Effect

Negative effects would be relatively low for all alternatives. All alternatives would yield a "may impact individuals or habitat, but will not likely contribute to a trend toward Federal listing or cause a loss of viability to the population or species" determination.

Great Gray Owl

Great gray owl habitat can be found in units 4A, 4B, 4C, 13, 37A, 37B, and 37C. It is uncertain if the species is actually present in these units.

Management Strategies

Maintenance of stable, rodent prey habitats and populations in forested environments is the primary goal of great gray owl habitat management, and maintaining adequate numbers of large, broken-topped snags is a secondary objective.

Direct and Indirect Effects

The no action alternative (Scenario 1) would have no direct and relatively minor indirect effects on great gray owls and their habitats, since they tend to occupy areas at higher elevations than the proposed burn units. Potential indirect effects of Scenario 1 would include

Disturbances of foraging habitats along the edges of the elevationally uppermost treatment areas. High-intensity fire risks in the same areas would remain unchanged. Scenario 2 could have some direct and indirect effects on owls and their prey habitats as well as potential nest sites, but this would depend on fire intensities, fire spread into higher elevation habitat types, and effectiveness of suppression efforts. Existing nest sites could be lost, large openings created and in the short term, prey populations would likely suffer in burned areas, but may be improved in the longer term.

The action alternatives would also have few direct effects and relatively minor indirect effects on great gray owls and their preferred habitats. Treatment actions would be predominantly below elevations used most by this owl, but all action alternatives would indirectly result in slightly reduced risks of destructive high-intensity fires and fragmentation risks in the overall landscape, particularly along the uppermost elevations treated. Since this species is apparently adapted to changing prey density conditions to some degree and is relatively mobile, direct and indirect effects would likely be minimal, but more positive than negative overall. These effects would be most realized with alternatives B and D due to the areas treated. Alternative C would not treat portions of unit 37B or the wilderness portion of unit 13. Alternative E would not treat a small portion of unit 4B or a major portion of unit 4C. Areas not treated would have the same effect as the no action alternative. All impacts would be minor due to the elevation of this species' habitat.

Cumulative Effects

The no action alternative (Scenario 1), in combination with the increased density of lower elevation habitat types that has been created by fire suppression, would increase the risk for large-scale, stand-replacing fires which could have significant potential to affect great gray owl habitats. Such fires would lead to greater overall habitat fragmentation and possibly loss of some nest sites at higher elevations. Scenario 2 may slightly affect some nests and habitats along the upper elevation boundaries of wildland fire areas and could increase habitat fragmentation, but given assumed suppression, would not likely have much overall effect and would not be cumulative in terms of a higher risk of large scale fire and consequent forest fragmentation.

The action alternatives would help begin to restore foraging habitat conditions along the lower margins of upper elevation sites treated, and would minimally help reverse cumulative effects of fire suppression and increased stand-replacing fire risks. All action alternatives may result in minimal loss of some nesting sites at the highest elevations treated, and this would cause minor cumulative negative impacts to owl habitats, but the increase in foraging sites created at lower elevations and reduction in catastrophic fire risk along the uppermost elevations treated would help reverse cumulative effects most critical to the owl and its habitat. Based on cumulative changes in forest structure due to past fire exclusion, the effects of prescription fire would be positive.

Summary and Determination of Effect

All alternatives would yield a "may impact individuals or habitat, but will not likely contribute to a trend toward Federal listing or cause a loss of viability to the population or species" determination.

Mountain Quail

Mountain quail habitat is present in units 2A, 2B, 2C, 2D, 2E, 4A, 4B, 4C, 4D, 8, 9, 10, 11, 12, and 13. It is uncertain if the species is present in units 11, 12, and 13 but is known to be present in the remaining units containing habitat.

Management Strategies

Maintenance of moderate tree crown cover with tall, dense shrub understories is the key to protecting and maintaining mountain quail nesting and migration habitats in planned treatment areas. Allowing overdominance by dense conifers suppresses forest understory shrubs, but encouraging grasslands or open ground are extremes that should be avoided. Loss of shrubby riparian draws adjacent to conifer-covered slopes should also be avoided.

Direct and Indirect Effects

The no action alternative (Scenario 1) would have no direct impact on shrubby riparian habitats or nest sites. Scenario 1 would indirectly lead to increased conifer domination on the forested landscapes, which could lead to increased risks for higher intensity fires, large openings and habitat losses. Scenario 2, depending on locations and severity of fires, would destroy nests and kill or displace nesting birds. Indirect effects of Scenario 2 would be potential long term fragmentation and isolation of nesting and migration habitats. Units 8, 9, 10, and 11 are scheduled for fall burns and should have relatively little impact on immediate nesting. Approximately 38,000 acres of the remaining units will be burned over a period of three years in the spring with Alternatives B and D which may burn some nests. Alternative C will burn slightly less in the spring (approximately 36,000 acres) over the same period. Alternative E will burn approximately 13,000 acres in the spring over the same time period.

Action alternatives could directly destroy some nests and potentially a few nesting birds in the short-term if implemented during spring or early summer periods. Indirect effects would include risk reduction of stand-replacing fires, rejuvenation of shrub communities beneath conifer stands, and slight reductions in overall conifer densities in treated sites, all of which are considered beneficial.

Cumulative Effects

The no action alternative (Scenario 1) would contribute to increased densities and dominance of conifers in quail habitats, which would be cumulative to past trends in vegetative structure from fire exclusion. This would lead to increased overall risks of destructive, stand-replacing fires which could be cumulative to other past and ongoing habitat effects from agriculture, cattle grazing, residential development and other causes. Scenario 2 would likely result in nest losses, habitat losses including fragmentation of forest landscape structures used for migration, and isolation of unburned habitat patches. These would be cumulative to past, present, and reasonably foreseeable future impacts.

Action alternatives would result in potential loss of some nests (if treated and burned in spring) which would be cumulative to other overall impacts but would help reverse successional trends and this would not be cumulative. The direct losses of some nests (assuming spring burns) and short-term habitat disturbances would be cumulative to other habitat effects and human-associated land uses.

Summary and Determination of Effect

All alternatives would yield a" may impact individuals or habitat, but will not likely contribute to a trend toward Federal listing or cause a loss of viability to the population or species" determination.

Black-backed Woodpecker

Black-backed woodpecker habitat is found in all units proposed for treatment but it is unknown if they are present in the specific burn units themselves.

Management Strategies

Black-backed woodpeckers are relatively unique among other wildlife within the northern Rocky Mountains in that they seem to be nearly restricted in their habitat distribution to standing dead forests created by stand-replacing fires (Hutto, R.L. 1995b). Stand-replacing fires may be necessary for long-term maintenance of black-backed woodpecker populations, because of the relative abundance of key habitat elements - standing fire-killed or fire-weakened trees.

Direct and Indirect Effects

The no action alternative (Scenario 1) would have no direct, immediate impact on black-backed woodpeckers or their habitats. Scenario 1 would likely result indirectly in continued successional advancement by live conifer communities resulting in continued incremental reduction of habitats important for black-backed woodpecker populations. Scenario 2 however, would directly create suitable habitats favorable for this woodpecker. Indirect effects of Scenario 2 would include substantial increases in both feeding and nesting sites important to the species.

Action alternatives would directly produce scattered dead trees in many cases, but most would likely be of smaller diameter and of limited value to the species overall. Burning activities would directly serve to reduce the "boom-bust" cycle of habitat availability for the species in treated areas and immediately outside them. Indirectly however, all action alternatives would be slightly positive and would help buffer the risks of large-scale habitat "boom-bust" cycles. Such cycles create large amounts of short-term quality habitat but at the expense of the long-term habitat stability.

Cumulative Effects

The no action alternative (Scenario 1) would further contribute to years of declines in the availability of habitat important to this species. In addition, these cumulative effects would be additive to loss of large snags and dying trees harvested in salvage logging operations (on sites where permitted) which are anticipated to continue. Scenario 2 would reverse the cumulative vegetative trends in loss of habitat for the bird in the short-term but reasonably foreseeable salvage harvests (particularly in lower elevations where roads are in place), could be expected to reduce availability of key habitat elements in some areas which would cumulatively affect past activities and human use patterns on the landscape. Forest Plan standards for snag retention and recruitment would be met in most areas except where stand replacement fires eliminate future snag recruitment opportunities for many years to come on larger landscapes.

Some action alternatives would potentially create scatterings of dead trees but would also eliminate some habitat for this species and these actions would be cumulative to past, current and reasonably foreseeable actions, such as salvage logging and fire suppression, particularly at lower elevations and on roaded areas. Wilderness areas would be the exception where salvage logging via roads and mechanized equipment is prohibited.

Summary and Determination of Effect

All alternatives would result in a "may impact individuals or habitat, but will not likely contribute to a trend toward Federal listing or cause a loss of viability to the population or species" determination.

White-headed Woodpecker

White-headed woodpecker habitat is found in all units proposed for treatment but it is only known to be present in Unit 38.

Management Strategies

White-headed woodpeckers prefer open-canopied stands of mature and older ponderosa pine where overstory canopies are low (less than 26 percent). They also require large snags. Safely reducing conifer densities and reestablishing frequent, low-intensity fire into suitable habitat to help perpetuate large, widely spaced pine is the primary habitat management strategy for this species (Blair, S., et al. 1995). Long term perpetuation and protection of Forest Plan old growth threshold amounts of ponderosa pine and mixed ponderosa pine/Douglas fir forest conditions is the primary population strategy.

Direct and Indirect Effects

The no action alternative (Scenario 1) would have little or no direct impact on existing habitats and would continue to encourage increased fuel loadings and invasion by shade-tolerant conifers on many acres of otherwise suitable habitat. Scenario 2, depending on relative fire intensities, would result in destruction of potentially suitable late seral habitats for white-headed woodpeckers, shortening of stand rotation ages and elimination of structural stages required by the species for long periods of time.

The action alternatives would begin to reduce forest fuel buildups and excessive tree densities which currently threaten suitable but otherwise low quality habitats in many areas by future high-intensity fires. Alternatives B and D would have the most impact due to the number of acres burned. Alternative C would burn the next highest number of acres and Alternative E would treat the least. Therefore, Alternative E would have the least impact on this habitat.

Cumulative Effects

The no action alternative (Scenario 1) would continue to perpetuate further fuel loading and high intensity fire risks in suitable habitats for white-headed woodpeckers. Cumulative effects of past logging of large ponderosa pine in roaded, developed areas combined with increased risk of high intensity fires across the suitable habitat within the analysis area would further risk remaining mixed stands of ponderosa pine/Douglas firs. Scenario 2 would result in more immediate loss and destruction of many remaining habitats for the bird, given past fire exclusion and commercial harvest of large ponderosa pine.

Action alternatives would begin to reduce the overall cumulative effects of past and present management actions thereby reducing cumulative high intensity fire risks to remaining habitats.

Summary and Determination of Effect

Alternatives A, C, and E would yield a "may impact individuals or habitat, but will not likely contribute to a trend toward Federal listing or cause a loss of viability to the population or species" determination. Alternatives B and D would yield a "Beneficial Impact" determination.

Three-toed woodpecker

Three-toed woodpecker habitat is found in all units proposed for treatment but it is unknown if they are present in the specific burn units themselves.

Management Strategies

Three-toed woodpeckers are associated primarily with post-fire habitat conditions within the landscapes of the analysis area (Hutto, R. 1995a). Management strategies that ensure a widely distributed supply of standing dead timber over the long term are considered beneficial to this species.

Direct and Indirect Effects

The no action alternative (Scenario 1) would not have any immediate effects on habitat for three-toed woodpeckers since fire would not kill trees for foraging and nesting. The scenario would continue to contribute to conditions that would eventually lead to large-scale burns which would inevitably produce large amounts of high quality habitat for short duration in the future but at the cost of long-term habitat stability. Scenario 2 would result in uncertain amounts of immediate quality habitats available for this species for the short term. Both scenarios may lead to wide variations in amounts of high quality habitat available but conditions would perpetuate "boom-bust" habitat scenarios over time.

Action alternatives would directly produce scattered dead trees in many cases, but most would likely be of smaller diameter and lower value to the bird. Prescription burning activities would directly reduce overall potential future habitat for the species in treated areas and immediately outside, but would also create scatterings of snags as well. All action alternatives would indirectly begin to reduce the probability of creation of large amounts of preferred habitat for this bird by high intensity fire, in exchange for short-term availability of smaller, scattered dead tree habitat. The actual amount of habitat created would be dependent on the number of acres burned. Therefore, Alternatives B and D would produce more habitat, Alternative E would produce the least and alternative C would be in the middle.

Cumulative Effects

The no action alternative (Scenario 1) would contribute to increased fuel loads and increased invasion by shade-tolerant conifers due to years of fire exclusion. This would result in cumulative declines in availability of quality habitat important to this species. In addition, these cumulative effects would be additive to losses of large snags and dying trees harvested in salvage logging operations (on sites where permitted), which are anticipated to continue. Scenario 2 would reverse the cumulative vegetative trends in loss of habitat for the bird but reasonably foreseeable salvage harvests (particularly in lower elevations where roads are in place) would be expected to reduce availability of key habitat elements which would add to the effects of past activities and human use patterns on the landscape.

Action alternatives would both create and eliminate habitat for this species and these actions would be cumulative to past, current and reasonably foreseeable actions such as salvage logging and fire suppression, particularly at lower elevations and on roaded areas. Wilderness areas would be the exception where salvage logging via roads and mechanized equipment is prohibited.

Summary and Determination of Effect

Negative effects for this species are not well understood given current information.

Spotted frog

Spotted frog habitat is found primarily in the riparian areas of all units proposed for treatment but it is unknown if they are present in the specific burn units themselves.

Management Strategies

Protection and maintenance of riparian habitats in which spotted frogs reproduce may be the most important strategy for this species. Relatively little is known about actual risks to the species, but the highest observed densities of spotted frogs occur in relatively open areas around riparian zones such as open meadows where sunlight and warmer temperatures produce a wide variety of insects as food (Blair, G.S. pers. obs.).

Direct and Indirect Effects

The no action alternative (Scenario 1) would have no immediate effect on spotted frogs or their habitats based on the limited knowledge base about the species. Indirectly, Scenario 1 would likely encourage excessive overstory cover development at some breeding sites, thereby reducing productivity and suitability of reproduction sites. Scenario 2 would potentially result in killing spring and summer migrating frogs. Scenario 2 would also remove excessive amounts of overstory canopy cover across large areas which, in combination with indirect effects of undampened wind and greater extremes in local climate and temperatures on burned areas, would most likely be harmful to spotted frogs.

Action alternatives would expose migrating frogs to lower intensity ground fires and the risk of mortality during summer dispersal periods in the short term. This dispersal period begins in the late spring and continues into the summer. The effects would be most evident with

Alternatives B because of the acres burned and the timing of the burn. Alternative C would have the second highest potential for impact and Alternative E would have the third highest potential for impact. Alternative D would not allow burning during the migrating period and would greatly reduce the risk of mortality.

In the longer term, moderation of overstory canopy levels would result in more moderate temperature regimes, and longer term stability of environmental conditions. In addition, risks of large scale, high intensity fires would be moderated. This would be most evident with Alternatives B and D because of the acres burned. Alternative C would have the second highest potential for impact and Alternative E would have the third highest potential for impact.

Cumulative Effects

The no action alternative (Scenario 1) would encourage continued overstory canopy closure and fuel buildups around frog reproduction sites. This would be cumulative to past and on-going densification of forest environments and would lead to hotter, more destructive fires when they eventually burned. Scenario 2 would likely result in stand replacement in many areas, resulting in reduced moderation of temperatures and climatic conditions where frogs reproduce. This would also be cumulative to past effects of forest canopy closure from past and ongoing fire exclusion.

Action alternatives would remove moderate amounts of forest overstory cover in mosaics or patches and this would not be cumulative to previous effects of fire exclusion or timber harvesting. Fuels reduction and minor tree thinning by fire would help maintain environmental conditions of temperature, moisture, and insect population stability across treated areas.

Summary and Determination of Effect

All alternatives would yield a" may impact individuals or habitat, but will not likely contribute to a trend toward Federal listing or cause a loss of viability to the population or species" determination.

Northern Leopard Frog

While all units proposed for burning contain habitat for the northern leopard frog (i.e. riparian areas), this species is not found within the planning area.

Management Strategies

Protection and maintenance of riparian habitats in which leopard frogs can potentially reproduce may be the most important strategy for this species. Relatively little is known about actual risks to the species, and since this frog is not known to exist within the planning area, maintaining quality of existing habitat is likely the best strategy.

Direst and Indirect Effects

None of the alternatives would have immediate effect on leopard frogs or their habitats based on their absence from the planning area. Inadequate information about the species and its habitat requirements or historical presence in the analysis area make further analysis meaningless.

Cumulative Effects

None of the alternatives would likely have any cumulative effects because the species is absent from the planning area. Inadequate information about the species and its habitat requirements or historical presence in the analysis area make further analysis meaningless.

Summary and Determination of Effect

All alternatives would yield a no impact determination.

Boreal Toad

Boreal toad habitat is found in all units proposed for treatment but it is unknown if they are present in the specific burn units themselves.

Management Strategies

Protection and maintenance of riparian habitats in which boreal toads reproduce may be the most important strategy for this species. Relatively little is known about actual risks to the species.

Direct and Indirect Effects

The no action alternative (Scenario 1) would have no immediate effect on boreal toads or their habitats based on the limited knowledge base about the species. Indirectly, Scenario 1 could likely encourage excessive overstory cover development at some breeding sites, thereby reducing productivity and suitability of reproduction sites. Scenario 2 would potentially result in killing spring and summer migrating frogs. Scenario 2 would also remove excessive amounts of overstory canopy cover across large areas which, in combination with indirect effects of undampened wind and greater extremes in local climate and temperatures on burned areas, would most likely be harmful overall to boreal toads.

All action alternatives would result in maintenance burning of riparian areas resulting in a reduced risk of stand replacement fires. This would be most evident with Alternatives B and D because of the acres burned. Alternative C would have the second highest potential for impact and Alternative E would have the third highest potential for impact.

Cumulative Effects

The no action alternative (Scenario 1) would encourage continued overstory canopy closure and fuel buildups around toad reproduction sites. This would be cumulative to past and on-going densification of forest environments and would lead to hotter, more destructive fires when they eventually burned. Scenario 2 would likely result in stand replacement in many areas, resulting in reduced moderation of temperatures and climatic conditions where frogs reproduce. This would also be cumulative to past effects of forest canopy closure from past and ongoing fire exclusion.

Summary and Determination of Effect

All alternatives would yield a "may impact individuals or habitat, but will not likely contribute to a trend toward Federal listing or cause a loss of viability to the population or species" determination.

Coeur d' Alene salamander

The project activities occur entirely outside this species' range and no effects to this salamander or it's habitats from any alternative are anticipated, therefore no further discussion will occur.

Summary and Determination of Effect

All alternatives would yield a "no impact" determination.

Fisher

Fisher habitat is found in Units 4A, 4B, 4C, 4D, and 38. It is uncertain if the species is present within these units.

Management Strategies

Strategies for management of fisher habitat includes maintenance and protection of overhead tree cover and perpetuation of late seral or old-growth forests, predominantly of grand and sub-alpine fir. Long term perpetuation of late seral and old growth forest conditions, predominantly in the more moist, higher elevation forest types is the primary population strategy.

Direct and Indirect Effects

The no action alternative (Scenario 1) would encourage continued successional advancement in habitats used by fishers and existing quality habitat would remain unchanged. Scenario 2 would risk loss of some or perhaps much late seral and old growth habitat from stand replacement fires that entered high quality fisher habitats.

Action alternatives would have little immediate effects on fisher habitats in most areas. Prescribed fires would tend to produce mixed effects to some fisher habitats from disturbance and structural changes, but in the long term may help protect best habitats from large-scale

stand replacement fires in the longer term. These effects would be most evident with alternatives B and D. The effects would be the same for units 4A, 4B, and 4C with Alternative C but reduced for unit 38 due to the reduced acreage burned. Alternative E would not burn unit 4D and would have reduced acreage for units 4A, 4B, and 4C. Impacts to the unburned areas would be the same as the no action alternative discussion.

Cumulative Effects

The no action alternative (Scenario 1) would continue to encourage maintenance of dense and moist forest conditions in habitat types preferred by fishers. It would further encourage increased fuel and forest densities on lower elevation and dryer site cover types which would be cumulative to those created by past fire exclusion. Scenario 1 would increase the risk of larger fires which might be cumulative to logging and roading effects on non-wilderness landscapes. Scenario 2 would likely result in loss of some late seral and old growth forest conditions, which would be cumulative to habitat losses and loss of overhead tree cover from clear-cut logging. These changes would be cumulative to those created by previous fire exclusion, timber harvest and related impacts to habitats.

Action alternatives would have immediate affects to cover types and elevations not preferred by fishers but would reverse and help reduce future impacts of past fire exclusion and harvesting in the longer term. There would be minor habitat changes to limited areas in fisher-preferred cover types but these would not be cumulative to habitat degradation trends created by previous management activities in most cases.

Summary and Determination of Effect

All alternatives would yield a "may impact individuals or habitat, but will not likely contribute to a trend toward Federal listing or cause a loss of viability to the population or species" determination.

Wolverine

Wolverine habitat is found in all units proposed for burning. It is uncertain if any of these species is actually present within the burn units.

Management Strategies

Habitats that exhibit high habitat diversity and an abundance of large ungulate carrion are deemed important to wolverines especially in remote areas or when actions or forest disturbances do not encourage additional human access and disturbances.

Direct and Indirect Effects

The no action alternative (scenario 1) would lead to short-term protection of some habitat structure, principally at elevations below those used by wolverines, but would encourage

continued conifer encroachment into small forest openings. No intrusions from helicopter or crew ignitions are expected to cause disturbances to wolverines. This scenario may perpetuate further conifer encroachment on winter ranges at lower elevations, which would reduce big game habitat and may encourage large-scale stand replacement fires. These could ascend to higher elevations, fragmenting the landscape and removing large areas of habitat. Scenario 2 would risk large scale high intensity fires at lower elevations , which could improve ungulate winter ranges but may also fragment some landscapes and result in short-term loss of some habitat.

The action alternatives would begin to reduce the risk of stand-replacement fires and create longer term habitat diversity and stability, but may slightly affect some wolverine habitat in the short term. No additional roads or human intrusion into preferred habitats would be encouraged by any alternative. Moderate increases in herbaceous forage availability and nutritive quality would benefit ungulates which serve as carrion for wolverines.

Due to the preference for remoteness, the likelihood of disturbing wolverines are those alternatives that burn within the roadless and wilderness areas. These are units 6, 9, 10, 13, 14, 15, 16, 17, and portions of units 2A, 2B, 2C, 4A, 4B, 4C, 5, 11, 12, 21A, 21B, 21C, 36, 37A, and 37B. Alternatives B, D, and E all burn the same areas that meet this criteria. Alternative C burns within roadless areas but does not burn in wilderness areas so would impact fewer areas where wolverines are likely to be present.

Cumulative Effects

The no action alternative (Scenario 1) would maintain current conditions in the short term but would encourage risks of large scale, higher intensity fires in the longer term. This would simplify habitat structures across large areas, thereby adding to the cumulative effects of human intrusion, roading and other manipulations of wolverine habitats. Scenario 2 would risk fragmentation of key habitats in wilderness and remote areas if fires ascend into higher elevations. This would result in substantial changes in vegetative cover and prey availability in the short-term, which would be cumulative to other negative impacts related to human intrusion, timber harvest, roading and other man-induced habitat changes.

The action alternatives would impact wolverine habitats with slight increases in short term human intrusion during application of prescription fires which would be cumulative to other impacts, but the landscape and vegetative results would not be cumulative to past trends in structural diversity caused by past fire exclusion. Reduction in stand-replacing fire risks, restoration of more fire stable vegetative conditions, and improvement in big game winter range conditions would result.

Summary and Determination of Effect

All alternatives would yield a "may impact individuals or habitat, but will not likely contribute to a trend toward Federal listing or cause a loss of viability to the population or species" determination.

BUREAU OF LAND MANAGEMENT SENSITIVE WILDLIFE SPECIES

In this analysis BLM Sensitive Species Effects are assessed and grouped based on family or feeding/nesting guilds.

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Myotis Bats (includes small-footed, long-eared, fringed, long-legged and Yuma myotis)

Myotis bat habitat is found in all units proposed for burning. It is uncertain if any of these species is actually present within the burn units.

Management Strategies

Effective myotis bat habitat management relates principally to cave habitats and protection of roost sites from human disturbances. None of the alternatives is predicted to affect caves or cave management within the analysis area. Secondarily, long-term maintenance of large tree habitats and a diversity of forest habitats including small openings and forest edges as feeding zones may be important to some species which use trees or snags.

Direct and Indirect Effects

The no action alternative is not expected to affect caves or management of human disturbances within them. The no action alternative (scenario 1) will continue to discourage forest structures and processes which perpetuate small forest openings for feeding or the growth of large trees as secondary roosts. Scenario 2 (wildland fire) would likely create large openings and possibly smaller islands of cover which may or may not be suitable as feeding sites. Snags created by the fires would become available as roosts but whether all the conditions suitable for their use would be in harmony is uncertain. Continuous development of conditions which create large trees and snags would be interrupted. Many sites would become dryer indirectly by the loss of overstory and understory tree canopies and rejuvenated grass/forb/shrub communities and may or may not be suitable for production of insects which constitute the bulk of these bat's diet.

No burning will occur during the winter, which is the most critical period for roosting bats.

Cumulative Effects

The no action alternative (scenario 1) would result in continued encroachment by shade-tolerant conifers, increased ground and latter fuels, and reductions in openings and other sites considered suitable as feeding habitats. This would become cumulative to forest structure and density trends created from past fire exclusion over much of the analysis area resulting in reduced large tree development and feeding site availability over the long term.

The action alternatives would produce greater human disturbance levels in the project areas but would not likely be cumulative to current and past human disturbance levels of caves. Changes in forest structure and disturbance regimes would not be cumulative to past effects of fire exclusion actions.

Summary and Determinations of Effect

No alternative would yield serious negative effects to important habitat or bats. All alternatives "may impact individuals or habitat, but will not likely contribute to a trend toward Federal listing or cause a loss of viability to the population or species."

Open Country Raptors (includes Northern harrier, Ferruginous hawk, and Prairie falcon)

Units 2A, 2B, 2C, 2D, 2E, 4A, and 4B have habitat for the northern harrier and the ferruginous hawk but it is uncertain if the species occupy the units. All units in the proposed action provide habitat for the prairie falcon. They are known to be present in units 2A, 2B, 2C, 2D, 2E, 4A, and 4B but it is unknown if they are present in the remaining units.

Management Strategies

Effective open country raptor habitat management relates principally to maintenance of a variety of vegetative conditions within the historical range of variability suitable to a wide variety of small and medium-sized mammals, birds and reptiles. Diversity of habitats with scattered large trees may be important for some species (i.e. Ferruginous hawks).

Direct and Indirect Effects

The no action alternative is expected to allow continued encroachment of open country by shrubs and trees accompanied by minor loss of herbaceous vegetation in the grass-forb dominated portions of the analysis area. The no action alternative (scenario 1) will continue to discourage grass and forb growth in favor of shrub and tree encroachment. Scenario 2 (wildland fire) would likely create large openings under hotter conditions than usual which may predispose some sites to noxious weed invasion, loss of historic vegetative character and reduced habitat diversity. Snags created by the fires would become available as perches along forest/grassland edges. Species such as Ferruginous hawks would lose future habitat.

Burning in areas that are currently being encroached by the shrubs and small conifers is expected to provide more open conditions with herbaceous plants and small rodents which will benefit the northern harrier, ferruginous hawk and prairie falcon. Reduction of competition for nutrients and water will provide for healthier overstory trees used for nesting by the ferruginous hawk and a more open terrain for the northern harrier and prairie falcon to hunt.

Cumulative Effects

The no action alternative (scenario 1) would result in continued encroachment by shade-tolerant conifers, increased ground and latter fuels, and reductions in openings and other sites considered suitable as feeding habitats. This would become cumulative to forest structure and density trends created from past fire exclusion over much of the analysis area resulting in reduced large tree development and feeding site availability over the long term.

The action alternatives would produce greater human disturbance levels for the short term in the project areas, but would help reestablish and maintain typical grass and forb communities important to prey species. Changes in open country vegetation structure and disturbance regimes would not be cumulative to past effects of fire exclusion actions.

Summary and Determinations of Effect

No alternative would yield serious negative effects to important habitat or raptors. All alternatives "may impact individuals or habitat, but will not likely contribute to a trend toward Federal listing or cause a loss of viability to the population or species."

BLM SENSITIVE BIRDS (by feeding/nesting guilds)

Primary Excavators (includes Lewis woodpecker & Red-naped sapsucker)

Habitat for both the Lewis woodpecker and the red-naped sapsucker can be found in all the units proposed for burning. The Lewis woodpecker is known to occupy all the units but it is uncertain if the red-naped sapsucker is present in the units.

Management Strategies

Effective excavator bird habitat management relates principally to maintenance of snags in open country portions of the forest environment. Maintenance of both live and dead trees. Maintenance of mature coniferous forests with mature aspen is important for red-naped sapsuckers.

Direct and Indirect Effects

The no action alternative is expected to allow continued encroachment of open country by trees accompanied by minor continued loss of key tree species such as aspen. The no action alternative (scenario 1) will continue to discourage open country character and aspen presence in favor of shrub or tree encroachment. Scenario 2 (wildland fire) would likely create large openings under hotter conditions than usual which may predispose some sites to noxious weed invasion, loss of historic vegetative character and reduced habitat diversity. Temporary loss of aspen stands would result in habitat losses for red-naped sapsuckers. Snags created by the fires would become available as feeding and nesting sites.

Burning will result in a more open environment beneficial for Lewis woodpecker feeding. The burning of aspen communities is an important method of sustaining healthy stands of these trees. This will be beneficial to the red-naped sapsucker habitat. The level of benefits will be dependent on the acres burned by alternative.

Cumulative Effects

The no action alternative (scenario 1) would result in continued encroachment by shade-tolerant conifers, increased ground and latter fuels, and eventual reductions in openings and continued loss of desirable open country character, as well as degradation and eventual loss of aspen stands. This would become cumulative to forest structure and density trends created from past fire exclusion over much of the analysis area.

The action alternatives would produce greater human disturbance levels for the short term in the project areas, but would help reduce hazardous fuel levels that may result in habitat losses due to high intensity fires. Continued changes in open country vegetation structure and disturbance regimes would not be cumulative to past effects of fire exclusion actions.

Summary and Determinations of Effect

No alternative would yield serious negative effects to important habitat or species. All alternatives "may impact individuals or habitat, but will not likely contribute to a trend toward Federal listing or cause a loss of viability to the population or species."

Secondary Cavity Nesters (includes Vaux's swift and black swift)

Habitat for both these species is present in all the units proposed for burning but it is not known if the species occupy the units. Black swifts are considered rare or uncommon throughout their range and have not been documented within the analysis area to date.

Management Strategies

Effective secondary cavity nester habitat management relates principally to maintenance and protection of old-growth Douglas fir/ponderosa pine forests and development of large diameter, broken-topped snags. Maintenance of both live and dead trees is important.

Direct and Indirect Effects

The no action alternative is expected to allow continued encroachment of open country by shade-tolerant trees accompanied by increased risks of destructive, high-intensity fire risks which may threaten old-growth stands. The no action alternative (scenario 1) will continue to discourage open country character and long term stability in favor of high intensity fire risks. Scenario 2 (wildland fire) would likely create large openings under hotter conditions than usual which may predispose some sites to noxious weed invasion, loss of historic vegetative character and reduced habitat diversity. Snags important as nest sites may be lost.

Burning may result in some temporary displacement of these species. None of the alternatives is expected to impact nesting sites.

Cumulative Effects

The no action alternative (scenario 1) would result in continued encroachment by shade-tolerant conifers, increased ground and latter fuels, and eventual reductions in openings and continued loss of desirable open country character. This would become cumulative to forest structure and density trends created from past fire exclusion over much of the analysis area.

The action alternatives would help reduce hazardous fuel levels that may result in habitat losses due to high intensity fires. Reversed changes from current to near-historical vegetation structure and disturbance regimes would not be cumulative to past effects of fire exclusion actions.

Summary and Determinations of Effect

No alternative would yield serious negative effects to important habitat or species. All alternatives "may impact individuals or habitat, but will not likely contribute to a trend toward Federal listing or cause a loss of viability to the population or species."

Aerial Insectivores (includes olive-sided flycatcher, dusky flycatcher, Cordilleran flycatcher, Hammond's flycatcher, and willow flycatcher)

Habitat for all the above species exists in all the units proposed for burning. Olive-sided flycatchers are not believed present in the units. The dusky flycatchers and willow flycatchers are believed present in all units proposed for burning. It is unknown if the cordilleran flycatcher is present in any of the units proposed for burning.

Management Strategies

Effective habitat management for aerial insectivore birds relates principally to maintenance of a wide variety of structural stages and habitat diversity characteristic of "natural" conditions.

Direct and Indirect Effects

The no action alternative is expected to allow continued encroachment of openings and edges by shade-tolerant trees. The no action alternative (scenario 1) will continue to discourage habitat diversity and stability. Scenario 2 (wildland fire) would likely create large openings under hotter conditions than usual which may result in habitat losses for some species and loss of historic vegetative character and reduced habitat diversity.

All of the action alternatives would result in a slightly more open stand condition preferred by the dusky flycatcher. None of the alternatives is expected to impact the preferred habitat of the Cordilleran flycatcher due to the minimal burning of streamside areas and cliffs. Habitat for the Hammond's flycatcher will likely be slightly reduced within the burned areas but will still be abundant above and adjacent to the burned areas. Habitat for the willow flycatcher is expected to change little but may be protected in the longer term by protecting the conditions of the riparian areas. The impact of these effects will be dependent on the acres burned for each alternative.

Cumulative Effects

The no action alternative (scenario 1) would result in continued encroachment by shade-tolerant conifers, losses of natural openings and forest structural diversity along with increased ground and latter fuels. This would become cumulative to forest structure simplification and density trends created from past fire exclusion over much of the analysis area.

The action alternatives would produce greater human disturbance levels for the short term in the project areas, but would help reduce hazardous fuel levels that may result in habitat losses due to high intensity fires.

Summary and Determinations of Effect

No alternative would yield serious negative effects to important habitat or species. All alternatives "may impact individuals or habitat, but will not likely contribute to a trend toward Federal listing or cause a loss of viability to the population or species."

Foliage Gleaning Insectivores (includes yellow-rumped warbler, MacGillivray's warbler, and Wilson's warbler)

Habitat exists in all of the proposed units for these three species of birds. The yellow-rumped warbler and MacGillivray's warblers are known to occupy all the units but the presence of the Wilson's warbler is uncertain in any of the units.

Management Strategies

Effective secondary cavity nester habitat management relates principally to maintenance and protection of old-growth Douglas fir/ponderosa pine forests and development of large diameter, broken-topped snags. Maintenance of both live and dead trees is important.

Direct and Indirect Effects

The no action alternative is expected to allow continued encroachment of open country by shade-tolerant trees accompanied by increased risks of destructive, high-intensity fire risks which may threaten old-growth stands. The no action alternative (scenario 1) will continue to discourage open country character and long term stability in favor of high intensity fire risks. Scenario 2 (wildland fire) would likely create large openings under hotter conditions than usual which may predispose some sites to noxious weed invasion, loss of historic vegetative character and reduced habitat diversity. Snags important as nest sites may be lost. Action alternatives would help maintain existing or slightly improved long term habitats for these birds as related to more open canopy conditions and maintenance of existing shrubs from disturbance.

Cumulative Effects

The no action alternative (scenario 1) would result in continued encroachment by shade-tolerant conifers, increased ground and latter fuels, and eventual reductions in openings and continued loss of desirable open country character. This would become cumulative to forest structure and density trends created from past fire exclusion over much of the analysis area.

The action alternatives would help reduce hazardous fuel levels that may result in habitat losses due to high intensity fires. Reversed changes from current to near-historical vegetation structure and disturbance regimes would not be cumulative to past effects of fire exclusion actions.

All alternatives considered in detail would result in more open conditions and/or maintenance of understory shrubs which the yellow-rumped, and MacGillivray's warblers prefer. Despite this relationship, prescription burning may not open the canopies to a sufficient magnitude to fully yield a beneficial effect to these species.

All alternatives considered in detail may potentially result in temporary displacement of individual birds during the burning operations, particularly during spring seasons. While the level of displacement is dependent on the alternative selected due to the acres and timing of burns, these impacts are expected to be minimal and short term.

Summary and Determinations of Effect

No alternative would yield serious negative effects to important habitat or species. All alternatives "may impact individuals or habitat, but will not likely contribute to a trend toward Federal listing or cause a loss of viability to the population or species."

Feeding Generalists (includes Solitary vireo, Swainson thrush, and Veery)

Management Strategies

Effective habitat management for this group of feeding generalists relates principally to maintenance and protection of a variety of habitat conditions, seral stages and structural conditions from large-scale, high-impact disturbances. The Swainson thrush adapts well to a variety of forest conditions and seral stages. Veerys are good indicators of riparian communities, while solitary vireos are seem to prefer coniferous forest cover, depending on some older, relatively uncut conifer forests.

Direct and Indirect Effects

The no action alternative is expected to allow continued successional advancement, increased long term forest moisture and encroachment of open country by shade-tolerant trees which is generally suitable for these species. However, in the longer term these conditions are accompanied by increased risks of destructive, high-intensity fire risks which may threaten habitat diversity including old-growth stands. The no action alternative (scenario 1) will continue to encourage stand infilling, loss of habitat openings and long term stability in exchange for high intensity fire risks. Scenario 2 (wildland fire) would likely create large openings and snag abundance under hotter conditions than usual which may predispose some sites to noxious weed invasion, loss of historic vegetative character and severely reduced habitat diversity. Snags important as nest sites may be lost.

Cumulative Effects

The no action alternative (scenario 1) would result in continued encroachment by shade-tolerant conifers, increased ground and latter fuels, continued reductions in small habitat openings, loss of habitat diversity and continued infilling by shade-tolerant conifers. This would become cumulative to forest structure and density trends created from past fire exclusion, and timber harvesting over much of the analysis area.

The action alternatives would help reduce hazardous fuel levels that may result in habitat and diversity losses due to high intensity fires. Reversed changes from current to near-historical vegetation structure and disturbance regimes would not be cumulative to past effects of fire exclusion act and harvest.

Summary and Determinations of Effect

No alternative would likely yield immediate, widespread negative effects to important habitats or species sufficient to jeopardize local populations. All alternatives "may impact individuals or habitat, but will not likely contribute to a trend toward Federal listing or cause a loss of viability to the population or species."

Aerial Nectar Feeders (including Solitary vireo, Swainson's thrush, Veery, Calliope and Rufus hummingbirds)

While habitat exists for these species in all the units proposed for burning, it is uncertain if they are actually present within the burn units.

Management Strategies

Effective habitat management for aerial nectar feeders relates principally to maintenance of open montane forests, meadows, burned areas and riparian thickets.

Direct and Indirect Effects

The no action alternative is expected to allow continued encroachment of natural openings, meadows, and early seral habitats by shade-tolerant trees accompanied by increased risks of destructive, high-intensity fire risks which may threaten habitat diversity. The no action alternative (scenario 1) will continue to encourage stand infilling, loss of habitat openings along with the forb and shrubs that produce nectar for nectar feeding birds. High intensity fire risks would increase. Scenario 2 (wildland fire) would likely create large openings and snag abundance under hotter conditions than usual which may predispose some sites to noxious weed invasion, loss of historic vegetative character and reduced habitat diversity. In all, nectar producing plants under this alternative would thrive over large areas in the short term, and would result in important food source increases for hummingbirds, but temporary losses of live conifers and brush used for nesting would likely become population limiting factors in severely burned areas.

All action alternatives would result in small openings and a more open environment where the understory is encroaching. This would slightly encourage more nectar producing plants while retaining ample nesting habitat. The level of impact is dependant on the number of acres treated as habitat exists in all units in the proposal.

Cumulative Effects

The no action alternative (scenario 1) would result in continued encroachment of openings and meadows by conifers further displacing nectar-producing plants. Increased ground and ladder fuels would increase risks of large, high-intensity fires which would likely create the reverse imbalance between food sources and nesting sites. This would become cumulatively negative to current imbalances in cover/openings and the trends created from past fire exclusion, and timber harvesting over much of the analysis area.

The action alternatives would help reduce hazardous fuel levels that may result in habitat and diversity losses from high-intensity fires. Action alternatives would help reverse the cumulative loss of openings and nectar-producing plants. This would not be cumulative to past effects of fire exclusion and livestock grazing, but would be cumulative to openings created by timber harvest.

Summary and Determinations of Effect

No alternative would yield major negative effects to important habitat or species. Action alternatives would be positive in serving to help maintain suitable cover conditions but would fall short of significant habitat improvement. All alternatives "may impact individuals or habitat, but will not likely contribute to a trend toward Federal listing or cause a loss of viability to the population or species."

Ground Foragers (includes grasshopper sparrow and Brewer's sparrow)

There is no habitat within the proposed units for the grasshopper sparrow and this species is not present within the units. Units 23, 24, 36, 37A, and 37B contain habitat for the Brewers sparrow and the species is known to be present in these units.

Management Strategies

Effective habitat management for these ground foraging birds relates principally to maintenance of open montane forests, grassland areas, montane thickets and shrub-covered slopes.

Direct and Indirect Effects

The no action alternative is expected to allow continued encroachment of natural openings, meadows, and early seral habitats by shade-tolerant trees accompanied by increased risks of destructive, high-intensity fire risks which may threaten habitat diversity. The no action alternative (scenario 1) will continue to encourage stand infilling, loss of habitat openings, grassland areas and shrub-covered slopes along with conditions required by ground foragers. High intensity fire risks would increase. Scenario 2 (wildland fire) would likely create larger than normal openings. Some sites may be predisposed to noxious weed invasion, loss of native vegetative character and reduced habitat diversity. In all, plant communities used by ground foragers under this alternative would be increased over large areas in the short term, resulting in improved habitats in the short term, but risks of occupation by noxious weeds would increase substantially which could displace food-producing grasses and shrubs.

All action alternatives burn all or portions of the units where the Brewer's sparrow is present. Burning within this habitat would be more positive than negative. It would have the temporary effect of reducing the level of the understory, but encouraging shrubs beneath conifers and along edges while discouraging further conifer encroachment into Brewer's sparrow habitats. Unlike scenario 2 of the no action alternative, mitigation measures for noxious weeds will reduce the potential for the spread of these weeds, thereby reducing the chance of the noxious weeds encroaching on the habitat at the level expected after a wildfire.

Cumulative Effects

The no action alternative (scenario 1) would result in continued encroachment of openings and meadows by conifers, further displacing plant communities important to ground foragers. Increased ground and ladder fuels would increase risks of large, high-intensity fires which would likely create large areas of early seral vegetation potentially beneficial to ground-foraging species. Scenario 2 would not yield cumulative changes to current habitat loss trends but may create large areas of more suitable habitat potentially.

The action alternatives would help reduce hazardous fuel levels that may result in habitat and diversity losses from high-intensity fires. Action alternatives would help reverse the cumulative loss of openings and food-producing plants. This would not be cumulative to past effects of fire exclusion and livestock grazing, but would be cumulative to openings and habitats created by timber harvest.

Summary and Determinations of Effect

All action alternatives will modestly help maintain or improve habitat conditions. No alternative would yield serious negative effects to important habitat or species. All alternatives "may impact individuals or habitat, but will not likely contribute to a trend toward Federal listing or cause a loss of viability to the population or species."

BLM-Sensitive Mountainsnails - (includes Idaho banded mountainsnail, boulder pile mountainsnail, whorled mountainsnail, lavarock mountainsnail)

The above listed species are primarily restricted to lower or middle elevations in dry, open areas in sage-scrub vegetation on limestone outcrops , talus, or boulder piles of varying rock types and are present within the planning area but are not present in the proposed burn units. Based on available survey information, whether additional habitats of these species once existed in planned burn units is unlikely but uncertain and remains a matter of scientific speculation.

Management Strategies

Effective habitat management for landsnails in general involves maintaining stability of ground conditions and vegetative environments over time since desiccation is considered the primary reason for land snail mortality even in undisturbed habitats (Solem, 1984). Primary risks to habitat and species include hardrock mining, logging, livestock grazing, water development and recreation. Combinations of various nonnative impacts seem to be the most

destructive. The best management technique is none at all, i.e. allowance of natural processes to continue, including fires (Frest & Johannes 1997). According to Frest and Johannes (1997, p. 39), "fire management techniques mimicking the natural process in each major plant communities much as possible (Agee, 1993) should be favored". Fires outside the range of normal variation have been implicated as potentially hazardous to remaining colonies of some of these snails, although most species evolved in the presence of frequent, low-intensity fires.

Direct and Indirect Effects

The no action alternative would be expected to allow continued infilling by conifers accompanied by ground fuels accumulations which would increase risks of destructive, high-intensity fires which may threaten some remaining mountainsnail colonies. Of the BLM-sensitive mountainsnails, the carinated striate-banded mountainsnail may be most at risk. The no action alternative (scenario 1) will continue to encourage stand infilling, increasing ground fuel levels increasing risks of high intensity fires. Scenario 2 (wildland fire) would likely create intensities of heat that may threaten some snail colonies. Although trampling effects from livestock grazing have been implicated in snail and habitat losses, relatively little is completely understood pertaining to effects of vegetative changes and their impacts on snails.

Cumulative Effects

The no action alternative (scenario 1) would result in continued encroachment of openings and meadows by conifers, further replacing light fuel plant communities with heavy fuel plant communities which would add to cumulative habitat changes from past fire exclusion. Scenario 2 (wildland fire) would result in additional risk of colony losses which would be cumulative to other impacts from grazing, minting, road building and other human uses of the land.

The action alternatives would help reduce hazardous fuel levels that may threaten some remaining mountainsnail colonies from high-intensity fires. Action alternatives would generally help reverse the cumulative fuel increases on the landscape which could threaten some remaining mountainsnail colonies. This would not be cumulative to effects of past fire exclusion, livestock grazing, mining and other land uses.

Summary and Determinations of Effect

No alternative would yield serious negative effects to important habitat or species. All alternatives "may impact individuals or habitat, but will not likely contribute to a trend toward Federal listing or cause a loss of viability to the population or species."

Carinated striate-banded mountainsnail

Management Strategies

Strategies for this landsnail are somewhat unlike those above, in that clearcutting and high-intensity fires are the primary risks due to the physical environments of sites occupied. This

species is found mostly on forested outcrops and commonly have partly to completely closed overstory of ponderosa pine with a diverse forb and deciduous understory (Frest & Johannes 1997). The snail is currently known to be present in Unit 2C only, based on existing survey data (Frest & Johannes 1997).

Direct & Indirect Effects

The no action alternative would be expected to allow continued infilling by conifers accompanied by ground fuel accumulations which would increase risks of destructive, high-intensity fires around perimeters of occupied colonies which may threaten remaining colonies of this strict, very local endemic snail. The no action alternative (scenario 1) will continue to encourage stand infilling, increasing ground fuel levels increasing risks of high intensity fires during hot, dry periods. Scenario 2 (wildland fire) would likely create intensities of heat that may potentially threaten remaining snail colonies. Risks of post-fire desiccation of colony microsites would be substantial. Action alternatives would allow controlled fire to help reduce these risks, removing smaller amounts of surface vegetation under cooler, prescribed conditions.

Cumulative Effects

The no action alternative (scenario 1) would result in continued encroachment of openings and meadows by conifers, further replacing light fuel plant communities with heavier fuel plant communities which would add to cumulative habitat changes from past fire exclusion. This, in combination with relatively recent clearcutting and wildfires have already reduced former colonies of this species to small, isolated remnant colonies which survive in small, rocky areas which offer some refuge from summer desiccation (Frest & Johannes 1997, p.95). Scenario 2 (wildland fire) would result in additional risk of colony losses which would be immediately cumulative to other impacts from past and current grazing, clearcutting and cumulative effects of past fire exclusion.

The action alternatives would help reduce hazardous fuel levels and high-intensity fire risks that may threaten remaining carinated striate-banded mountainsnail colonies. Action alternatives would help reverse the cumulative fuel increases on the landscape which could threaten some remaining mountainsnail colonies. This would not be cumulative to effects of past fire exclusion, but may potentially be cumulative in impact with previous clearcutting and wildfires.

Summary and Determinations of Effect

The no action alternative and Alternative E would not reduce cumulative, high-intensity wildfire risks and thus would have the effect of risking remaining colonies of this snail indirectly. Since this species is extremely limited in its distribution and range, being limited exclusively to a few remaining colonies in the Lower Salmon River Canyon, and is currently a federal C2 candidate (USFWS 1999), the No Action alternative (A) and Alternative E is "likely to impact individuals or habitat with a consequence that the action may contribute towards federal listing or result in reduced viability for the population or species". Other action alternatives including B, C and D would risk impacts to remaining colonies as well but may be beneficial to long term maintenance or expansion opportunities of remaining

colonies, and as such, "may impact individuals or habitat, but will not likely contribute to a trend toward Federal listing or cause a loss of viability to the population or species."

FOREST PLAN MANAGEMENT INDICATOR SPECIES

Rocky Mountain Elk

Rocky Mountain elk can be found in all units proposed for burning.

Management Strategies

The primary habitat management strategy for elk is to maintain an appropriate mix of productive, nutritious early seral vegetation in proximity to hiding cover, while limiting open road densities.

Direct and Indirect Effects

The no action alternative (Scenario 1) would maintain existing vegetative conditions that favor the continued encroachment of conifers into openings and discourage productive forage plants. Indirectly, this would also increase the future risk of large scale, high intensity fires which may put cover and forage out of balance in some areas. It would increase the risk of noxious weed infestation, but would also risk loss of some key hiding cover patches. Scenario 2 would indirectly risk loss of some hiding cover and may create large areas of ample forage, but may also increase the risk of noxious weed infestation and add to the cumulative hunting vulnerability effects from existing openings and roads in non-wilderness areas.

Action alternatives may slightly increase noxious weed infestation risks, but would help to restore more open forest structures, encouraging forage plants for elk by recycling nutrients important to growth, vigor and nutritive quality of forage plants consumed by elk. Prescribed burning may result in short term displacement of animals from burning activity and temporary loss of big game forage. Fall burning of winter range areas would result in temporary loss of important forage for big game species. However, mosaic burning patterns would not leave large areas "blackened" and would maintain ample forage adjacent to the burned areas. Regrowth and resprouting of desirable forage would be available the following year. Action alternatives would also help reduce risks of stand-replacing fires which could result in very large openings, too large to be of optimum value for use by elk. Action alternatives would also help begin to improve short-term cover/forage ratios in areas overcrowded by dense conifer vegetation which currently is suppressing growth and production of key forage plants. Due to the number of acres burned, Alternatives B and D would provide the most forage for this species. Alternative C would provide the next highest level of forage and Alternative E would provide the least of the action alternatives.

Cumulative Effects

Alternative A would contribute to forest infilling and successional advancement. Continued losses of small forest openings and overall availability of forage species would contribute to habitat degradations throughout the analysis area. It would also contribute to increased risks of stand-replacing fires on winter ranges and to some degree of summer ranges where large-scale openings in forest canopy would risk the creation of unbalanced forage/cover ratios that lack sufficient interspersions of hiding and thermal cover.

Action alternatives would cause some temporary disturbance but would begin to reduce encroachment of conifers in treated areas, thus would not be a cumulative effect except to overall disturbance levels. The increased post-treatment availability of early seral herbaceous plants would not be cumulative to past effects of fire exclusion, nor would discouragement of encroaching conifers be cumulative to previous trends of structural habitat imbalance created by fire exclusion. Treatment in roaded areas would not likely contribute to losses of effective hiding cover in most areas because of relatively limited cover removal and quick regrowth of shrubs and herbaceous growth on most sites.

Shira's Moose

Shira's moose can generally be found in the higher elevations of all the units proposed for burning.

Management Strategies

Shira's moose occupy the higher elevations within the analysis area and use a variety of shrubs as both summer and winter forage. Summer habitats typically used by moose have productive stands of browse species, however the primary habitat limiting factor for moose in the analysis area is winter habitat quality and availability. Where important winter range habitat exists, the primary aim for moose habitat management is to protect mature forest with a subcanopy of palatable coniferous species and shade-tolerant deciduous shrubs, particularly at higher elevations.

Direct and Indirect Effects

The no action alternative (Scenario 1) would have no direct effects on higher elevation late seral and old growth stand structures or understory shrubs, and would maintain these conditions in the short term. In the longer term, it may slightly increase the risk of stand-replacing fire runs from lower elevations into important moose winter habitats. Scenario 2 would likely have no direct effects but could indirectly lead to habitat losses through runs of stand-replacing fires, which might ascend above lower and mid-elevation conifer types into grand fir and subalpine fir in localized areas.

Action alternatives would have no direct effects on key moose winter habitats but would help improve some shrub availability on summer habitats for moose and would indirectly help reduce potential risks of stand-replacement fire ascent into key moose habitats during high risk fire seasons. The level of improvement would be based upon the acres treated. Therefore, alternatives B and D would provide the most improvement followed by C and E.

Cumulative Effects

Alternative A would add cumulatively to the risk of stand-replacing fire consumption of important high elevation winter ranges in some areas which would be cumulative to past habitat losses and degradations related to clear cutting, roading, human-induced mortality risks along roads, and overall fragmentation of important winter habitats.

Action alternatives would tend to reverse the cumulative effects of stand-replacing fire risks at higher elevations due to possible runs from lower elevation communities. This would not be cumulative to other past, present and reasonably foreseeable future landscape changes to moose winter habitats.

Mule deer

Mule deer can be found in all units proposed for burning.

Management Strategies

Mule deer management strategies aim at maintaining a mix of vegetation structures including both cover and forage in relative proximity. Forage quality and quantity are considered very important for this ungulate, as forage supply is inversely related to amount of tree overstory cover in most situations.

Direct and Indirect Effects

The no action alternative (Scenario 1) would directly allow further encroachment of conifer vegetation and crowd out remaining valuable forage plants. This would indirectly increase the risk of long term, large scale cover losses from high intensity fires and increase the risk of spreading noxious weeds. Losses of key browse plants including curl-leaf mountain mahogany would be avoided in the short term. Scenario 2 would risk direct losses of cover and would increase risks of noxious weed spread. Key winter range browse plants would likely sustain greater losses to high intensity fires and seed sources could conceivably be eliminated from large areas if fire intensities were extreme. Despite the fact that high intensity fires are likely to kill this species, absence of periodic fire has resulted in closure of mahogany crowns, excessive litter and competition from other vegetation which indirectly inhibits regeneration (Gruell, G. et al. 1985).

Action alternatives would result in direct increases in the quantity and nutritive quality of herbaceous grasses and forb forage. Prescribed burning may result in short term displacement of animals from burning activity and temporary loss of big game forage. Fall burning of winter range areas would result in temporary loss of important forage for big game species. However, mosaic burning patterns would not leave large areas "blackened". Regrowth and resprouting of desirable forage would be available the following year. Prescribed fires would reverse conifer encroachment but would indirectly result in some losses of mountain mahogany browse particularly in sites away from protected rocky outcrops and bluffs. The projected direct loss of mahogany browse from prescribed fire would be about 40 percent based on field estimates (Blair, G.S. pers, obs.) but older seed-bearing individuals would remain interspersed in the landscape, because prescription fires would generally be of lower intensity. Studies found that curl-leaf mountain mahogany stands apparently survived cooler, less intensive fires which experienced mean fire intervals ranging from 13 to 22 years in one study (Arno and Wilson 1986). Since browse species such as curl-leaf mountain mahogany typically grows in regions where fire has been a common ecological disturbance, the absence of fire for long periods has resulted in declining condition caused by advanced stages of succession.

The level of these effects would be based upon the acres treated. Therefore, alternatives B and D would provide the most improvement followed by C and E. The changes in the mountain mahogany browse availability would be most realized with alternatives B, C, and D due to the higher number of acres of this habitat burned with these alternatives primarily on the Salmon-Challis units.

Cumulative Effects

The no action alternative (Scenario 1) would contribute to cumulative effects from past and ongoing conifer encroachment and reductions in herbaceous food plants and their nutritive value due to past fire exclusion. Scenario 2 would risk loss of interspersions of cover in the short term and this would be cumulative to fire exclusion impacts on habitat. Scenario 2 would increase available forage on large, contiguous areas in the longer term.

Action alternatives would not contribute to cumulative forage loss and conifer encroachment effects, but may result in partial losses of important, fire-sensitive winter browse such as curl-leaf mahogany, and this would be cumulative to other losses of forage from past fire exclusion. Curl-leaf mountain mahogany is subject to encroachment from adjacent forested areas with attendant, indirect loss by fire , but may require some fire to provide suitable seed beds (Nez Perce National Forest, 1997).

Bighorn Sheep

Bighorn sheep habitat is present in units 4D, 5, 6, 13, 14, 15, 16, 17, 21A, 21B, 21C, 22, 23, 24, 36, 37A, 37B, and 38. It is uncertain if they are present in units 4D, 6, 13, and 14 but is known to be present in the remaining units where habitat is available.

Management Strategies

Perpetuation of stable, long-lasting grass communities particularly on winter ranges is an important habitat strategy. Maintenance of low to moderate vegetation densities allowing moderate to high visibility particularly adjacent to predator escape terrain, which encourages dispersal and interchange among sub-populations , are part of good habitat management strategies for bighorn sheep.

Direct and Indirect Effects

The no action alternative (Scenario 1) would continue to allow conifer vegetation to encroach at moderate and higher elevations of the analysis area. In some key bighorn habitat areas this could potentially cause movement barriers to bighorns over time. Lower elevation winter ranges would not benefit from the growth and nutritive stimulus that fire provides. Scenario 1 would impose no immediate changes to existing habitats. Scenario 2 would risk opening up large areas by removing conifers particularly at moderate to higher elevations Higher fire intensities related to fuel accumulations in conifer dominated areas may temporarily suppress grass/forb communities and accelerate risks of noxious weed invasions.

Action alternatives would apply fire to lower elevation winter ranges under conditions more similar to those under which the native plant communities evolved. Despite this, increased

current fuel loadings might result in unexpected impacts to herbaceous plants. Prescribed burning may result in short term displacement of animals from burning activity and temporary loss of big game forage. Fall burning of winter range areas would result in temporary loss of important forage for big game species. However, mosaic burning patterns would not leave large areas "blackened". Regrowth and resprouting of desirable forage would be available the following year. Reductions in conifer densities and rejuvenation of summer and winter range conditions would indirectly benefit bighorns in the long term. Risks of noxious weed spread would be present in the short term, but likely not as serious as with Alternative A (Scenario 2) due to the intensity of the fires and damage levels to root systems of native herbaceous plants.

These effects would be most evident with alternatives B and D but alternative C also burns a large portion of the habitat within the units. Alternative E burns the least amount of the habitat within the units and would thus have the least impact of the action alternatives.

Cumulative Effects

The no action alternative (Scenario 1) would add to conifer encroachment effects at higher elevations in the long term and would not invigorate grass/forb communities at lower elevations and this would be cumulative to effects of past fire exclusion. Scenario 2 would open up large areas at moderate and higher elevations in the analysis area and may expose lower elevation winter ranges to combustion temperatures above those tolerable by some herbaceous plants, and therefore indirectly cause an increased risk of the spread of noxious weeds.

Action alternatives would begin to reverse conifer encroachment on treated sites at moderate and higher elevations which would not be cumulative to past negative effects of management. Lower elevation ranges would benefit from grass/forb invigoration and would help maintain nutritional quality of winter ranges.

Mountain goat

There is no mountain goat habitat within the planned burn areas and they are not present within these areas. Management strategies for this species can be found in the project file.

Pine marten

Pine martin habit and the species are found within all the units proposed for burning under the proposed action.

Management Strategies

Management of pine martin habitat includes protection of high elevation, late successional mesic conifer communities dominated by subalpine fir, Douglas fir, and lodgepole pine , particularly those with a complex physical structure near the ground. Long term perpetuation of Forest Plan old growth threshold amounts of late seral and old growth forest conditions is a primary population strategy.

Direct and Indirect Effects

The no action alternative (Scenario 1) would have no effects on the habitat preferred by martens. Indirect effects could include an increased long term risk for large scale, high intensity fires which could eliminate some late seral habitats. Scenario 2 would likely have few if any direct effects, but indirectly may result in losses of some preferred habitat depending on the extent of fire spread and intensities of burn. Significant loss of habitat connectivity could occur in some areas.

Action alternatives would likewise have relatively few direct impacts because a very small percentage of the treatment acres would affect preferred marten habitats. Most treatment would occur in dryer, lower elevation sites. Indirectly however, the reduction of fuels in adjacent and lower elevation sites could help to slightly reduce risks for elevational spread of destructive stand-replacing fires, which may result in a reduced risk of habitat loss, degradation, or continuity of habitat in some areas.

These effects would be higher with Alternatives B and D, less with alternative C and the least with alternative E. This is due to the number of acres treated as all units provide habitat for this species.

Cumulative Effects

The no action alternative (Scenario 1) would not contribute to any measurable cumulative effects on marten or their habitats in the short term but may slightly increase risks of impacts from high intensity burns in the longer term, which would be cumulative to past and future timber harvest, road-building and other habitat fragmentation influences. Scenario 2 would not likely add measurably to cumulative negative effects in most areas but may do so in limited areas where fire intensities and spread created openings in otherwise suitable habitats. Such openings would be negatively cumulative and additive to the past effects of clear cutting, roading and other habitat fragmenting effects in developed areas.

Vesper sparrow

Vesper sparrow habitat can be found in all the units proposed for burning except units 4D, 5, 6, 8, 9, and 10. It is uncertain if the species is actually present within the proposed burn units.

Management Strategies

Habitat management for vesper sparrows includes maintenance and protection of lower elevation grassland with scattered shrubs and includes ponderosa pine and pine/grassland communities.

Direct and Indirect Effects

The no action alternative (Scenario 1) would have no immediate, direct effect on vesper sparrows or their habitats. However, in the longer term this alternative would likely lead to

increased risks of temporary habitat loss over large areas, because of the risk of high intensity fires. The indirect impacts would be relatively minor and short term because this species is associated with early seral stages of forested habitats. Scenario 2 would risk immediate short-term loss of some habitats due to fire intensities, but the duration of the effects would be short-lived. Indirect effects of Scenario 2 could include loss of some key food producing grasses or forbs due to fire intensities outside their historical ranges. In addition, the risk for accelerated invasion of noxious weeds would likely be higher after such fires due to opportunity conditions favoring noxious weeds.

All actions would reverse or reduce the trend towards encroachment of this species habitat. Alternatives B, C, and D would do the most towards this reduction. Alternative E would do considerably less to reduce this trend in habitat loss because of its limited treatment. Areas not treated under alternative E would be similar to the no action alternative.

Cumulative Effects

The no action alternative (Scenario 1) would have no known cumulative impacts on vesper sparrows or their habitats in the short term. Longer term cumulative impacts from successional advancement would occur and would be additive to vegetative changes brought about by past and present fire exclusion. Scenario 2 would reverse past cumulative vegetation changes but if fire intensities were too high, damage could occur to native grasses and forbs whose seeds provide food sources for the sparrow. In addition, high intensity wildland fires may add to acceleration of noxious weeds on important habitats. In addition, burning large, contiguous areas may affect availability of sparce cover around nesting sites immediately after fires.

Action alternatives may improve sparrow habitats in ponderosa pine and pine/grassland sites (Bock and Bock, 1983; In; Dobkin, D.S. 1994). They may also lead to cumulative degradation of fire-excluded habitat conditions because of accelerated noxious weed invasions into new habitat. The relationship of fire to the spread of some noxious weeds is as yet poorly understood, but preliminary indications suggest that even low intensity prescribed fire may help accelerate such invasions, which could potentially affect sparrow food and cover sources in some areas.

Yellow warbler

Yellow warbler is known to occupy primarily the riparian areas of all of the units proposed for burning.

Management Strategies

The primary strategies for yellow warbler management are to maintain riparian shrub and woodland habitats, and to prevent significant forest fragmentation where livestock grazing and the associated risks of cowbird parasitism occur.

Direct and Indirect Effects

The no action alternative (Scenario 1) would have no immediate, direct impacts on warblers or their habitats. It would increase the long term risk of high intensity, fire-related forest fragmentation, which could indirectly encourage expansion of cowbird parasitism of warbler nests in some areas. Scenario 2 may have immediate but short-term direct impacts including habitat losses and direct mortalities. Losses of riparian shrub and woodland habitats from wildland fires would likely be relatively limited in their distribution and impacts. Indirect effects from Scenario 2 could include opening up large forest areas, thereby fragmenting and creating unnatural travel corridors for cow birds to extend their nest parasitism into previously unoccupied warbler nesting sites.

Action alternatives would likewise have very little direct impact on warblers or their habitats, because so few acres of their preferred habitats would receive prescription fire. Fires ignited during nesting seasons may displace or kill nestlings in very isolated locations only. Because actions would be deliberately implemented, riparian zones would be partially protected by design and less at risk from prescribed fire conditions. No areas would be at risk from stand-replacing fires.

Cumulative Effects

The no action alternative (Scenario 1) would allow further accumulations of forest fuels which may increase the long term risk of fire-related direct mortalities, forest fragmentation, and cowbird parasitism. Scenario 2 would immediately risk direct mortalities, localized habitat fragmentation, and extension of cowbird parasitism into otherwise unoccupied warbler nesting habitats.

Action alternatives would help reduce risks of stand-replacing fires and forest fragmentation near treatment areas. Such would also reduce long term risks of eliminating natural barriers to cowbird movements parasitism, which would be cumulative to past and ongoing cowbird parasitism risks.

Pileated woodpecker

Habitat for this species exists in all the units proposed for burning and they are known to be present in all the units.

Management Strategies

Protection of pileated woodpecker nesting trees is a primary strategy for maintaining populations of this bird. Preferred conditions include large trees (usually ponderosa pine or larch) within late seral or old growth timber that display relatively high canopy closure around nest trees. Pileated woodpeckers almost never nest in large openings, clearcuts, fields or meadows. Protection and long term perpetuation of Forest Plan old growth threshold amounts of late seral and old growth forests is a primary population strategy.

Direct and Indirect Effects

The no action alternative (Scenario 1) would have no immediate or direct effects on pileated woodpeckers or their preferred nesting habitats. Scenario 1 would indirectly lead to

continued fuel loading in the longer term and would eventually lead to higher intensity fires, which may jeopardize key nesting trees due to extensive stand-replacing fires. Disruption of availability of large snags over time would also result. Scenario 2 would risk near term losses of some late seral and old growth timber stands and preferred structural stages in places where fires burned hottest. Indirect effects of scenario 2 would be an increased long term risk of preferred nesting structures across large landscape areas, where stand-replacing fires have removed trees of all size classes.

Action alternatives would help remove excess fuels in treated areas but may disturb, displace or cause incidental woodpecker mortalities in nest snags, depending on the season of the burn. Indirect effects would include a reduced risk of stand replacing fires in the longer term in areas where treatments were applied. While alternatives B and C have the highest potential for disturbing the most individual birds, these alternatives have the highest potential for improving overall conditions needed for this bird. Alternatives C and E follow in that order for disturbance and improvement.

Cumulative Effects

The no action alternative (Scenario 1) would have no immediate cumulative impacts to pileated woodpecker nesting stands. However in the longer term, encroachment of conifers and fuel loading at lower and mid elevations may add the risks of habitat loss from future fires to those from past timber harvest and short rotations. Shorter rotations would prevent many trees (particularly ponderosa pine and larch) from reaching the large diameters preferred by pileateds for nest sites, particularly in dryer Douglas fir habitats, but to a lesser degree in more moist cover types. Scenario 2 would potentially remove some important nesting habitat in the short term, and would reduce snags and future snags where fires burned hot enough to replace the stands. These effects would be cumulative to snag and late seral habitat losses created by past, present and potential future timber harvest, fire exclusion and fuelwood cutting, particularly in roaded and developed areas.

Williamson's sapsucker

Habitat for this species can be found in the higher portions of all the units proposed for burning but it is unknown of the species is present.

Management Strategies

Since Williamson's sapsuckers are generally associated with old growth forest characteristics and are not found in smaller, fragmented forest conditions, protection and long term perpetuation of Forest Plan threshold amounts of old growth is the primary population strategy.

Direct and Indirect Effects

The no action alternative (Scenario 1) would have no direct effect on the bird or its habitat in the short term, but in the longer term this alternative would contribute to past fuel accumulations and possible losses of large areas of late seral or old growth habitats from high intensity fires. Scenario 2 would likely have direct negative effects on old growth forest conditions. Since Scenario 2 would probably eliminate and regenerate some old growth or

replacement stands, losses of these habitats, particularly in heavily harvested areas, may threaten Forest Plan minimum old growth retention standards in some areas.

Action alternatives would directly risk some disturbance of nesting woodpeckers and may destroy a few nest trees in localized areas, but would help reduce ground fuels in and adjacent to late seral and old growth stands across larger areas. This would help reduce the risk of future stand replacement fires in the longer term thus maintaining important habitat conditions.

Cumulative Effects

The no action alternative (Scenario 1) would tend to add to overall forest fuel loadings, which would increase long term risks of high intensity fire losses of old growth forest and broad-scale fragmentation of forested habitats deemed harmful to this species. Scenario 2 would likely result in some cumulative degrading changes to overall sapsucker habitats from old growth areas lost to stand-replacing fires, which would be cumulative to previous forest fragmentation effects of timber harvest and fire .

Ruby-crowned kinglet

Habitat for this species can be found in the higher portions of all the units proposed for burning but it is unknown of the species is present.

Management Strategies

Maintenance of relatively high tree densities in mid and late successional stands of Douglas fir and higher elevation cover types , are the conditions most favorable to this species. While the species may inhabit post-fire areas, kinglet densities observed in such areas indicate less than optimal habitat conditions (Finch, D. et al. 1997).

Direct and Indirect Effects

The no action alternative (Scenario 1) would have no direct impacts on ruby-crowned kinglets or their preferred habitats. Indirect effects of this alternative across large landscapes may be a higher risk of the loss of larger areas of preferred nesting habitat, nests and direct mortalities due to high fuel accumulations, continuous conifer fuels and consequent resulting higher fire intensities in the longer term. Scenario 2 would likely result in direct loss of some nesting and feeding stands. Depending on the extent and intensity of fires, indirect effects would range from extreme loss through direct mortality of individuals and preferred nesting and foraging habitats to simple fuel reductions which would help abate intensities of future wildland fires and habitat losses through "breaking up" the contiguous nature of mature forest structure across landscapes.

Action alternatives would directly reduce the relative suitability of treated stands for kinglets but may reduce the likelihood of complete losses of nesting stands in the longer term. These impacts are expected to be minimal because of the generally higher elevations normally used by this species. Indirect effects would include some isolated and very limited displacement or mortality of individual birds if ignitions occurred during nesting periods, reduction of

large-scale stand replacement fires primarily in Douglas fir cover types, but also a subtle reduction in future probabilities of higher elevation cover type losses from stand-replacing fires as well.

Cumulative Effects

The no action alternative (Scenario 1) would allow continued buildup and encroachment of conifer vegetation within and adjacent to preferred nesting and feeding stands. Some of this may be beneficial. The resulting risk of high intensity fires would add to the effects of past fire exclusion. Scenario 2 would likely result in less than optimal conditions where fires burned less intense but some "break up" of forest contiguity would occur and would help reduce cumulative risk effects of future broadscale habitat losses to more intense fires.

Action alternatives may displace kinglets or cause uncommon, localized nest mortalities in some areas where fires were ignited during nesting, but would create few if any other cumulative effects to kinglets or their habitats. The subtle negative effect of prescription fires on nesting birds could be considered cumulative to past fire exclusion risks incurred by contiguous forest stands.

Goshawk

Refer to Chapter 4 discussion of goshawk under "sensitive species" in the wildlife section.

Great Gray Owl

Refer to great gray owl discussion under "sensitive species" in the wildlife section.

Yellow-bellied sapsucker

Habitat for this species can be found in units 21A, 21B, 21C, 22, 23, 24, 36, 37A, and 37B. However it is unknown if the species actually occupies these units.

Management Strategies

Maintenance of deciduous and mixed deciduous-coniferous forests, particularly those with aspen is considered the primary strategy for species perpetuation. Aspen is a product of intermittent, moderate to high intensity fires in western forests. Generally without fire, aspen cannot maintain itself in coniferous forest environments over the long term.

Direct and Indirect Effects

The no action alternative (Scenario 1) would have no immediate or direct effects on this sapsucker or its habitat. In the longer term, absence of fire would continue to indirectly allow reduction of the development of deciduous tree species this bird is associated with. In the longer term, Scenario 1 may help prepare many suitable habitats for regeneration and encouragement of greater amounts of deciduous tree species including aspen. Scenario 2 would directly encourage high-intensity, widespread fires which would result in regeneration of resprouted deciduous trees, including aspen, in burned areas for the longer term.

Regeneration of aspen and other deciduous tree species in this manner would tend to perpetuate "boom-bust" habitat availability and sapsucker populations over time.

Action alternatives would directly help retard continued encroachment of suitable habitats by conifers and would encourage aspen and other deciduous species in smaller, scattered areas. This would indirectly result in temporary deferral of hotter, stand-replacing fires which help to resprout key deciduous tree species (particularly aspen) on localized areas, which over the longer term may be disadvantageous to the species, given the long term encroachment of many acres predominately by conifers. Displacement of nesting birds if any, would likely be very limited and uncommon due to the relative decline of primary nesting habitats. Nestling losses could potentially occur in isolated areas if ignitions occurred during nesting periods. These effects would be the highest to the habitat with alternatives B and D followed by alternative C then alternative E. However, due to the level of occupation of this species, these effects are expected to be minimal.

Cumulative Effects

Long-term cumulative losses of the deciduous tree component in many stands would be compounded by the no action alternative (Scenario 1) through continued conifer encroachment and "in-filling". Scenario 2 would temporarily destroy some habitats but would set the stage for regeneration of deciduous trees and would help reestablish better deciduous-coniferous habitats for the longer term. Action alternatives would help discourage some conifer in-filling which is not cumulative to past changes and cumulative loss of deciduous tree components but may also cause minor disturbance or displacement of nesting birds and potential nest losses if ignitions occur during nesting seasons.

Pygmy nuthatch

Habitat for this species can primarily be found in the ponderosa pine stands and the species is relatively common in all the units proposed for burning.

Management Strategies

Strategies which perpetuate and protect old-growth ponderosa pine, particularly in open, park-like forest structures, will benefit this species. Restoring short-interval fire as a thinning agent to protect stands from stand-replacing fires is a positive strategy.

Direct and Indirect Effects

The no action alternative (Scenario 1) would have no immediate direct effects on pygmy nuthatches or their existing habitats. Indirect effects on habitats would include continued "in-filling" between larger ponderosa pine by Douglas fir and other shade-tolerant tree species, which would continue to degrade habitat conditions and would reduce the probability that stands would eventually survive destructive wildland fires long enough to develop to structural conditions and species compositions optimal for this bird. Scenario 2 would likely have direct and immediate impacts on habitats and potentially individual birds as well. Depending on timing of burn events, the effects could include direct loss of nuthatches, and

substantial losses of existing and potential future nesting and foraging habitats from localized stand-replacing fire.

Action alternatives may directly displace some birds from nests if ignited during nesting seasons, but would otherwise simply reduce fuel loadings in ponderosa pine and mixed Douglass fir/ponderosa pine sites. Fires would help encourage a more open forest structure and allow ponderosa pine trees to survive longer. Indirect effects would also include extending the useful life of marginal habitats and perpetuating and encouraging longer term development of better habitat conditions for the bird. Alternatives B and D would provide for the highest level of maintenance and restoration of habitat within the planning preferred by these birds. Alternative C would provide the next highest level followed by alternative E.

Cumulative Effects

The no action alternative (Scenario 1) would contribute to cumulative fuel buildups and "infilling" in ponderosa pine stands and mixed stands with pine components. This would continue the cumulative degradation effects of past fire exclusion and would further increase future probabilities of stand-replacement fires which would destroy large old growth pine. Scenario 2 would likely result in some losses of old growth ponderosa pine and developing mixed species stands. These habitat losses for nuthatches would be cumulative to past degradation and losses of old growth pine to fire exclusion, timber harvest, and fuelwood gathering.

Action alternatives would begin to reverse the cumulative effects of past fire exclusion and would reduce the risk of future additional habitat losses. Some nest losses or displacement of birds from nest sites may occur if ignitions occur during nesting seasons and this would be cumulative to current and historical habitat degradation trends in ponderosa pine and dry Douglas fir habitats for this bird.

Pine squirrel

Pine squirrel habitat and the species can be found in all units proposed for burning.

Management Strategies

Habitat strategies that allow forest conditions to succeed forward to more dense conditions, especially in dry pine sites and some mixed conifer sites, tend to benefit this species. Increased densities of canopy and moisture conditions that perpetuate Douglas fir and other seed-bearing trees tend to benefit this squirrel.

Direct and Indirect Effects

The no action alternative (Scenario 1) would have no direct or immediate effects on the squirrel or its habitat, but would tend to indirectly improve habitat in the short-term. In the longer term, the effects of Scenario 1 could be short-lived if increased fuel loading resulted in stand-replacing high-intensity fires, which would likely cause direct squirrel mortality and significant habitat losses across the landscape. Scenario 2 would result in significant direct mortalities and habitat losses on most acres burned, depending on fire intensities. Indirect effects would include habitat fragmentation over relatively large area. This could delay

immigration of individuals from unburned areas to regenerated forests for long periods until mature forests developed.

Action alternatives may result in very minimal risks of direct mortalities of squirrels in treated areas and some limited and short-term degradation of local habitats. Indirect benefits would occur from the extension of habitat effectiveness over the longer term due to decreased risks of stand-replacing fire. Increased protection and perpetuation of mid and late seral aged stands of pine and mixed conifer from the risk of stand-replacing fires would indirectly benefit pine squirrels and their habitats in the long term. These effects would be the greatest with alternatives B and D. Alternative C would have the next highest level of impact followed by alternative E.

Cumulative Effects

The no action alternative (Scenario 1) would result in cumulative increases in acres suitable for pine squirrels in the short term and would be cumulative to past fire exclusion successional advancement trends. Scenario 2 would lead to destruction of squirrel habitats which would not be cumulative to past successional trend effects on squirrel habitat but in combination with other effects of timber harvests, would be cumulative to this trend in habitat loss, particularly in developed, roaded areas.

Action alternatives would begin to reverse long term successional advancement trends in forest structure which would not be cumulative to past and present effects trends, but would also extend the life span of many stands and reduce the cumulative habitat fragmentation effects from other sources, such as timber harvest and stand-replacing fires.

Alternatives B, C, and D may have cumulative impacts by the burning of continuous portions of the Nez Perce National Forest in the Lower Salmon segment of the planning area over a period of several years.

Mountain bluebird

While habitat for the mountain bluebird can be found in all units proposed for burning, it is uncertain if the species is actually present in these units.

Management Strategies

Managing forest landscapes characterized with open woodland structure, forest edges and burned areas with abundant standing snags best meets the needs of this species. Within forested areas of the northern Rockies, nesting populations appear to depend heavily on burned areas with abundant standing snags (Dobkin, D.S. 1994; Hutto, R. 1995).

Direct and Indirect Effects

The no action alternative (Scenario 1) would encourage successional advancement and dense forest growth without fire's influence. This would directly lead to continued degradation of mountain bluebird habitats and the mosaic of open forest, edges, and abundant snags they prefer. Indirectly, this scenario would perpetuate more dense conditions which would

become prone to stand-replacing fire over large areas rather than the character of creating small openings, a few snags and habitat mosaics. Scenario 2 would create abundant standing snags on large, contiguous areas directly beneficial to nesting bluebirds in the short-term, but large-scale areas of regenerated forest would be poor habitat over the longer term after snags fell and mid- seral vegetation dominated these sites.

Action alternatives would burn areas at low and intermediate intensities, thereby initiating smaller patches of snags in overdense areas but would leave most trees live. Overall ground fuels and smaller tree densities would be reduced, indirectly lowering subsequent stand-replacing fire risk in the future but also initiating mosaic patterns of small openings mixed with live tree cover preferred by mountain bluebirds. Alternative E would provide a higher potential for higher amounts of snags from wildfires because fewer fuels would be reduced. Alternative C would treat fewer acres than Alternatives B and D.

Cumulative Effects

The no action alternative (Scenario 1) would contribute to cumulative habitat degradation trends by allowing further forest infilling in natural openings and any existing mosaics, as well as cumulative reductions in fire-created snag availability. Scenario 2 would reverse long term cumulative habitat degradation trends by creating large-scale areas of standing, fire-killed snags beneficial to bluebirds in the short term, but eliminating forest mosaics of cover and openings in favor of large-scale openings, and precipitating long term "boom-bust" habitat and population cycles.

Action alternatives would begin to move forest conditions away from cumulative infilling and the absence of snags perpetuated by fire exclusion, logging and firewood cutting especially in roaded, developed areas.

Brown creeper

While habitat for the Brown creeper can be found in all units proposed for burning, it is uncertain if the species is actually present in these units.

Management Strategies

Brown creepers are considered a forest interior nesting species and are sensitive to forest fragmentation during the breeding seasons (Dobkin, D.S. 1994). They prefer larger trees as foraging sites. The most beneficial strategy for managing brown creepers is to perpetuate long term growth and protection of ponderosa pine/Douglas fir forests from fragmentation and stand-replacing fires.

Direct and Indirect Effects

The no action alternative (Scenario 1) would have no immediate direct impacts on brown creepers or their current habitats. It would continue to allow encroachment of ponderosa pine/Douglas fir cover types by shade-tolerant conifers through excluding fire, which would indirectly result in longer term risks of stand-replacing fires in these cover types. Scenario 2 would potentially eliminate nest sites, creepers and some habitat for the bird through larger

scale, high intensity fires. These fires would replace all trees on some sites, add to forest fragmentation, and reduce stand rotation ages, which would discourage development of larger trees as preferred foraging sites.

Action alternatives would directly begin to help reduce unhealthy fuel loadings, encroachment by shade-tolerant species, and the overdense forest conditions that could lead to increased incidence of stand-replacing fires that fragment the forest landscape. Disturbance or displacement of nesting birds may occur if sites are burned during spring breeding seasons. They would indirectly help to reduce future habitat losses to high intensity fires, would reduce future fragmentation of habitats by stand-replacing fires and would help perpetuate long term existence of ponderosa pine/Douglas fir cover types important to development of larger trees preferred as foraging sites. These effects to the habitat (as well as potential displacement) would be highest with alternatives B and D with alternatives C and E having less impact respectively due to fewer acres being treated.

Cumulative Effects

The no action alternative (Scenario 1) would add to past fuel loadings, fragmentation risks from fire, and to past fragmentation from timber harvest- related activities by continuing the trend toward high ladder fuels, high tree densities, and an increase in the risk of stand replacing fires. Scenario 2 would result in large-scale losses of preferred habitats including large trees which would be cumulative to past forest fragmentation from past harvest patterns and fires.

Action alternatives would begin to reverse cumulative habitat losses to changing fire regimes in ponderosa pine/Douglas fir cover types and would help clear excess fuels and encourage small openings which serve to protect large standing trees. This would not be cumulative to past and present trends.

FISHERIES

DIRECT AND INDIRECT EFFECTS TO FISH HABITAT

General Effects to Fish Habitat from Wildland Fire Related to Changes in Water Yield, Sediment Yield, Large Woody Debris Recruitment, and Stream Temperature

The influence of fire on hydrology and water quality can be viewed as a continuum, with effects of prescribed burning at one extreme and large, stand-replacing wildland fire at the other (Baker 1989). The effects of prescribed burning are generally considered both in terms of potential short-term, negative effects and long-term benefits of fuels reduction, which we assume will result in the reduced risk of a catastrophic, stand-replacing fire.

Potential short-term effects to streams and fish from wildland fire include increased risk of landslides, mass movement, and debris torrents, increases in surface sediment erosion, possible reduction in streamside vegetation resulting in changes in Riparian Conservation Areas (RHCAs), and possible increases in water yield depending on the amount and severity of vegetation burned. Long-term effects include increases in nutrient delivery, possible

increases in woody debris in streams, and possible increases in stream temperature if shading is significantly reduced.

Effects from the prescribed burning are expected to be less than those of uncontrolled wildland fires. Studies of the effects to fish habitat from wildland fires show they are not necessarily adverse. Even the consequences of large fires are not as catastrophic as often anticipated (Reiman et al. 1995). Observations by fishery biologists and monitoring by Idaho State University and the Payette National Forest indicate that fish habitat is generally not adversely affected by wildland fire, and any habitat changes are short-term.

The upper reaches of Chamberlain Creek were within the 1994 Chicken Fire Complex. Fine sediments were slightly elevated in 1996, but have generally declined since 1989. In the upper South Fork watershed, in spite of two large wildland fires, high snowpacks and spring runoffs for three consecutive years and widespread hillslope failures, streambed conditions have fluctuated but did not change significantly (DRAFT, Nelson et al. 1999). Similar results were found in the Secesh River watershed where the entire Lake Creek area was within the Chicken Fire perimeter, but the trend in spawning conditions for anadromous fish appear to be improving, with decreasing amounts of fine sediment.

Monitoring conducted on the Nez Perce National Forest indicates that short-term impacts may occur from larger, stand-replacing wildfires as a result of mass movement events, increases in Equivalent Clearcut Area (ECA), and increases in stream temperature. Monitoring data collected in the East Moose drainage following the Footstool Fire in 1988 suggest increases in channel erosion and deposition which may have been due to changes in water yield (Green and Gerhardt 1991). These changes appeared to have occurred the second year post-fire in response to intense convective thunderstorms and high spring runoff flows. Changes were most dramatic within the fire area only. No obvious changes were noted in substrate condition downstream in Moose Creek and the Selway River. Effects were much less pronounced at the downstream portion of the fire and below in East Moose Creek. High summer stream temperatures within and below areas where overstory vegetation had been burned were also recorded.

Other monitoring of long-term effects to fish habitat on the Nez Perce National Forest from wildfires suggests either there are no significant long-term effects, or long-term effects are beneficial. Stream survey data collected in 1998 from a watershed burned in 1994 in the Selway-Bitterroot Wilderness Area indicated large amounts of woody debris in the channel, much of which occurred as a result of the fire. Large debris jams formed highly complex pool habitat over most of the surveyed reaches in the upper third of the stream. Low levels of deposited sediment were measured. High densities of bull trout and westslope cutthroat trout were observed in areas affected by wildfire, and adult fluvial bull trout were strongly associated with pools created by debris jams. Measured stream temperatures in mid-August 1998 did not exceed 16° C during the surveyed period. Although the riparian area burned over much of the area, burned trees provided a good source of woody debris. Stream temperatures did not appear to be adversely affected by tree mortality in riparian areas, although pre-fire temperature data are not available.

The Porcupine Fire occurred in 1992 in the Crooked Creek watershed. Crooked Creek was monitored while the fire was still burning in late August 1992. Delivery of ash and overland

sediment to the stream were observed during this monitoring trip, but overt sediment deposition was not evident. Since 1992, small landslides and debris torrents associated with this fire have been documented, but high levels of deposited sediment have not been observed in the stream. We have assumed that mass movement events were not at a magnitude which caused overt deposition in the stream. The fire burned hot in some areas, especially near the tops of ridges, but in general a mosaic burn was achieved where areas of low intensity burn were interspersed with areas of intense burns. This is typical of many wildfires in river breaklands areas.

In summary, a basic premise upon which prescribed fire proposals are made is that fire is intentionally applied to reduce fuels and thus the risk of a large, stand-replacing fire burning uncontrolled during the mid to late summer. We therefore expect that the effects of prescribed fire under controlled conditions will be less than if the area was allowed to burn as the result of a natural ignition mid to late summer and fall, including effects to watersheds and fish. We expect that the effects of the action alternatives on fish and fish habitat will be less than those of the wildfires described above, which involved large, stand-replacing fires, and may be insignificant depending on the existing condition of the watershed and the amount and intensity of fire achieved.

This does not mean that prescribed fire does not have the potential to affect streams or fish habitat. These potential effects are assessed for each stream in the assessment area in the following section.

Direct and Indirect Effects from Alternatives on Nez Perce National Forest Streams

Alternative A - No Action

If Alternative A is implemented, no prescribed burning will occur, and the landscape will remain the same in the short term. Natural processes will continue to dominate, and no immediate human-caused changes in the watersheds will occur. Amount of sediment, summer water temperatures, streamflow, amount of wood in the channel, and condition of riparian reserves will remain unchanged.

Long-term effects are difficult to predict and are based solely on the probability of a large, catastrophic fire which may occur in this watershed. The effects of such an event must be weighed in the context of severity between implementation of the No Action Alternative and any efforts conducted to reduce current fuel loading in the area. With the assumption that prescribed burning in the analysis area would reduce the current level of fuel accumulation and contribute to a more natural fire regime, predicting long-term effects to the watershed from selection of the No Action Alternative becomes an assessment of the effects of a severe fire over the long term. Burning of forests destroys the vegetation on slopes and along stream margins, and the effects of this are largely dependent on the severity of the burn. Effects of a severe stand-replacing fire include increased water yield, which would contribute to increases in bank erosion and number of debris torrents, increases in surface sediment erosion, increases in mass failures, and increases in water temperature.

Alternatives B, C, and D

Effects to Streams and Fish Habitat from Potential Changes in Equivalent Clearcut Area (ECA)

As disclosed in the Watershed Effects section, changes in Equivalent Clearcut Area (ECA) are not of a magnitude where significant changes in water yield or stream channels would occur in any of the streams on the Nez Perce National Forest, except for East Fork John Day Creek, Clark Creek, and Elfers Creek. Of these, East Fork John Day Creek is the only fish-bearing stream. It has a high existing ECA (20 percent) which will increase to 22 percent under Alternatives B, C, and D. This increase could result in increased water yield and contribute to channel erosion, fine sediment deposition, and reduction in the carrying capacity of this stream for fish. Because of mitigation for East Fork John Day Creek, which involves development of burn plans which will result in low-intensity burns in riparian areas, risks are expected to be low. Risks from prescribed fire must be weighed against the risk of catastrophic fire (and corresponding effects) in the absence of prescribed burning.

Clark and Elfers Creek are both very small tributaries to the main Salmon River. Existing ECA in Clark Creek is 22 percent, which will be increased to 24 percent under the above alternatives. Existing ECA in Elfers Creek is 24 percent, which will be increased to 26 percent. Since these streams do not support fish, no direct effects to fish or habitat would occur. Indirect effects to the Salmon River are possible, however, from increased bedload and fine sediment delivery as a result of channel erosion, if increases in water yield occur. Mitigation staggering the application of fire, and development of burn plans which minimize fire intensity in riparian areas, are expected to reduce risks.

For all other streams, final ECA predicted as a result of prescribed burning is less than 15 percent, which is considered a conservative threshold for changes in water yield. Therefore, effects to fish and habitat in these streams from increased water yield are not expected.

Effects to Streams and Fish Habitat from Potential Changes in Sediment Yield and Turbidity

As discussed in the Watershed Effects section, sediment yield on Nez Perce National Forest streams was modeled using the NEZSED sediment model. This model predicts percent over the natural base rate, including surface erosion, as a result of ground disturbance, both historic, current, and future. NEZSED predictions are then assessed against information provided by Stowell et al. (1983) in development of a subsequent model (FISHSED), which predicts effects of increased sediment yield on fish habitat. In the FISHSED model, general thresholds for significant changes in fish habitat are as follows:

45 percent over base for Rosgen A channels
30 percent over base for Rosgen B channels
20 percent over base for Rosgen C channels

Fish-bearing streams where these thresholds may be exceeded as a result of implementation of the above alternatives include Allison, East Fork John Day, No Business, Little Van Buren, Sherwin, China, Cow, Lower Big Mallard, Kessler, South Fork Race, and West Fork Race Creeks. Related to sediment, changes in fish habitat predicted by FISHSED include increases in cobble embeddedness (fine sediment deposition) and corresponding decreases in summer and winter habitat carrying capacity.

Based on the above information, increases in fine sediment deposition and decreases in summer and winter carrying capacity may occur in the above streams if burning is initiated and accomplished as modeled by NEZSED (see Watershed Effects section). Increased sedimentation could also result in loss of pool habitat and increased stream temperature if the stream becomes shallower and wider. All of the above alternatives would affect streams similarly.

Since increased sediment yields are based on prescribed fire activities only and do not include construction of permanent erosive features on the landscape (such as roads), streams are expected to recover to their pre-disturbance condition, and loss of pools and increased temperature from channel changes are not expected. Prescribed fire would result in a pulse of sediment, represented by temporary increases ("spikes") in sediment yield, which would decrease to pre-fire levels within the next three years. Although increases in sediment deposition and decreases in winter and summer habitat carrying capacity may occur during the first year following the activity, the streams are expected to recover quickly to pre-disturbance levels. As with changes in ECA, risks from prescribed must be weighed against the risk of catastrophic fire (and corresponding effects) in the absence of prescribed burning.

Fish species potentially affected by the above changes include steelhead trout in Allison, Little Van Buren, Lower Big Mallard, Kessler, South Fork Race, and West Fork Race Creeks; bull trout in East Fork John Day and Lower Big Mallard Creeks; and westslope cutthroat trout in East Fork John Day, Little Van Buren, No Business, Sherwin, Kessler, Lower Big Mallard, and Race Creeks. Cutthroat trout in Cow, Sherwin, and No Business Creeks are a particular concern because they comprise isolated, distinct populations and exist in watersheds which are already adversely affected and have very low resilience. In addition, the low numbers of bull trout in East Fork John Day Creek result in a high extinction risk of this species in this watershed.

The short-term risks associated with these increases could be ameliorated by staging burns over several years rather than burning all acres in one year, or by burning the riparian areas of these streams at very low intensity. This mitigation will be applied to Kelly, Little Van Buren, Sherwin, China, Cow, Clark, Kessler, and Elfers Creeks on the Nez Perce National Forest. Staging burns across several years should reduce the risk of adverse effects to fish and habitat from sediment. Effects would be transitory, lasting for a short time only.

Effects to Streams, Fish Habitat, and Riparian Areas from Prescribed Fire in Riparian Habitat Conservation Areas (RHCAs)

In all action alternatives, fire may be ignited in streamside areas, collectively known as "RHCAs", or move into RHCAs from ignitions which occurred elsewhere. In both cases, the result would include burned riparian vegetation and a level of mortality. Loss of riparian vegetation, particularly overstory vegetation, may result in increases in stream temperature, which could adversely affect fish. Long-term, mortality of overstory vegetation may result in increased large woody debris recruitment to the stream, increased growth and vigor of remaining vegetation, and a reduction in risk of catastrophic fire, all of which are considered beneficial effects. Short-term risks must be weighed against potential long-term benefits. Streams identified at particular risk of riparian impacts included Shingle and John Day Creeks. For these streams, the following mitigation will be implemented.

No more than 5 percent mortality in the mature forest canopy within the streamside RHCA, with this mortality not highly concentrated.

Less than 5 percent of the streamside RHCA is burned at high severity (litter and duff consumed), with these patches not highly concentrated.

If the above mitigation is implemented, short-term adverse effects to temperature are expected to be minimal, if any, for the above sensitive areas.

Other sensitive streams identified, which include Kelly, Little Van Buren, Robbins, Sherwin, China, Cow, Clark, Kessler, and Elfers Creeks, will have the following mitigation applied to avoid both sediment and riparian impacts. There either will be a minimum of one year between burns or the prescription will be to burn through the riparian zones at very low intensity.

Alternative E

Effects to Streams and Fish Habitat from Potential Changes in Equivalent Clearcut Area (ECA)

As disclosed in the Watershed Effects section, changes in Equivalent Clearcut Area (ECA) are not of a magnitude where significant changes in water yield or stream channels would occur in any of the streams on the Nez Perce National Forest. Since much less burning is proposed in fewer watersheds, no adverse changes in water yield or fish habitat are expected as a result of implementation of Alternative E.

Effects to Streams and Fish Habitat from Potential Changes in Sediment Yield and Turbidity

The effects on sediment from implementation of Alternative E are generally less than those under the other action alternatives because less fire will be applied to the landscape. There are two streams where the above thresholds for sediment yield will be exceeded, and these include Little Van Buren, No Business, South Fork Race, and West Fork Race Creeks. Little Van Buren and No Business Creeks are both located in the Slate Creek watershed.

Effects to fish and habitat in these streams would be similar to effects described under Alternatives B, C, and D, where burning is proposed.

Effects to Streams, Fish Habitat, and Riparian Areas from Prescribed Fire in Riparian Habitat Conservation Areas (RHCAs)

Effects to streams, fish habitat, and riparian areas, are expected to be similar to those described under Alternatives B, C, and D. Loss of riparian vegetation, particularly overstory vegetation, may result in increases in stream temperature, which could adversely affect fish. Long-term, mortality of overstory vegetation may result in increased large woody debris recruitment to the stream, increased growth and vigor of remaining vegetation, and a reduction in risk of catastrophic fire, all of which are considered beneficial effects. Short-term risks must be weighed against potential long-term benefits.

Streams potentially affected by this alternative include No Business, Bear Gulch, Little Van Buren, John Day, Race, Rapid River, Crooked, Lower Big Mallard, and Bargamin Creeks.

In general, fewer streams will be affected under this alternative than under Alternatives B,C, and D, so risk of short-term effects across the landscape will be less than for the other action alternatives. Because risk of wildfire will not be addressed by prescribed burning in as many areas, these areas may be more prone to intense fires in the absence of additional vegetative treatments. Long-term adverse effects to streams, habitat, and riparian areas may occur from future exclusion of fire from these areas.

Cumulative Effects for Nez Perce National Forest Streams

Streams on the Nez Perce National Forest rated at a high risk for cumulative effects, based on past impacts to their watersheds, include all streams proposed for burning for all alternatives except for Lower Crooked, Big Mallard, Bargamin, Indian, and any other affected watersheds flowing through wilderness or roadless areas. All Nez Perce Forest streams in the project area besides these have been affected by road construction, timber harvest, and domestic livestock grazing, with severity of effects ranging from negligible to severe. Fish-bearing streams at highest risk of cumulative impacts include No Business, John Day, Sherwin, and Cow Creeks. These streams all have high or moderate road densities, high or moderate equivalent clearcut area, existing high stream temperature in the summer, and high levels of deposited sediment. Existing roads and improper livestock grazing in riparian areas result in chronic, low to moderate input of fine sediment which may accumulate in streams over the years. In addition, John Day Creek was adversely affected by a debris torrent in spring 1995, which occurred from a road failure.

Cumulative temperature effects are not expected in streams where fire intensity is limited through mitigation, which include John Day, Shingle, Indian, Sherwin, Cow, No Business, Allison, and Little Van Buren Creeks. Cumulative temperature effects are possible but not likely in other non-wilderness, non-roadless streams; effects to fish would not occur because these streams do not support fish. Cumulative temperature effects in wilderness or roadless streams are not expected because existing temperatures have not been affected by human activities.

Cumulative sediment effects are possible in roaded watersheds, which are related to high peak sediment yields predicted by the sediment model NEZSED for all action alternatives. Effects of peak sediment yields may be ameliorated by staging burning over several years and by minimizing amount of fire in riparian areas. In any event, predicted sediment yields for this project are expected to return to pre-project levels within several years following burning. Increases in chronic sediment yield are thus not expected for any of the alternatives. Short-term risks to fish are possible, however, due to increases in peak sediment yield which may temporarily affect streams already degraded by sediment deposition. Risk of short-term adverse effects must be weighed against the long-term benefits of fuel reduction, increased stand vigor, and decreased risk of catastrophic wildfire.

Cumulative effects related to sediment and temperature to the mainstem Salmon River may also occur. See the Watershed Cumulative Effects section for a complete assessment of these

effects. In summary, cumulative sediment effects from this project are expected to be negligible and have insignificant effects on fish and habitat in the mainstem Salmon River.

Forest Plan Consistency - Nez Perce National Forest

Consistency with Amendment 20 - PACFISH

As outlined in Chapter 3, PACFISH amended the Nez Perce National Forest Plan. PACFISH establishes riparian goals, riparian management objectives (RMOs), and riparian habitat conservation areas (RHCAs) and includes specific direction for land management activities within riparian areas (areas adjacent to streams, lakes, wetlands, and landslide prone terrain). RMOs for stream channel condition provide the criteria against which attainment, or progress toward attainment, of the riparian goals is measured. They include habitat attributes such as number of pools, amount of large wood in the channel, stability of the streambanks, and width to depth ratio. RHCAs, or the areas adjacent to streams and wetlands, were established in PACFISH to maintain the integrity of aquatic ecosystems. Healthy riparian areas are essential to maintaining or improving the quality of fish habitat in streams.

The National Marine Fisheries Service recognizes that the introduction of prescribed fire could have potential long term benefits in restoring habitat functions in RHCAs (Biological Opinion for LRMPs, chinook salmon 1995). The Biological Opinion for LRMPs, steelhead (1998) added items under "Fire Management" to be implemented to reduce or avoid adverse effects to steelhead and listed salmon. These included emphasizing containment and confinement rather than control strategies to manage wildland fire, and maximizing the use of planned ignitions and natural prescribed fire to meet vegetation management objectives.

Prescribed burning would be a step towards watershed restoration and towards restoring habitat function in RHCAs. Reiman and Clayton (1997) recognize that successfully reestablishing more natural patterns and processes could lead to long term restoration of more complex, productive aquatic habitats.

We believe that RMOs, as described in PACFISH, will be maintained or improved over both the short and the long term. Limiting the intensity of fire in the RHCAs of presently-degraded streams should result in short-term maintenance of RMOs and long-term maintenance or improvement of RMOs. Amount of large wood in the channel will remain unchanged or improve over time following burning. Fire intensity will be restricted in RHCAs such that significant overstory mortality to cause increases in stream temperature should not occur. Increases in sediment yield should not be of a magnitude where channel condition, number of pools, or width-depth ratio are significantly affected, if burns are staggered across several years in streams listed above under the sediment effects subsection.

Impacts to riparian areas in wilderness and roadless area streams from prescribed burning are not expected to be so severe that stream temperatures would be affected. The majority of the acreage (about 80-90 percent) to be burned would be a low intensity underburn. Overstory mortality of two to fifteen percent is expected in burned areas. Observations of other prescribed burns indicate the percentages of overstory mortality would be even less in riparian areas. These low levels of canopy removal are not expected to cause increases in stream temperatures. Controlled burning that occurred in riparian areas would stimulate

regeneration of some riparian species that may have become decadent due to fire exclusion, contributing long-term to stream shading.

In the event that a fire escapes prescription and burns hot enough to kill more than 10 or 15 percent of overstory vegetation in RHCAs of fish-bearing streams, increases in stream temperature could occur if this vegetation was providing significant shade to the stream.

Consistency with Nez Perce Forest Plan

As described in Chapter 3, the Nez Perce Forest Plan outlined specific sediment yield guidelines for ground-disturbing activities. Streams identified above in the Watershed Effects section where sediment yield guidelines will be exceeded under Alternatives B, C, and D include Sherwin and Little Van Buren Creeks. Under Alternative E, sediment yield guidelines will be exceeded in Little Van Buren Creek. Peak sediment yields were modeled as if burning occurred all in one year. Staggering the burns across several years would allow the sediment yield guidelines to be met. If burns are staggered in this way, then Forest Plan sediment yield guidelines will probably be met.

Other direction in the Nez Perce Forest Plan included direction for activities occurring in riparian areas. This included the following:

1. Consider cumulative impacts of proposed actions on the entire riparian ecosystem.

2. Manage riparian areas to maintain and enhance their value for wildlife, fishery, aquatic habitat, and water quality.

3. Maintain sufficient streamside vegetative canopy to ensure acceptable water temperatures for fish and to provide cover.

4. Management activities shall not be permitted to adversely change the composition and productivity of key riparian vegetation. Riparian areas now degraded by management should be rehabilitated before any further nondependent resource use.

5. Maintain sufficient streamside vegetative structure, composition, and diversity for travel corridors between old-growth stands.

6. Planned ignitions, when within prescription, will be allowed to burn to enhance resource values.

These guidelines are met with all action alternatives under this EIS.

C. Direct and Indirect Effects from Alternatives on Payette National Forest Streams

Alternative A - No Action

If Alternative A is implemented, no prescribed burning will occur, and the landscape will remain the same in the short term. Natural processes will continue to dominate, and no immediate human-caused changes in the watersheds will occur. Amount of sediment, summer water temperatures, streamflow, amount of wood in the channel, and condition of riparian reserves will remain unchanged.

Long-term effects are difficult to predict and are based solely on the probability of a large, catastrophic fire which may occur in this watershed. The effects of such an event must be weighed in the context of severity between implementation of the No Action Alternative and any efforts conducted to reduce current fuel loading in the area. With the assumption that prescribed burning in the analysis area would reduce the current level of fuel accumulation and contribute to a more natural fire regime, predicting long-term effects to the watershed from selection of the No Action Alternative becomes an assessment of the effects of a severe fire over the long term. Burning of forests destroys the vegetation on slopes and along stream margins, and the effects of this are largely dependent on the severity of the burn. Effects of a severe stand-replacing fire include increased water yield, which would contribute to increases in bank erosion and number of debris torrents, increases in surface sediment erosion, increases in mass failures, and increases in water temperature.

Alternatives B, C, D, and E

Effects to Streams and Fish Habitat from Potential Changes in Equivalent Clearcut Area (ECA)

As discussed on the Watershed Effects section, changes in Equivalent Clearcut Area are not of a magnitude where significant changes in water yield or stream channels would occur for any of the streams on the Payette National Forest, with the possible exception of Upper Boulder Creek. Existing ECA for this watershed is 18.4 percent; implementation of Alternatives B, D, and C would increase ECA to 20.2 percent. Although this increase is minor, 20 percent is within the range of ECAs which could result in water yield increases. ECA under Alternative E would increase to 19.4 percent. As discussed in the Watershed Effects section, however, a combination of mostly low and some moderate severity burning is not expected to have a detrimental effect on water yield. Because of poor existing watershed condition, Boulder Creek is at higher risk of cumulative impacts, however.

Effects to Streams and Fish Habitat from Potential Changes in Sediment Yield and Turbidity

As discussed in the Watershed Effects section, sediment yield on Payette National Forest streams was modeled using the BOISED sediment model. Unlike the NEZSED sediment model, BOISED models both surface sediment yield and mass erosion, thus often resulting in much higher predicted peak yields than those predicted by NEZSED. The results from the NEZSED and BOISED model can therefore not be compared, nor can the model FISHSED be applied to BOISED predictions.

High sediment peaks in small, steep watersheds modeled for streams on the Payette National Forest are often a function of the high percentage of the watersheds proposed for burning on landtypes that are landslide-prone. Watersheds on the Payette National Forest which fall into this category include Lockwood, Fall, Camp, Carey, Rabbit, Poly, Cottontail, Lemhi, and

Little Trout Creeks. Of these, Fall and Carey Creeks are the only known fish-bearing streams, although the others may affect the mainstem Salmon River. In addition, larger streams with high predicted increases in sediment include Boulder, Indian, Partridge, Elkhorn, French, and Trout Creeks. These are all fish-bearing streams. High peak sediment yields in these watersheds could adversely affect watershed condition and indirectly affect fish through adverse effects to habitat. Increases in deposited sediment in mountain streams reduces the carrying capacity of the stream and may adversely affect spawning habitat.

Wilderness watersheds include Lemhi, Trout, Little Fivemile, Poly, and Fivemile Creeks. These streams would not be affected if Alternative C is implemented because no burning is proposed in these watersheds.

Mitigation proposed for these streams includes either a minimum of one year between burns or the prescription will include provisions for very low intensity burns through riparian zones. Ideally, both of these mitigation measures would be implemented for the above streams, but even implementation of only one would significantly reduce the risk of sediment impacts in these streams.

Effects to Streams, Fish Habitat, and Riparian Areas from Prescribed Fire in Riparian Habitat Conservation Areas (RHCAs)

In all action alternatives, fire may be ignited in streamside areas, collectively known as "RHCAs", or move into RHCAs from ignitions which occurred elsewhere. In both cases, the result would include burned riparian vegetation and a level of mortality. Loss of riparian vegetation, particularly overstory vegetation, may result in increases in stream temperature, which could adversely affect fish. Long-term, mortality of overstory vegetation may result in increased large woody debris recruitment to the stream, increased growth and vigor of remaining vegetation, and a reduction in risk of catastrophic fire, all of which are considered beneficial effects. Short-term risks must be weighed against potential long-term benefits. Streams on the Payette National Forest which were identified as having special concerns for riparian areas include Boulder and French Creeks. The following mitigation will be implemented.

> No more than 5 percent mortality in the mature forest canopy within the streamside RHCA, with this mortality not highly concentrated.
>
> Less than 5 percent of the streamside RHCA is burned at high severity (litter and duff consumed), with these patches not highly concentrated.

If the above mitigation is implemented, short-term adverse effects to temperature are expected to be minimal, if any, for the above sensitive areas.

Cumulative Effects for Streams on the Payette National Forest

Streams on the Payette National Forest at high risk of cumulative impacts include Boulder, Fall, Partridge, Elkhorn, French, and Carey Creeks. There streams are all fish-bearing. These streams have all been affected by past and current management activity and/or recent wildfires.

Cumulative temperature effects are not expected because mitigation applied to these streams should result in no measurable decrease in stream shading. Cumulative temperature effects in wilderness or roadless streams are not expected because existing temperatures have not been affected by ongoing human actions.

Cumulative sediment effects are possible in roaded watersheds, which are related to high peak sediment yields predicted by BOISED for all action alternatives. Cumulative sediment effects are not expected in roadless and wilderness watersheds because these streams do not have existing high levels of deposited sediment. Effects of increases in peak sediment yields from the action alternatives may be ameliorated by staging burning activities over several years rather than burning all acres in one year or by minimizing fire intensity in riparian areas. In any event, predicted sediment yields for this project are expected to return to pre-project levels within several years following burning and not persist indefinitely. Short-term risks are higher for fish in degraded watersheds, however. Risks of short-term adverse effects must be weighed against the long-term benefits of fuel reduction, increased stand vigor, and decreased risk of catastrophic wildfire.

Cumulative effects related to sediment and temperature to the mainstem Salmon River may also occur. See the Watershed Cumulative Effects section for a complete assessment of these effects. In summary, cumulative sediment effects from this project are expected to be negligible and have insignificant effects on fish and habitat in the mainstem Salmon River.

Forest Plan Consistency -Payette National Forest

Consistency with PACFISH

As outlined in Chapter 3, PACFISH amended the Payette Forest Plan. PACFISH establishes riparian goals, riparian management objectives (RMOs), and riparian habitat conservation areas (RHCAs) and includes specific direction for land management activities within riparian areas (areas adjacent to streams, lakes, wetlands, and landslide prone terrain). RMOs for stream channel condition provide the criteria against which attainment, or progress toward attainment, of the riparian goals is measured. They include habitat attributes such as number of pools, amount of large wood in the channel, stability of the streambanks, and width to depth ratio. RHCAs, or the areas adjacent to streams and wetlands, were established in PACFISH to maintain the integrity of aquatic ecosystems. Healthy riparian areas are essential to maintaining or improving the quality of fish habitat in streams.

The National Marine Fisheries Service recognizes that the introduction of prescribed fire could have potential long term benefits in restoring habitat functions in RHCAs (Biological Opinion for LRMPs, chinook salmon 1995). The Biological Opinion for LRMPs, steelhead (1998) added items under "Fire Management" to be implemented to reduce or avoid adverse effects to steelhead and listed salmon. These included emphasizing containment and confinement rather than control strategies to manage wildland fire, and maximizing the use of planned ignitions and natural prescribed fire to meet vegetation management objectives.

Prescribed burning would be a step towards watershed restoration and towards restoring habitat function in RHCAs. Reiman and Clayton (1997) recognize that successfully reestablishing more natural patterns and processes could lead to long term restoration of more complex, productive aquatic habitats.

We believe that RMOs, as described in PACFISH, will be maintained or improved over both the short and the long term. Limiting the intensity of fire in the RHCAs of presently-degraded streams should result in short-term maintenance of RMOs and long-term maintenance or improvement of RMOs. Amount of large wood in the channel will remain unchanged or improve over time following burning. Fire intensity will be restricted in RHCAs such that significant overstory mortality to cause increases in stream temperature should not occur. Increases in sediment yield should not be of a magnitude where channel condition, number of pools, or width-depth ratio are significantly affected, if burns are staggered across several years in streams listed above under the sediment effects subsection.

Impacts to riparian areas in wilderness and roadless area streams from prescribed burning are not expected to be so severe that stream temperatures would be affected. The majority of the acreage (about 80-90 percent) to be burned would be a low intensity underburn. Overstory mortality of two to fifteen percent is expected in burned areas. Observations of other prescribed burns indicate the percentages of overstory mortality would be even less in riparian areas. These low levels of canopy removal are not expected to cause increases in stream temperatures. Controlled burning that occurred in riparian areas would stimulate regeneration of some riparian species that may have become decadent due to fire exclusion, contributing long-term to stream shading.

In the event that a fire escapes prescription and burns hot enough to kill more than 10 or 15 percent of overstory vegetation in RHCAs of fish-bearing streams, increases in stream temperature could occur if this vegetation was providing significant shade to the stream.

Consistency With Other Payette Forest Plan Direction

Fish habitat direction for Payette Forest streams was outlined in Chapter 3. This direction describes objectives for streams, generally ranging from allowing natural processes to dominate to impacting streams immeasurably to active restoration. General direction includes managing viable populations of all existing native fish species and ensuring that protection is provided for streams, streambanks, shorelines, lakes wetlands, and other bodies of water from detrimental changes in water temperatures, blockages of water courses, and deposits of sediment.

Implementation of the action alternatives, with mitigation for aquatics and riparian, is consistent with this direction.

Direct and Indirect Effect for Streams on the Salmon-Challis National Forest

Alternative A - No Action

If Alternative A is implemented, no prescribed burning will occur, and the landscape will remain the same in the short term. Natural processes will continue to dominate, and no

immediate human-caused changes in the watersheds will occur. Amount of sediment, summer water temperatures, streamflow, amount of wood in the channel, and condition of riparian reserves will remain unchanged.

Long-term effects are difficult to predict and are based solely on the probability of a large, catastrophic fire which may occur in this watershed. The effects of such an event must be weighed in the context of severity between implementation of the No Action Alternative and any efforts conducted to reduce current fuel loading in the area. With the assumption that prescribed burning in the analysis area would reduce the current level of fuel accumulation and contribute to a more natural fire regime, predicting long-term effects to the watershed from selection of the No Action Alternative becomes an assessment of the effects of a severe fire over the long term. Burning of forests may destroy a portion of the vegetation on slopes and along stream margins, and the effects of this are largely dependent on the severity of the burn. Effects of a severe stand-replacing fire include increased water yield, which would contribute to increases in bank erosion and number of debris torrents, increases in surface sediment erosion, increases in mass failures, and increases in water temperature.

Alternatives B, C, D, and E

Effects to Streams and Fish Habitat from Potential Changes in Equivalent Clearcut Area (ECA)

As discussed on the Watershed Effects section, changes in Equivalent Clearcut Area are not of a magnitude where significant changes in water yield or stream channels would occur for any of the streams on the Salmon-Challis National Forest, with the possible exception of Owl Creek. Although ECA would only be increased by one percent under all the action alternatives, the existing condition (49 percent ECA) could result in additional impacts in this watershed.

Effects to Streams and Fish Habitat from Potential Changes in Sediment Yield and Turbidity

As discussed in the Watershed Effects section, sediment yield on Salmon-Challis National Forest was assessed using percent fine sediment in spawning habitat as an indicator. This habitat element is monitored in the field and then compared to Forest Plan standards. Increases in sediment using a model such as NEZSED or BOISED were not predicted.

Percent fine sediment in substrates met Forest Plan guidelines for all streams in the project area except Owl and Pine Creeks. Other streams, including Long Tom and Ebenezer Creeks, were identified at high watershed risk because of a recent wildfire. Shell Creek is a steep, high energy stream and has a high potential for debris torrents if steep channels are burned hot. Burning in and near steep stream channels can cause dry ravel slides or debris torrents.

Due to the low acres proposed for burning in Corn, Fountain, Spring, Hot Springs, Gant, Garden and Indian Creeks, no adverse sediment effects are expected.

In Clear Creek, proposed burn acres are high enough to result in a change in fine sediment, but given its largely pristine condition, these increases are not expected to adversely affect fish habitat.

In Owl and Pine Creeks, although potential increases in sediment yield are small, given the existing condition of percent fines, adverse effects are possible.

Mitigation to lower the risk of sediment effects will be applied to Indian, Corn, Fall, Pine, Spring, Colson, Fountain, Clear, Garden, and Lockwood Creeks.

Effects to Streams, Fish Habitat, and Riparian Areas from Prescribed Fire in Riparian Habitat Conservation Areas (RHCAs)

In all action alternatives, fire may be ignited in streamside areas, collectively known as "RHCAs", or move into RHCAs from ignitions which occurred elsewhere. In both cases, the result would include burned riparian vegetation and a level of mortality. Loss of riparian vegetation, particularly overstory vegetation, may result in increases in stream temperature, which could adversely affect fish. Long-term, mortality of overstory vegetation may result in increased large woody debris recruitment to the stream, increased growth and vigor of remaining vegetation, and a reduction in risk of catastrophic fire, all of which are considered beneficial effects. Short-term risks must be weighed against potential long-term benefits. Streams on the Salmon-Challis National Forest which were identified as having special concerns for riparian areas include Indian Creek. The following mitigation will be implemented.

> No more than 5 percent mortality in the mature forest canopy within the streamside RHCA, with this mortality not highly concentrated.
>
> Less than 5 percent of the streamside RHCA is burned at high severity (litter and duff consumed), with these patches not highly concentrated.

If the above mitigation is implemented, short-term adverse effects to temperature are expected to be minimal, if any, for the above sensitive area.

Cumulative Effects for Streams on the Salmon-Challis National Forest

Streams on the Salmon-Challis National Forest identified at high risk of cumulative impacts include Owl, Long Tom, Colson, Ebenezer, and Indian Creeks. These streams have been affected by past human activity or recent wildfire.

Cumulative temperature effects are not expected because mitigation should result in no measurable decrease in stream shading. Cumulative temperature effects in wilderness or roadless streams are not expected because existing temperatures have not been affected by ongoing human actions.

Cumulative sediment effects are possible in roaded watersheds. Cumulative sediment effects are not expected in roadless and wilderness watersheds because these streams do not have existing high levels of deposited sediment. Effects of increases in peak sediment yields from the action alternatives may be ameliorated by staging burning activities over several years rather than burning all acres in one year or by minimizing fire intensity in riparian areas. In any event, predicted sediment yields for this project are expected to return to pre-project levels

within several years following burning and not persist indefinitely. Short-term risks are higher for fish in degraded watersheds, however. Risks of short-term adverse effects must be weighed against the long-term benefits of fuel reduction, increased stand vigor, and decreased risk of catastrophic wildfire.

Cumulative effects related to sediment and temperature to the mainstem Salmon River may also occur. See the Watershed Cumulative Effects section for a complete assessment of these effects. In summary, cumulative sediment effects from this project are expected to be negligible and have insignificant effects on fish and habitat in the mainstem Salmon River.

Forest Plan Consistency -Salmon-Challis National Forest

Consistency with PACFISH

As outlined in Chapter 3, PACFISH amended the Salmon-Challis Forest Plan. PACFISH establishes riparian goals, riparian management objectives (RMOs), and riparian habitat conservation areas (RHCAs) and includes specific direction for land management activities within riparian areas (areas adjacent to streams, lakes, wetlands, and landslide prone terrain). RMOs for stream channel condition provide the criteria against which attainment, or progress toward attainment, of the riparian goals is measured. They include habitat attributes such as number of pools, amount of large wood in the channel, stability of the streambanks, and width to depth ratio. RHCAs, or the areas adjacent to streams and wetlands, were established in PACFISH to maintain the integrity of aquatic ecosystems. Healthy riparian areas are essential to maintaining or improving the quality of fish habitat in streams.

The National Marine Fisheries Service recognizes that the introduction of prescribed fire could have potential long term benefits in restoring habitat functions in RHCAs (Biological Opinion for LRMPs, chinook salmon 1995). The Biological Opinion for LRMPs, steelhead (1998) added items under "Fire Management" to be implemented to reduce or avoid adverse effects to steelhead and listed salmon. These included emphasizing containment and confinement rather than control strategies to manage wildland fire, and maximizing the use of planned ignitions and natural prescribed fire to meet vegetation management objectives.

Prescribed burning would be a step towards watershed restoration and towards restoring habitat function in RHCAs. Reiman and Clayton (1997) recognize that successfully reestablishing more natural patterns and processes could lead to long term restoration of more complex, productive aquatic habitats.

We believe that RMOs, as described in PACFISH, will be maintained or improved over both the short and the long term. Limiting the intensity of fire in the RHCAs of presently-degraded streams should result in short-term maintenance of RMOs and long-term maintenance or improvement of RMOs. Amount of large wood in the channel will remain unchanged or improve over time following burning. Fire intensity will be restricted in RHCAs such that significant overstory mortality to cause increases in stream temperature should not occur. Increases in sediment yield should not be of a magnitude where channel condition, number of pools, or width-depth ratio are significantly affected, if burns are staggered across several years in streams listed above under the sediment effects subsection.

Impacts to riparian areas in wilderness and roadless area streams from prescribed burning are not expected to be so severe that stream temperatures would be affected. The majority of the acreage (about 80-90 percent) to be burned would be a low intensity underburn. Overstory mortality of two to fifteen percent is expected in burned areas. Observations of other prescribed burns indicate the percentages of overstory mortality would be even less in riparian areas. These low levels of canopy removal are not expected to cause increases in stream temperatures. Controlled burning that occurred in riparian areas would stimulate regeneration of some riparian species that may have become decadent due to fire exclusion, contributing long-term to stream shading.

In the event that a fire escapes prescription and burns hot enough to kill more than 10 or 15 percent of overstory vegetation in RHCAs of fish-bearing streams, increases in stream temperature could occur if this vegetation was providing significant shade to the stream.

Other Forest Plan Direction

Activities proposed under the action alternatives are consistent with all Forest Plan direction for the Salmon-Challis National Forest.

DIRECT, INDIRECT, AND CUMULATIVE EFFECTS TO LISTED AND SENSITIVE FISH - ALL FORESTS

Sockeye Salmon

Alternative A - No Action

Implementation of this alternative would result in no short-term direct, indirect, or cumulative effects to sockeye salmon. Risk of catastrophic fire may increase over time and possibly result in significant effects to this species if a large, uncontrolled wildfire were to occur with subsequent adverse effects to watershed condition.

Alternatives B, C, D, and E - Action Alternatives

Implementation of any of the actions alternatives is not expected to have a significant effect on sockeye salmon. As discussed in Chapter 3, sockeye salmon in the Snake River are functionally extinct, although an occasional adult returns to Redfish Lake as a result of hatchery recovery and supplementation efforts. The mainstem Salmon River throughout the project area is designated critical habitat for this species, the river is used as a migration corridor. No spawning in the mainstem river in the project area or downstream is known to have occurred historically.

Therefore, sockeye salmon would be affected only if one of the above alternatives significantly affected habitat in the mainstem Salmon River during the migration period for this species. Effects of the magnitude necessary to significantly affect the mainstem Salmon River are not expected (see Watershed Cumulative Effects discussion).

Fall Chinook Salmon

Alternative A- No Action

Implementation of this alternative would result in no short-term direct, indirect, or cumulative effects to fall chinook salmon. Risk of catastrophic fire may increase over time and possibly result in significant effects to this species if a large, uncontrolled wildfire were to occur with subsequent adverse effects to watershed condition.

Alternatives B, C, D, and E

Implementation of the action alternatives is not expected to significantly affect fall chinook salmon. As discussed in Chapter 3, fall chinook salmon are only found in the mainstem Salmon River within and downstream of the project area. The mainstem river is used as a migration corridor and for spawning and rearing. Numbers of returning adults are extremely low, and areas used for spawning are widely distributed, with most documented spawning areas located above Riggins, ID. Direct and indirect effects to the Salmon River are not expected as a result of project implementation.

Cumulative effects to the Salmon River could occur, since the river has been significantly affected by land-disturbing activity, and is considered degraded by both sediment and temperature impacts throughout the project area. Most impacts in the Salmon River originate outside of the project area. Effects from project implementation of the magnitude necessary to significantly affect the mainstem Salmon River, are not expected (see Watershed Cumulative Effects discussion).

Therefore, potential short and long-term effects to fall chinook salmon from the action alternatives are considered very low or insignificant.

Spring/Summer Chinook Salmon

Alternative A - No Action

Implementation of this alternative would result in no short-term direct, indirect, or cumulative effects to spring/summer chinook salmon. Risk of catastrophic fire may increase over time and possibly result in significant effects to this species if a large, uncontrolled wildfire were to occur with subsequent adverse effects to watershed condition.

Alternatives B, C, D, and E

Implementation of the action alternatives has greater potential to adversely affect spring chinook salmon because of potential effects to streams where spring chinook salmon are present and where they spawn and rear. Streams which support salmon, or where salmon are present immediately below tributaries where prescribed fire is proposed, include Slate Creek (Little Van Buren, Bear Gulch, and No Business Creeks), Rapid River, Little Salmon River, Crooked Creek, Bargamin Creek, Boulder Creek, French Creek, Trout Creek, Panther Creek, Clear, and Lower Indian (Payette NF) Creek. Of these, spring/summer chinook salmon are most at risk in Slate, French, Lower Indian, and Boulder Creeks. These streams have sustained past sediment impacts and are at higher risk of cumulative effects than the other streams. A short-term increase in sediment yield is predicted as a result of project

implementation. This increase may result in additional sediment impacts in these streams. Modeled increases in sediment yield are considered "pulse" impacts and would not be sustained over time. Therefore, streams should recover rapidly. Spring chinook salmon may be adversely affected over the short-term.

Significant short-term effects to the other watersheds included above are not expected because they have not sustained significant past impacts. They maintain their ability to recover rapidly from disturbances such as pulse sediment effects from prescribed fire.

Staggering burns across several years in watersheds where salmon could be adversely affected, rather than burning all acres in one year, should reduce the risk and magnitude of sediment impacts. An improvement in watershed condition and reduced risk of catastrophic fire is expected long-term if project objectives are met. This improvement would contribute to the long-term persistence of salmon in these watersheds. Prescribed burning, particularly if burning activities are spread across several years, is preferable to an intense, stand-replacing wildfire.

Steelhead Trout

Alternative A- No Action

Implementation of this alternative would result in no short-term direct, indirect, or cumulative effects to steelhead trout. Risk of catastrophic fire may increase over time and possibly result in significant effects to this species if a large, uncontrolled wildfire were to occur with subsequent adverse effects to watershed condition.

Alternatives B, C, D, and E

Implementation of the action alternatives has the potential to adversely affect this species short-term because prescribed fire is proposed in watersheds where steelhead spawn and rear. Steelhead trout are widely distributed and do not limit themselves to larger streams. They may be found in any perennial stream which is accessible to the Salmon River. Watersheds in the project area where this species is known to occur include Slate, Little Van Buren, John Day, China, Squaw, Big Mallard, Little Mallard, Crooked, Bargamin, Kessler, Race, Shingle, Rapid River, Allison, Kelly, Van, Robbins, Boulder, Indian (Nez Perce NF), Fall, Rattlesnake, Partridge, Elkhorn, French, Trout, Carey, Corn, Fountain, Shell, Long Tom, Colson, Owl, Panther, Pine, Spring, and Lower Indian (Payette NF) Creeks. The wide distribution of this species across the project area contributes to its inherent resistance to impacts.

Steelhead trout are most at risk in watersheds which have sustained past sediment impacts. These watersheds include Slate, Little Van Buren, John Day, China, Squaw, Kessler, Race, Shingle, Allison, Boulder, Partridge, French, Elkhorn, Colson, Owl, Clear, Lower Indian, and Pine Creeks. All these watersheds are either affected by chronic sediment yield from roads or have not recovered from the sediment effects of wildfires which occurred in the recent past.

A short-term increase in sediment yield is predicted as a result of project implementation. This increase may result in additional sediment impacts in these streams. Modeled increases

in sediment yield are considered "pulse" impacts and would not be sustained over time. Therefore, streams should recover rapidly. Steelhead trout may be adversely affected over the short-term.

Staggering burns across several years in watersheds where steelhead could be adversely affected, rather than burning all acres in one year, should reduce the risk and magnitude of sediment impacts. An improvement in watershed condition and reduced risk of catastrophic fire is expected long-term if project objectives are met. This improvement would contribute to the long-term persistence of steelhead trout in these watersheds. Prescribed burning, particularly if burning activities are spread across several years, is preferable to an intense, stand-replacing wildfire.

Bull Trout

Alternative A -No Action

Implementation of this alternative would result in no short-term direct, indirect, or cumulative effects to bull trout. Risk of catastrophic fire may increase over time and possibly result in significant effects to this species if a large, uncontrolled wildfire were to occur with subsequent adverse effects to watershed condition.

Alternatives B, C, D, and E

As discussed in Chapter 3, bull trout are not as widely distributed other species in the project area and have a narrower range of acceptable habitat conditions. Bull trout are highly sensitive both to increases in stream temperature in the summer and increases in fine sediment deposition. Streams in the project area where bull trout are known or suspected include Slate, John Day, Rapid River, Crooked, Little Mallard, Big Mallard, Bargamin, Boulder, French, Partridge, Elkhorn, Colson, Owl, Pine, Spring, Clear, and Lower Indian Creeks.

Bull trout are most at risk in watersheds which have sustained past sediment impacts. Of the above streams, included are Slate, John Day, Boulder, French, Partridge, Elkhorn, Colson, Owl, Lower Indian, and Pine Creeks. All these watersheds are either affected by chronic sediment yield from roads or have not recovered from the sediment effects of wildfires which occurred in the recent past.

A short-term increase in sediment yield is predicted as a result of project implementation. This increase may result in additional sediment impacts in these streams. Modeled increases in sediment yield are considered "pulse" impacts and would not be sustained over time. Therefore, streams should recover rapidly. Bull trout may be adversely affected over the short-term.

Staggering burns across several years in watersheds where bull trout could be adversely affected, rather than burning all acres in one year, should reduce the risk and magnitude of sediment impacts. An improvement in watershed condition and reduced risk of catastrophic fire is expected long-term if project objectives are met. This improvement would contribute to the long-term persistence of bull trout in these watersheds. Prescribed burning, particularly

if burning activities are spread across several years, is preferable to an intense, stand-replacing wildfire.

Westslope Cutthroat Trout

Alternative A - No Action

Implementation of this alternative would result in no short-term direct, indirect, or cumulative effects to bull trout. Risk of catastrophic fire may increase over time and possibly result in significant effects to this species if a large, uncontrolled wildfire were to occur with subsequent adverse effects to watershed condition.

Alternatives B, C, D, and E

Westslope cutthroat trout are distributed widely across the analysis area and are more abundant than bull trout. Streams in the project area which are known or suspected to support westslope cutthroat trout include Slate, Little Van Buren, No Business, John Day, Sherwin, Cow, Race, Crooked, Big Mallard, Bargamin, Fivemile, Fall, Rattlesnake, Boulder, Partridge, Elkhorn, French, Corn, Colson, Owl, Garden, Clear, Panther, Pine, Spring, and Lower Indian Creeks. Of these, cutthroat trout are most at risk in Slate, Little Van Buren, No Business, John Day, Sherwin, Cow, Race, Boulder, Partridge, Elkhorn, French, Colson, Owl, Panther, Pine, Spring, and Lower Indian Creeks. All these streams have sustained past and present sediment impacts from roaded development and/or wildfires which have occurred in the recent past. They are at high risk of cumulative impacts.

In addition, Sherwin, Cow, and No Business Creeks are of a special concern because they support isolated remnant westslope cutthroat trout populations which may be genetically unique. There are no other salmonid species in these streams. All three have sustained sediment impacts ranging from moderate to severe from grazing, road construction, and past timber harvest.

A short-term increase in sediment yield is predicted as a result of project implementation. This increase may result in additional sediment impacts in these streams. Modeled increases in sediment yield are considered "pulse" impacts and would not be sustained over time. Therefore, streams should recover rapidly. Westslope cutthroat trout may be adversely affected over the short-term.

Staggering burns across several years in watersheds where westslope cutthroat trout could be adversely affected, rather than burning all acres in one year, should reduce the risk and magnitude of sediment impacts. An improvement in watershed condition and reduced risk of catastrophic fire is expected long-term if project objectives are met. This improvement would contribute to the long-term persistence of cutthroat trout in these watersheds. Prescribed burning, particularly if burning activities are spread across several years, is preferable to an intense, stand-replacing wildfire.

WATER QUALITY

DIRECT AND INDIRECT EFFECTS

Water Yield

Introduction

Prescribed burning represents one of the management practices that affects the hydrology of forested watersheds. Prescribed burning generally has less impact on water quantity than wildland fire. Catastrophic fires have much greater effect on hydrologic processes such as interception, evapotranspiration, infiltration, soil moisture storage, and subsurface flow than prescribed burning (Baker, 1990). All of these factors are influenced by the intensity and severity of burning, and the proportion of the watershed burned. Where vegetation is destroyed, interception and evapotranspiration are reduced. When the organic layers of the forest are consumed and mineral soil exposed, infiltration and water storage capacities are reduced (Baker, 19 90). The duration of fire effects vary with recovery of vegetation and range from a few years to decades. Fire is a natural part of the hydrologic cycle of most forested ecosystems, and healthy watersheds have a high resiliency to recover quickly from fire effects.

Water quantity and timing are affected by several of the factors discussed in the above paragraph. The following discussion will compare the effects of higher severity and intensity wildland fires, to planned prescribed burns. The prescribed burns are similar to the proposed action in Salmon River prescribed burn project. Conditions in which wildland fire burns usually differ greatly from the controlled circumstances of a prescribed fire project. Prescribed burns take place under less severe burning conditions such as cooler air temperatures and higher humidities, higher live and dead fuel moisture, higher soil moisture , and lower wind speeds. Depending on the objectives of the burn, most prescribed burns only consume part of the forest floor fuels, and do not consume a high percentage of canopy material except for the smaller trees in the stand component, and occasional burning of larger trees. The assumption, as modeled in the BEHAVE model, is that the low and moderate intensity prescribed burns in the Salmon River project consume only part of the organic material in the forest floor and less than 15 percent of the forest stand (included large and small tree stand components), and that the high intensity burns would consume a higher amount of organic material on the forest floor, but would still consume less than 22 percent of the forest stand.

Wildland fire usually creates a mosaic of fire severity and effects across topography that often varies from low to high severity. Prescribed fire will also create a mosaic of conditions across the topography, but with a much higher percent of low and moderate severity and intensity within the mosaic than there is with most wildland fires. The hydrologic responses of a watershed to water yield depends, and are related to several factors. The most important factors are: the severity of the fire on the soil surface, the proportion of the watershed burned, the relative proximity of the burned area to a stream channel, the slope of the watershed, and the soil type. Where measurable hydrologic responses occur following burning, they are typically greatest within the first year or two and then return toward pre-fire levels (Beschta, 1990).

Wildland fires often spread through the forest canopy producing intense fire that consumes much of the canopy, surface fuels, litter, and the forest floor. Prescribed fire burns through the forest canopy with lower intensity and thus has a much lower effect on interception of precipitation by the forest canopy. Prescribed fires mainly show their effects by reducing the amount of interception by the lower canopy vegetation, but retaining the larger canopy vegetation. In higher intensity and severity wildland fire, evapotranspiration may be greatly reduced, compared to a prescribed burn where most of the vegetation affected is the lower canopy layer, instead of mid size and larger trees in the forest stand, which are responsible for the main part of the evapotranspiration.

Soil physical conditions after fires can affect water yield and timing. Some of the effects of fire on physical changes in soil are increases in hydrophobic soil layer, increased bulk density, and loss of the litter, duff and humus on the forest floor. These physical soil changes result in loss of soil infiltration, soil water storage, and ultimately can cause an increase in overland flow and increase in water yield. The higher the severity of fire on the forest floor, the more chance there is for increased water yields, overland flow, and mass wasting in the watersheds. Prescribed fire applied under controlled conditions tends to produce a mosaic of conditions on the forest floor that disperse effects on soil physical conditions, thus producing much lower effects on soil infiltration and water storage than higher severity wildland fires.

The effect of fire on peak flow is usually dependant upon the changes in physical soil properties. With reduced infiltration rates caused by water repellant soils, increased bulk density, and loss of water storage, overland flow increases and water reaches stream channels more quickly. Peak flow increases reported during the first year after wildland fire in California and Arizona chaparral varied from 2 to 45 times the normal peak flows usually measured after an intense storm (Baker, 1990). Wildland fires in central Oregon watersheds showed 45 percent increases in annual peak flow the first year after the 1933 Tillamook Burn, with the increases disappearing in 8 years. Hervey et, al. (1976) reported an increased snowmelt peak flow of 50 percent the first year following wildland fire in north-central Washington (Beschta, 1990). These records show large percentages of high intensity and high severity within the burned areas. Peak flow responses to prescribed fire are related to the amount of change there is in physical soil properties. Because prescribed fire gives us the ability to mitigate soil damage, the peak flow increases should be minimal due to maintenance of soil infiltration capacity and water storage abilities.

In some cases prescribed fire may affect water yield and peak flows. If a watershed has a history of timber harvest where much of the watershed has been heavily harvested with ground base and jammer systems with skid trails, roads and landings increasing soil compaction, even a prescribed burn can increase detrimental cumulative effects. Watersheds such as Long Tom Creek and Owl Creek that are still recovering from high severity and intensity wildland fires may also be directly affected by a prescribed burn.

In the water yield discussion in Chapter 3, equivalent clear-cut area (ECA) is used as an indicator for water yield. A range of 20 to 30 percent of the watershed in clear-cut condition has been used as an indicator that water yield and peak flows could increase in-channel erosion. This percentage may be too high for a small watershed. The smaller watersheds are affected more by a higher percent of watershed in clear-cut condition than larger watersheds, with other factors such as topography, geology and climate being the same (Grant, 1996).

The other factor that could affect watershed condition after fire are the high intensity rain storms that take place in the Salmon River Canyon. If soil has been exposed by burning and stream channels overloaded by runoff after a high intensity thunderstorm, debris torrents may occur in stream channels. This was observed in 1998 on the Rainier Fire, and historically on the Fountain Creek Fire, Long Tom Fire and numerous others. Controlled conditions on prescribed fires near stream channels should prevent most of the conditions where debris torrents are increased. Dry ravel is another affect of wildland fire, especially in granitic soils and on steep slopes. Accumulation of dry ravel materials can load steep stream channels and accelerate failures in the channels.

The following section discusses ECA for each watershed and compares each alternative for indirect and direct effects. ECA is used as an indicator in this chapter for water yield.

Equivalent Clearcut Area

Allison Creek, Van Creek, Kelly Creek, Robbins Creek, Face Drainages, Smith Canyon Creek, Gasper Creek, Flock Creek, Chamberlain Creek, and Spring Creek

Table 4 - 4. Alternative A - No Action

Watershed Name	Total Area (ac)	Existing ECA Acres	Existing ECA (Percent)
Plant Cr.	354	95	27
Van Cr.	2654	282	11
Kelly Cr.	5241	495	9
Robbins Cr.	3239	396	12
Smith Cr.	1117	1	<1
Gasper Cr.	1540	4	<1
Flock Cr.	757	6	1
Chamberlain G.	791	4	1
Spring Cr.	513	8	2
Face	912	0	0
Allison Cr.	7697	757	10
WF Allison Cr.	4892	353	7

Under alternative A water yield would stay the same and improve over time as clear-cut stands and past wildland fire areas recover. But, if fuels continue to accumulate and wildland fire occurs and burns at high severity and intensity levels, water yields could increase for up to 5 years if a high proportion of stands are burned in the watershed. Overland flow could occur if soil becomes hydrophobic and forest floor organic matter is removed. If a high severity fire occurs and a high intensity rainstorm follows, overland flow could quickly deliver water and sediment to the stream channels increasing water yields, peak flows and in channel erosion. These are also the conditions that accelerate debris torrents on the breakland landtypes.

Alternative B C and D

Table 4 - 5. ECA results for Salmon River Watersheds

Watershed Name	Total Area (ac)	Existing ECA Acres	Existing ECA Percent	Post Fire ECA Acres	Post Fire ECA Percent	Total ECA Acres	Total ECA Percent
Plant Cr.	354	95	27	---	---	95	27
Van Cr.	2654	282	11	18	1	300	12
Kelly Cr.	5241	495	9	44	1	539	10
Robbins Cr.	3239	396	12	54	2	450	14
Smith Cr.	1117	1	<1	1	<1	2	1
Gasper Cr.	1540	4	<1	2	<1	6	1
Flock Cr.	757	6	1	1	<1	7	1
Chamberlain G.	791	4	1	---	---	4	1
Spring Cr.	513	8	2	---	---	8	2
Face	912	0	0	3	<1	3	<1
Allison Cr.	7697	757	10	35		792	11
WF Allison Cr.	4892	353	7	0	0	353	7

Alternative B

There should be no detrimental effects from increased water yield on most of the watersheds shown in the above table. Plant Creek is within the Cumulative Effects area, but not within the proposed burn area, so the high ECA in Plant Creek will not be a concern. Robbins Creek has an ECA of 14 percent with the proposed burn. The water yield effects as described in the water yield discussion above are greater than those of prescribed fire for low and moderate severity levels. The high road density combined with the ECA especially in the upper watershed where most of the roads are located may be a concern when burning. The road density along with past harvest practices have left some of the upper tributaries of Kelly Creek with reduced shade and large wood in some along streams. Kelly and Robbins Creek are adjoining watersheds, so prescribed fire mitigation in these watersheds could easily be considered and easy to implement. Refer to the Sediment Section and the Mitigation Section for watershed specific mitigation

Alternative C and D

Alternative C and D would have the same effect as alternative B. Alternative B, C, and D have the most effect on water yield increase of all of the action alternatives.

Table 4 - 6. Alternative E

Watershed Name	Total Area Acres	Existing ECA Acres	Existing ECA Percent	Post Fire ECA Acres	Post Fire ECA Percent	Total ECA Acres	Total ECA Percent
Allison Cr.	7679	751	10	16	<1	767	10

Under alternative E the fire intensity is mostly low severity and there is an increase in ECA of less than 1 percent. There will be no detrimental effects to the watershed due to the actions in alternative E.

Fiddle Creek Watershed

Alternative A-No Action

The Fiddle Creek watershed is already a watershed with indicators that point toward poor watershed condition. The ECA is currently 19 percent, road density is 4 mi/mi², failures on the road systems are common, stream channels in some reaches are in poor condition, and a high percentage of the watershed has high landslide prone landtypes. This condition is currently improving due to rehabilitation of roads with obliteration and recovering stream crossings. This will reduce erosion in streams and will help reduce road density. Forest stands are regenerated, and as they mature, the ECA percent will decrease. Both of these factors will help reduce sediment in the stream channels.

Alternative B, C, and D

This proposal would have very little effect on Fiddle Creek. The area to be burned is so small that it would not improve or degrade the watershed condition.

Alternative E

Alternative E proposes no burning in Fiddle Creek watershed, so there is no effect on the watershed.

Bargamin Creek, Crooked Creek, Upper Indian Creek, Lower Indian Creek, Moccasin Creek, Cougar Creek, Rattlesnake Creek and Unnamed Salmon River Face Watersheds

Alternative A-No Action

The effects for Alternative A would be the same as for Allison Creek.
(See page 4 - 121.)

Alternative B

Because these watersheds are in the wilderness or are mostly roadless, ECA values are not available for these watersheds. Existing ECA acres in these watersheds are mostly due to wildland fire. The Bargamin Watershed has had large natural fires in the recent past. About 60 percent of the watershed was burned since 1960. Due to recent burning in Lower Bargamin Creek, there is probably a lower risk for high severity burns than in some of the watersheds that have not had recent fire activity.

Because Lower Bargamin has been designated as wilderness, the main disturbance has been wildland fire. At this time data are lacking to calculate ECA from the fire history. The main concern in Bargamin Creek is in areas where fire has already burned at moderate and high intensities during the Ladder Creek Fire.

The water yield in upper Crooked Creek will not be affected by the proposed prescribed fire in Lower Crooked Creek. There are some concerns for water yield and channel stability related to the recent Porcupine Fire. Two large debris torrents occurred after the Porcupine Fire four miles from the mouth of Crooked Creek. These debris torrents carried material and scoured main Crooked Creek for one half mile. Before fire is reintroduced into Crooked Creek, this area of concern should be visited in the field by the district watershed specialists and mitigation such as avoidance of this area or cool spring burn should be recommended in the area near the debris torrent channels. Alternative B is the highest risk alternative for water yield and channel failure.

ECA is not available for Indian, Moccasin, Rattlesnake, Cougar and the Unnamed Face watersheds. The only disturbance has been light grazing use and scattered wildland fire. There should be no detrimental effects from the proposed action in alternative B for the above watersheds.

Alternative C-Alternative C proposes no burning, so the effect is the same as Alternative A.

Alternative D and E - These alternatives burn the same amount of acres as Alternative B, so the effect is the same as the proposed burn for alternative B, except where spring burning is implemented and the affect would be less.

John Day Creek Watershed, East Fork John Day Watershed, South Fork John Day Watershed, and Middle Fork John Day Watershed

Alternative A-No Action

The effects for Alternative A would be the same as for Allison Creek. (Page 4 - 121)

Table 4 - 7. John Day Creek ECA Acres and Percents for Alternative B, C and D

Watershed Name	Total Area (ac)	Existing ECA Acres	Existing ECA Percent	Post Fire ECA Acres	Post Fire ECA Percent	Total ECA Acres	Total ECA Percent
EF John Day	3624	724	20	43	2	767	22
MF John Day	3795	226	6	42	1	268	7
SF John Day	2503	0	0	34	2	34	2
John Day Cum.	9922	950	10	0	0	950	10

Alternatives B, C, D

Under Alternatives B, C, and D the East Fork of John Day Creek will be detrimentally impacted from prescribed fire. Watershed indicators for the East Fork of John Day Creek such as an ECA of 22 percent with the proposed action, an existing road density of 3.37 mi/mi^2, and an existing history of recent road failures and 13 debris torrents, point to high watershed risk for East Fork John Day with this proposal. Increase in ECA alone is not the only concern in East Fork John Day Creek. The cumulative effects of all watershed indicators, and the high percent of landslide prone area in the watershed show that increased activity in the watershed such as this prescribed burning proposal has the ability to have a negative effect on watershed condition.

The ECA increase with this proposal in not a concern in the Middle Fork and South Fork of John Day Creek due to low existing ECA percentages. There should be no detrimental affect from water yield in these watersheds

Table 4 - 8. Alternative E

Watershed Name	Total Area Acres	Existing ECA Acres	Existing ECA Percent	Post Fire ECA Acres	Post Fire ECA Percent	Total ECA Acres	Total ECA Percent
SF John Day	2503	0	0	48	2	48	2
MF John Day	3795	266	6	63	2	289	8
EF John Day	3624	724	20	14	0	738	20

Under alternative E, East Fork John Day Creek has the same concerns as the other action alternatives. Burning is not recommended under alternative E for East Fork Of John Day Creek. South Fork John Day Creek and Middle Fork John Day Creek will not have any detrimental effects from increased water yield.

Slate Creek Watershed

Alternative A-No Action

The effects for Alternative A would be the same as for Allison Creek.
(See page 4 - 121)

Table 4 - 9. Slate Creek ECA Percentages and Acres For Alternative B, C, and D

Watershed Name	Total Area	Existing ECA Acres	Existing ECA Percent	Post Fire ECA Acres	Post Fire ECA Percent	Total ECA Acres	Total ECA Percent
Van Buren Cr.	5273	251	5	12	<1	251	5
L. Van Buren	3612	270	8	71	2	341	10
Bear Gulch	1704	181	11	12	1	193	12
No Business Cr	1279	34	3	21	2	55	5
L. Main Slate	6088	198	3	8	1	206	4
Main Slate	10654	653	6	---	---	653	6

Alternative B, C, and D

The watersheds affected in the Slate Creek watershed are Van Buren Creek, Little Van Buren Creek, Bear Gulch, No Business Creek and Lower Slate Creek. The highest existing ECA is Bear Gulch at 12 percent, and Lower Van burn at 10 percent. The highest increase in ECA in the Slate Creek watershed is 2 percent. There will be no detrimental effect from water yield from the proposed burning in the Slate Creek watersheds.

Table 4 - 10. Alternative E

Watershed Name	Total Area Acres	Existing ECA Acres	Existing ECA Percent	Post Fire ECA Acres	Post Fire ECA Percent	Total ECA Acres	Total ECA Percent
L. Main Slate	6088	198	3	8	0	206	3
Bear Gulch	1704	181	11	3	0	184	11
L. Van Buren	3612	270	8	66	2	336	10
No Business	1279	34	3	21	2	55	5

The effects from increased water yield on the watersheds shown above is similar to alternatives B, C, and D, and there should be no detrimental effects to the watersheds by increased water yield.

Lower Salmon River West Watersheds: Sherwin Creek, China Creek, Cow Creek, Christie Creek

Alternative A-No Action

The effects for Alternative A would be the same as for Allison Creek.
(See page 4 - 121)

Table 4 - 11. Lower Salmon West ECA Acres and Percents for Alternative B, C and D

Watershed Name	Total Area (ac)	Existing ECA Acres	Existing ECA Percent	Post Fire ECA Acres	Post Fire ECA Percent	Total ECA Acres	Total ECA Percent
Christie Cr.	2651	132	5	32	1	164	6
Sherwin Cr.	3726	178	5	44	1	222	6
China Cr.	3070	345	11	28	1	373	12
Cow Cr.	6947	824	12	48	1	872	13
Rhett Cr.	461	45	10	3	1	48	11
Elfers Cr.	473	114	24	6	2	120	26
Clark Cr.	519	116	22	9	2	125	24
SR Face	1491	NA	NA	1	<1	NA	NA

Alternative B, C, and D

There should be no detrimental effects from water yield using ECA as an indicator on Christie Creek, Sherwin Creek, China Creek and Cow Creek. This burning proposal in Alternative B only increases the ECA 1 percent in these watersheds, if prescribed fires stay in prescription. When ECA is evaluated as a separate indicator, the percent shown in the table above shows proposed fire having a small effect on water yield. But other indicators for these small watersheds analyzed show that there is some concern when burning these watersheds. Road density is high to very high (3 -4 mi/mi²), and accelerated sediment is also high in Sherwin Creek and Cow Creek. Mitigation is discussed for Cow Creek and Sherwin Creek in the Sediment and Mitigation Sections.

ECA for Rhett Creek is at 10 percent and the proposed prescribed burn only increaser the ECA to 11 percent. Clark Creek and Elfers Creek already have high ECA's for small watersheds, 22 and 24 percent. The fire project only increases the ECA by 2 percent, but the existing conditions indicates that water yield is a concern.

Alternative E

Alternative E will have the same effect as alternative A, because no burning is proposed under alternative E in these watersheds.

Race Creek Watersheds

Alternative A - No Action

The effects for Alternative A would be the same as for Allison Creek.
(See page 4 - 121)

Table 4 - 12. Race Creek ECA Acres and Percents for Alternative B, C, and D

Watershed Name	Total Area (ac)	Existing ECA Acres	Existing ECA Percent	Post Fire ECA Acres	Post Fire ECA Percent	Total ECA Acres	Total ECA Percent
Kessler Cr.	2210	278	13	9	<1	287	13
SF Race Cr.	4343	195	4	29	1	224	5
WF Race Cr.	6795	894	13	26	1	920	14
SF Race Cr. Faces	643	NA	NA	0	0	NA	NA

Alternative B, C, and D

The proposal for the Race Creek watersheds is to burn 8900 acres in the 19,300 acre watershed. Existing ECAs in South Fork Race Creek are not a concern, and the proposed fire, which is mostly low intensity burning will raise the ECA 1 percent and should not have any detrimental effects on the watershed. Kessler Creek and West Fork Race Creek have had more past harvest that the South Fork, but the increase in ECA with the proposed burning will not increase the ECA of either watershed substantially. The proposed burning in Kessler Creek combined with effects from past roading (road density 3.5 mi/mi^2), and increase in sediment is a concern.

Table 4 - 13. Alternative E

Watershed Name	Total Area Acres	Existing ECA Acres	Existing ECA Percent	Post Fire ECA Acres	Post Fire ECA Percent	Total ECA Acres	Total ECA Percent
SF Race	4343	195	4	33	1	228	5

The only watershed with proposed burn acres for alternative E is South Fork Race Creek and there will be no detrimental effect on the watershed from increase in water yield.

Shingle Creek and Rapid Face Watersheds

Alternative A- No Action

The effects for Alternative A would be the same as for Allison Creek.
(See page 4 - 121)

Table 4 - 14. ECA Acres and Percents for Alternative B, C, and D

Watershed Name	Total Area (ac)	Existing ECA Acres	Existing ECA Percent	Post Fire ECA Acres	Post Fire ECA Percent	Total ECA Acres	Total ECA Percent
Shingle Cr.	7964	505	6	50	1	555	7
Rapid Face	66	NA	NA	0	0	NA	NA

Alternative B, C, and D

Riparian shade and large wood in streams zones is a concern, because riparian zones were harvested in past timber sales. This has affected riparian function and water storage which also effects water yield and timing of flows. Existing and proposed increases in ECA will not detrimentally effect water yield. Under alternatives B, C and D, water yield is not a concern for Shingle Creek and prescribed burning should not cause detrimental effects. Water yield will not be affected in the upper part of Rapid River because the proposed burning project does not affect that part of the watershed.

Table 4 - 15. ECA, Alternative E.

Watershed Name	Total Area Acres	Existing ECA Acres	Existing ECA Percent	Post Fire ECA Acres	Post Fire ECA Percent	Total ECA Acres	Total ECA Percent
Shingle Cr.	7964	505	6	28	0	533	6

Squaw and Papoose Watersheds

Alternative A - No Action

The effects for Alternative A would be the same as for Allison Creek. (See page 4 - 121)

Table 4 - 16. Squaw and Papoose ECA Acres and Percents for Alternative B, C, and D

Watershed Name	Total Area (ac)	Existing ECA Acres	Existing ECA Percent	Post Fire ECA Acres	Post Fire ECA Percent	Total ECA Acres	Total ECA Percent
Squaw Cr.	5236	236	5	22	<1	258	5
Papoose Cr.	3125	138	5	5	<1	143	5

Alternative B, C, and D

About 4700 acres of this 11,900 acre watershed is proposed for burning. Currently the ECA in Squaw Creek and Papoose Creek is very low, and the high percent of low intensity fire that is proposed raises the ECA only one percent. There should be no detrimental effect on water yield from proposed fire in these watersheds

Table 4 - 17. ECA, Alternative E

Watershed Name	Total Area Acres	Existing ECA Acres	Existing ECA Percent	Post Fire ECA Acres	Post Fire ECA Percent	Total ECA Acres	Total ECA Percent
Squaw Cr.	5236	236	5	6	0	242	5

Alternative E is the same as the other actions alternatives for Squaw Creek.

Mallard Creek Watershed

Alternative A - No Action

The effects for Alternative A would be the same as for Allison Creek. (See page 4 - 121)

Table 4 - 18. Mallard ECA Acres and Percents for Alternative B, C, and D

Watershed Name	Total Area (ac)	Existing ECA Acres	Existing ECA Percent	Post Fire ECA Acres	Post Fire ECA Percent	Total ECA Acres	Total ECA Percent
Lower Mallard Cr.	6672	304	5	61	<1	309	6

Alternative B, C, and D

There will be no effect on the Upper Mallard Creek Watersheds from burning in the Lower Mallard Creek watersheds. The increase in ECA is due to the high percent of low severity fire acres an this shows less that 1 percent increase in the Mallard Creek Watershed. There will be no detrimental effects to Lower Mallard Creek Watershed due to increase in water yield.

Table 4 - 19. ECA, Alternative E.

Watershed Name	Total Area Acres	Existing ECA Acres	Existing ECA Percent	Post Fire ECA Acres	Post Fire ECA Percent	Total ECA Acres	Total ECA Percent
L. Big Mallard	6672	304	5	93	2	397	7

Same effect as the other action alternatives.

Table 4 - 22 (page 4 - 132,133) compares the proposed burning alternatives by watershed for the indicator equivalent clear-cut acres. ECA is used as an indicator of the affect of burning on water yield.

PAYETTE- LITTLE SALMON RIVER WATERSHEDS

Boulder Creek Watershed

Alternative A-No Action

Boulder Creek watershed has been heavily managed in the past . Timber harvest , road building and grazing have had the most impact on upper Boulder Creek. These activities in addition to subdivision development and heavy recreation use have affected lower Boulder Creek. The proposed burn activities will take place in Upper Boulder Creek watershed. Burning in the upper watershed affects the condition of the lower watershed, so both watersheds are displayed in the table above. The existing condition in upper Boulder Creek is 18 percent ECA. The landtypes in upper Boulder Creek do not pose a risk of debris torrents or mass failure if a wildland fire should burn through the area. With the existing ECA of 18 percent, a stand replacing fire in Boulder Creek could increase water yield enough to raise peaks flows and increase in channel erosion. Under alternative A surface erosion could increase if a wildland fire occurs, but mass erosion risk is low.

Alternatives B, C, D and E

Alternatives B, C, D and E have about the same effect on the Upper Boulder Creek watershed raising the ECA about 2 percent to a total of 20 percent. When calculating the ECA for the total Boulder Creek watershed , the ECA increases from 14.5 to 15.3 percent with alternatives B, C, and D. The main concern in the Upper Boulder Creek watershed is the effect of the burn proposal on stream channels which have been impacted in the past from a combination of roading, grazing and harvest. A combination of mostly low and some moderate severity burning in Lower Boulder would not have a detrimental effect on water yield.

Table 4 - 20. Water Yield Analysis (ECA)

WATERSHED NAME	WS ac	EXISTING CONDITION ECA ac	EXISTING CONDITION RD ac	EXISTING CONDITION ECA	ALTB/D ECA ac	ALTB/D RD ac	ALTB/D TOT ECA	ALT C ECA ac	ALT C RD ac	ALT C TOT ECA	ALT E ECA ac	ALT E RD ac	ALT E TOT ECA
Lower Boulder	14003	1417.1	177.3	11.4%	0	0.00	11.4%	0.00	0.00	11.4%	0.00	0.00	11.4%
Upper Boulder	11100	1765.5	277.8	18.4%	199.3	0.00	20.2%	199.30	0.00	20.2%	114.00	0.00	19.4%
Boulder Total	25103	3182.63	455.1	14.5%	199.3	0	15.3%	199.3	0	15.3%	114	0	14.9%
Indian Creek	1734	0.0	38.9	2.2%	2.6	0.00	2.4%	2.60	0.00	2.4%	2.60	0.00	2.4%
Lockwood Creek	1924	0.0	1.2	0.1%	59.2	0.00	3.1%	59.20	0.00	3.1%	59.20	0.00	3.1%
Fall Creek	2474	0.0	10.5	0.4%	143.4	0.00	6.2%	143.40	0.00	6.2%	143.40	0.00	6.2%
Camp Creek	796	0.0	0.0	0.0%	17.2	0.00	2.2%	17.20	0.00	2.2%	17.20	0.00	2.2%
Partridge Creek	16809	0.0	0.0	0.0%	211.4	0.00	1.3%	211.40	0.00	1.3%	211.40	0.00	1.3%
Elkhorn Creek	14178	4604	106.5	33.2%	313.5	0.00	35.4%	313.50	0.00	35.4%	100.15	0.00	33.9%
Lower French	13523	2006.3	109.3	15.6%	155.5	0.00	16.8%	155.50	0.00	16.8%	115.90	0.00	16.5%
Middle French	7845	1868.0	2.0	23.8%	0	0.00	23.8%	0.00	0.00	23.8%	0.00	0.00	23.8%
Little French	12599	5054.3	31.3	40.4%	0	0.00	40.4%	0.00	0.00	40.4%	0.00	0.00	40.4%
Upper French	5404	740.0	0.0	13.7%	0	0.00	13.7%	0.00	0.00	13.7%	0.00	0.00	13.7%
Klip Creek	5943	0.0	0.0	0.0%	0	0.00	0.0%	0.00	0.00	0.0%	0.00	0.00	0.0%

Jackson Creek	4325	4.0	12.9	0.4%	0	0.00	0.4%	0.00	0.00	0.4%	0.00	0.00	0.4%
French Total	49639	9672.6	155.5	19.8%	155.5	0	20.1%	155.5	0	20.1%	115.9	0	20.0%
Carey Creek	6016	780.4	60.9	14.0%	116.4	0.00	15.9%	116.40	0.00	15.9%	64.50	0.00	15.1%
California Creek	16089	721.3	40.7	4.7%	147	0.00	5.6%	147.00	0.00	5.6%	147.00	0.00	5.6%
Maxwell Creek	6548	89.9	29.7	1.8%	11	0	2.0%	11.00	0.00	2.0%	11.00	0.00	2.0%
California Total	22637	811.2	70.4	3.9%	158	0	4.6%	158.00	0.00	4.6%	158.00	0.00	4.6%
Poly Creek	2320	0.0	0.0	0.0%	5.5	0.00	0.2%	0.40	0.00	0.0%	5.50	0.00	0.2%
Rabbit Creek	5593	0.0	0.0	0.0%	49.5	0.00	0.9%	23.50	0.00	0.4%	49.50	0.00	0.9%
Rugged Creek	1855	0.0	0.0	0.0%	30.4	0.00	1.6%	22.20	0.00	1.2%	30.40	0.00	1.6%
Cottontail Creek	4238	0.0	0.0	0.0%	40.5	0.00	1.0%	38.50	0.00	0.9%	40.50	0.00	1.0%
Fivemile Creek	18111	0.0	0.0	0.0%	24	0.00	0.1%	0.00	0.00	0.0%	24.00	0.00	0.1%
Little Fivemile Creek	5618	0.0	0.0	0.0%	55.4	0.00	1.0%	0.00	0.00	0.0%	55.40	0.00	1.0%
Lemhi Creek	8886	0.0	0.0	0.0%	127.8	0.00	1.4%	0.00	0.00	0.0%	127.80	0.00	1.4%
Trout Creek	8059	0.0	0.0	0.0%	142.6	0.00	1.8%	0.00	0.00	0.0%	142.60	0.00	1.8%
Little Trout Creek	1940	0.0	0.0	0.0%	108	0.00	5.6%	0.00	0.29	0.0%	108.00	0.00	5.6%

Indian Creek Watershed

Alternative A - No Action

Without wildland fire, Indian Creek stream channels would continue to recover from past debris torrents during floods. Fuels would continue to accumulate, increasing the chance of stand replacing fire.

Alternatives B, C, D, E

There should be no detrimental effect on water yield with all action alternatives. Proposed burning could increase sediment in riparian zones that are heavily roaded, and this will be discussed under the sediment section.

Lockwood Creek Watershed

Alternative A-No Action

Without prescribed burning, Lockwood Creek will continue to accumulate fuels and wildland fire may occur. If a large percentage of stands were burned in a stand replacing fire, water yield could increase, causing higher peak flows, increased in channel erosion, and increasing the chance of inchannel debris torrents.

Alternatives B, C, D, and E

The existing condition ECA for Lockwood Creek is 0.1 percent. All action alternative have the same effect on Lockwood Creek, raising the ECA to 3.1 percent. This 3 percent ECA increase should have no detrimental affect increase in water yield on Lockwood Creek for all action alternatives.

Fall Creek Watershed

Alternative A-No Action

Effects would be the same as Lockwood Creek, above.

Alternatives B, C, D, and E

The existing condition ECA of Fall Creek watershed is 0.4 percent. Al l alternatives raise the ECA to 6.2 percent. All alternatives burn over 80 percent of the watershed. The ECA increase is the same for all action alternatives and will not cause a detrimental increase in water yield, but the broad scope of burning across the watershed may be of concern for cumulative effects. These are discussed later in this section. Mitigation for Fall Creek will be discussed in the sediment section.

Camp Creek

Alternative A-No Action

Effects would be the same as Lockwood Creek. See above, page 90.

Alternatives B, C, D, and E

Camp Creek is a small, mostly unmanaged watershed, with an existing ECA percent of zero. The proposed burn has the same effect on all action alternatives, raising the ECA to 2.2 percent. There will be no detrimental effect from increase in water yield for the action alternatives.

PAYETTE- LOWER MAIN SALMON RIVER WATERSHEDS

Partridge Creek Watershed

Alternative A-No Action

Same as Camp Creek with increase of wildland fire risk, If fire does not occur, Partridge Creek stands will continue to recover from recent wildland fire and water yield will continue to decrease.

Alternatives B, C, D, and E

Most of the proposed burning in Partridge Creek is in the Lower Partridge Creek watershed, with just 200 acres proposed in the upper watershed. The ECA was calculated for the total watershed which includes the upper and lower watershed. Partridge Creek is largely unroaded and unmanaged, but fires in 1989 raised the ECA to 5 percent. This has recovered to the existing ECA of 0 percent. The proposed burn will raise the ECA to 1.3 percent for all action alternatives. There will be no detrimental effect for increase in water yield from the proposed burn project.

Elkhorn Creek Watershed

Alternative A-No Action

Elkhorn Creek watershed has an existing ECA of 33 percent. This is attributed to timber harvest, wildland fire and road building. Without prescribed burning the stands in this watershed would continue to recover, and water yield would continue to decrease toward more natural levels.

Alternatives B, C, D, and E

Elkhorn Creek watershed has an existing ECA of 33 percent. This is attributed to timber harvest, wildland fire and road building. Elkhorn Creek is a 14,178 acres watershed with around 5000 acres of burning proposed, all of the burning occurring in the Fall. A large percent of the burning proposed is low and moderate severity burning. The ECA increase is

highest at 35.4 percent with the proposed burning in alternatives B, D, and E. These alternatives have the most effect on the watershed of all of the action alternatives. The proposed burning in itself is not detrimental when considering risk of increased water yield effects in the watershed. The existing condition due to the high level of recent management activity and wildland fire, already put the watershed at risk. If other indicators such as sediment and channel condition combine to show poor watershed condition, then the proposed action could be detrimental for the watershed.

French Creek Watershed

No Action-Alternative A

French Creek watershed has an existing ECA of 15.6 percent. This is attributed to timber harvest, wildland fire and road building. Without prescribed burning the stands in this watershed would continue to recover, and water yield would continue to decrease toward more natural levels. French Creek also has a history of several past large wildland fires, so without reducing fuels in some areas where fires have occurred in the past, the risk of increasing ECA could occur with more stand replacing wildland fire.

Alternatives B, C, D, and E

The French Creek watershed is a large watershed , with several subwatersheds that are within French Creek as shown in the table above. All subwatersheds for French Creek were modeled for ECA to determine cumulative effects of the burn on the watershed. The proposed burn affects the Lower French Creek watershed only, with a burn proposal of around 3700 acres. All action alternatives have about the same effect on the watershed, raising the ECA 1 percent. The current ECA for Lower French Creek is 15.6 percent, with the action alternatives raising it to 16.8 percent. Past activity in the Lower French Creek watershed such as recent wildland fire, timber harvest, and roads have affected riparian vegetation.

PAYETTE- MIDDLE SALMON RIVER WATERSHEDS

Carey Creek Watershed

No Action-Alternative A

Carey Creek watershed has an existing ECA of 14 percent. This is attributed to timber harvest, wildland fire and road building. Without prescribed burning the stands in this watershed would continue to recover, and water yield would continue to decrease toward more natural levels. Carey Creek also has a history of several past wildland fires, so without reducing fuels in some areas where fires have occurred in the past, the risk of increasing ECA could occur with more stand removal.

Alternatives B, C, D, and E

Carey Creek has had recent timber harvest and roading. Alternatives B, C, and D raise the ECA about 2 percent to approximately 16 percent. These alternatives have the most effect

on Carey Creek. These alternatives also produce a large increase in sediment. An increase in sediment in combination with water yield may pose a high hydrologic risk for Carey Creek.

California Creek and Maxwell Creek Watersheds

No Action-Alternative A

Without prescribed burning the stands in this watershed would mature, and water yield would continue to stay at natural levels. California Creek also has a history of some wildland fire. Without reducing fuels in some areas, the chance of stand replacing fire is greatly increased, along with the chance of increased water yield as large acreages of stands in the watershed are consumed by fire.

Alternatives B, C, D, and E

This watershed has no history of timber harvest, has a low road density, and has had only around 700 acres of wildland fire impact in the recent past. All action alternatives have the same effect, raising the ECA to 5.6 percent. There will be no detrimental effect with any of the action alternatives on increases in water yield.

Maxwell Creek watershed is largely unmanaged and the ECA will raise less than 1 percent with the action alternatives. There will be no detrimental affect from increase in water yield from any of the action alternatives in Maxwell Creek.

Cottontail Creek, Polly Creek, Rabbit Creek, Rugged Creek and Face Watersheds

No Action-Alternative A

Without prescribed burning the stands in this watershed would mature, and water yield would continue to stay at natural levels. Without reducing fuels, the chance of stand replacing fire is can be greatly increased, along with the chance of increased water yield as large acreages of the watershed are consumed by fire.

Alternatives B, C, D, and E

These are small watersheds that have not had any timber harvest or road construction. Some wildland fire has occurred on a small scale in all 3 watersheds in the past 20 years, but not enough to affect water yield. Existing ECA is less that 1 percent for all 3 watersheds, and the proposed burn in these watersheds raised the ECA less than 2 percent. There should be no detrimental effect from increase in water yield in these watershed for any of the action alternatives.

WILDERNESS SECTION SALMON RIVER

Fivemile Creek Watershed

No Action-Alternative A

See Cottontail Creek.

Alternatives B, C, D, and E

Fivemile Creek burned during the Chicken Fire in 1994 with the ECA being 14 percent of the watershed. This ECA has recovered to less than 1 percent in 1999. About 1500 acres are proposed to be burned in the watershed , the ECA will be increased less that 1 percent for all the actions alternatives. There will be not detrimental increase in water yield for Fivemile watershed.

Little Fivemile Creek, Lemhi Creek, and Trout Creek

No Action-Alternative A

Same as Fivemile Creek.

Alternatives B, C, D, and E

All of these watersheds have burned in the past 10 years and had ECA percents as high as 5 percent. These watersheds have recovered at the existing time to where ECA is less that 1 percent. The proposed burns for all action alternatives show an ECA increase of less than 2 percent, which indicates no detrimental effect on water yield in these watersheds.

Little Trout Creek

No Action-Alternative A

Same as Fivemile Creek

Alternatives B, C, D, and E

Little Trout Creek is a small watershed of 1940 acres. The action alternatives propose to burn almost the whole watershed. Little Trout Creek has highly erodible steep breakland landtypes. The ECA is presently 0 percent and will be increased to 5 percent. Even though the burn is extensive in the watershed, most of the planned burn will be low and moderate severity and will kill less that 15 percent of the total crown canopy. In this case the extent of the burn spatially and temporally in the watershed is the concern, and the effect and amount of the surface erosion on the steep landtypes. This is reflected more in the BOISED modeling which models tons/year loss from surface erosion, than from ECA. Water yield itself is not the main concern in this watershed. The main concern is the extent of the burn in the watershed and the effect that the burn may have on surface and mass erosion. The increase in ECA, although only 5 percent could contribute to these effects. Alternatives B, D, and E increase the ECA to 5.6 percent, and this combined with a high sediment peak could increase the hydrologic risk in Little Trout Creek beyond acceptable levels. Refer to the Sediment and Cumulative Effects Section for mitigation for Little Trout Creek.

Water Yield Analysis For The Salmon- Challis Watersheds Using Percent Of Stands Less Than 30 Years Of Age As A Indicator Of Water Yield.

Hot Springs-Gant, Clear Creek, and Garden Creek Watersheds

Alternative A - No Action

Under alternative A water yield in the Hot Springs-Gant, Clear Creek and Garden Creek watersheds would stay the same and or improve over time as past wildland fire areas recover and stand ages increase . Percent of stands less than 30 years old in the watershed would stay the same. If fuels continue to accumulate and wildland fire occurs at high severity, water yields could increase for up to five years if a high proportion of stands are burned in the watershed. If a high severity fire occurs and a high intensity rainstorm follows, overland flow could quickly deliver water and sediment to the lower slopes and will eventually be delivered to stream channels increasing water yields, peak flows and in channel erosion. These are also the conditions that happen naturally and are part of the natural climatic and fire cycle in the Salmon River Canyon. High severity and intensity fire can accelerate the process.

Alternative B, C, and D

The existing condition of this watershed is almost near natural condition with most of the watershed designated as wilderness. Percent of stands in the watershed that are 30 years or less in the watershed is 1 or 2 percent. Assuming that 15 percent of the moderate intensity burn acres are stand replacing, 62 acres of stands less that 30 years would be added with the proposed burn. Less than one percent of the watershed would be added to the stands acres less than 30 years of age in the watershed, which puts the total percent of watershed in stands less than 30 years less than 2 percent for the Hot Springs-Gant watershed for alternative B, C, and D.

Clear Creek and Garden Creek watersheds are mostly wilderness watersheds with very little history of past management. There will be 190 acres of stand mortality in Clear Creek/Garden Creek watershed from the proposed burn project in alternative B and D, and 22 acres in alternative C. None of the alternatives will increase the percent of stands less than 30 years of age more than 2 percent within the composite watershed. This mortality will be distributed in a mosaic within the prescribed burn area with low and unburned areas. This distributes the effect of hydrophobic soils over a small area and retains ground cover dispersed throughout the burn to protect soil from erosion. There will be no detrimental increase in water yield from any of the action alternatives.

Alternative B has the highest impact on the Clear Creek and Garden Creek watersheds.

Alternative E

.Under alternative E, Hot Springs-Gant watershed will have 89 acres of stand removed in a mosaic across the prescribed burn. This will raise the percent of the watershed in stands less than 30 years of less than 1 percent. The greatest portion of the burn is low intensity with no stand mortality. Under alternative E the Clear Creek and Garden Creek watersheds will have

189 acres of stand mortality which is an increase of less than 2 percent. There should be no detrimental effects from the proposed burn under alternative E from increased water yield effects. Alternative E has the highest impact on the Clear Creek and Garden Creek watersheds of all of the action alternatives.

Colson Creek and Face Watersheds Shell-Long Tom

Alternative A - No Action

Under alternative A water yield in the Colson Creek watershed would stay the same and or improve over time as past wildland fire areas recover and stand ages increase . Reduction of sediment and lowering of hydrologic risk by letting stands recover is the preferred action for these watersheds. Alternative A is the best alternative for Long Tom and Ebenezer Creek.

Alternative B and D

If it is assumed that there is 15 percent mortality in the stands if they are burned at moderate intensity, and 20 percent stand mortality at severe intensities, then 153 acres of the stand would be converted to stands less than 30 years old. This would be located in a mosaic pattern with unburned and low intensity crossed the burn polygon. This would be an increase of less than one percent of the stands less that 30 years in the watershed. The existing condition of Colson Creek is 1.3 percent of the watershed in stands less than 30 years, and the Shell/Lake Watershed is only 10.8 percent. The proposed burn should not have any detrimental effect on these watersheds.

Long Tom Creek and Ebenezer Creek are watersheds that were identified by the Salmon National Forest Hydrologist as watersheds with high hydrologic risk due to the condition from recent wildland fire. Ebenezer Creek has 90 percent of the stands less than 30 years of age in the watershed and it is located in the high intensity storm track. Long Tom Creek is in the same condition.

Alternative C and E

With alternative C, there will be an increase of 81 acres of stand mortality which is less than 1 percent of the watersheds. This will increase the percent of the watershed in stands less than 30 years by 1 percent. There would be no detrimental impact due to increase in water yield on the watershed condition due to prescribed burning in Colson and Shell Creek.

Corn Creek and Fountain Creek Watersheds

Alternative A - No Action

The effects would be the same as under Hot Springs-Gant, (pg. 4 - 122)

Alternative B, C, D, and E

With the assumption there is 15 percent stand mortality if stands are burned at moderate intensity, and 20 percent stand mortality at severe intensity, then 156 acres of the stand

would be converted to stands less than 30 years of age within the watershed. This would be located in a mosaic pattern with unburned and low intensity fire crossed the burn polygon. This would be an increase in less than one total percent of stands less that 30 years over the watersheds. The existing condition of the Corn-Fountain watershed is 6 percent of the watershed in stands less than 30 years. The proposed burn should not have any detrimental effect on increased water yield in these watersheds. All of the action alternatives have a similar effect on the watershed.

Indian Creek Watershed

Alternative A-No Action

The effects would be the same as under Hot Springs-Gant (pg 4 - 122)

Alternatives B, C, and D

The existing condition of Indian Creek for percent of watershed in stands less than 30 of age years is 4.8 percent. For alternatives B, C, and D, this will increase less than 1 percent due to the high percent of the burn falling in the low intensity category. The prescribed burn should not be detrimental to the watershed, but some mitigation should occur along main Indian Creek. Due to the narrowing effect of the Indian Creek road on the riparian zone and loss of shade and large woody debris sources during the channel changes in the 1997, mitigation is recommended in the riparian zone. Mitigation recommended will be designed to control intensity of fire and percent crown removal in the riparian zone.

Alternative E

Alternative E would be the same as Alternative A, because there is no proposed burning under this alternative.

Owl Creek Watershed

Alternative A-No Action

Under alternative A, Owl Creek, which has 49 percent of the watershed in stands less than 30 years, would continue to recover as stands regenerate and recover. The percent fine sediment in the stream would decrease further as it has since the Long Tom Fire, continuing with current improving trends over time in reduction of fine sediment in substrates.

Alternative B, C and D

There would be around 1900 acres of low intensity burning and 163 acres of moderate intensity burning under these alternatives. This would increase the percent of stands in the watershed under 30 years of age 25 acres which is about one percent. When evaluating the impact of the prescribed burn, the proposed action would not be detrimental to a watershed in good condition, but Owl Creek already has 49 percent of the stands less than 30 years of age due to the Long Tom Fire. Referring to the sediment analysis, the percent fine sediment in

substrates is also high, and does not meet Forest Plan standards at most of the monitoring stations.

Alternative E

Alternative E would be the same as Alternative A, because there is no proposed burning under this alternative.

Pine Creek Watershed

Alternative A-No Action

The effects would be the same as under *Hot-Springs-Gant (pg. 4 - 122).*

Alternatives B, C and D

There will be 5,518 acres of low intensity burning, 414 acres of moderate intensity burning, and 20 acres of high intensity burning, resulting in 173 acres of stand removed. This increases the stands less than 30 years by 173 acres, less than one percent of the watershed. The existing condition of Pine Creek is 3.5 percent of the stands in the watershed less than 30 years. This is a low percent of the watershed, and the prescribed burn increases it by less than 1 percent, so there should be no detrimental effect on increase in water yield from the watershed from these alternatives.

Sawmill and Virginia Gulch have sensitive landtypes with high inherent erosion. They are located in the high intensity storm track of the Salmon River Canyon. The sensitivity of these areas was discussed in personal communication with the Salmon National Forest Hydrologist. These areas tend to have frequent debris torrents after burning.

Alternative E

Under alternative E, there will be 1630 acres of low intensity fire, and 244 acres of moderate intensity fire. This will increase the percent of stands in the watershed less than 30 years of age by less than one percent. There will be no detrimental impact due to increase in water yield. This alternative has the least impact of the action alternatives.

Spring Creek Watershed

Alternative A-No Action

The effects would be the same as under Hot Springs-Gant (pg. 4 - 122).

Alternatives B, C, and D

There will be 8, 856 acres of low intensity burning, 414 acres of moderate intensity burning and 9 acres of high intensity burning. This will increase the percent of stands in the watershed by 65 acres. This will increase stands less than 30 years in the watershed from 1809 acres to 1874 acres and increase percent of stands less than 30 years from 11 to 12 percent.

There will be no detrimental effect on the Spring Creek watershed from the proposed burn, with the following mitigation.

Alternative E

Alternative E would be the same as Alternative A, because there is no proposed burning under this alternative.

DIRECT AND INDIRECT EFFECTS

Sediment and Turbidity

Sediment and turbidity are perhaps the most significant water quality responses associated with fire. Turbidity is an optical property of a water quality sample and is associated, and increases with suspended sediment. An increase in sediment can degrade water quality and have a detrimental affect on aquatic organisms (Beschta, 1990). The effect of fire on sediment yields depends on the overall condition of the watershed. Past activities such as roading, timber harvest, and grazing can be responsible for the poor condition of a watershed. The watersheds in the Salmon River Canyon Prescribed Fire analysis vary widely in watershed condition from highly managed to wilderness where human disturbance is minimal, except for fire suppression.

The overall condition of the watersheds is estimated using indicators such as road density, sediment, Equivalent Clear-cut Area, streambank and channel stability. A discussion of Water Quality Limited Segments (WQLS) is included in the watershed discussion. The main Salmon River from Corn Creek to Wind River, the Little Salmon River from the headwaters to Round Valley Creek, and from Round Valley Creek to the confluence with the main Salmon River, are WQLS. Individual streams are also WQLS and this is included in the Chapter 3 discussion. The main contaminate of concern on streams and rivers in the analysis area is sediment. Within this analysis area, three Forest Plans vary in their interpretation on Standards and Guidelines for sediment. The Nez Perce Forest Plan applies Standards in Appendix A of the Forest Plan that includes percent over natural sediment allowed per watershed with frequency of entry allowed per decade. This only includes surface sediment, not sediment from mass wasting. This surface sediment is modeled in the NEZSED sediment model . The existing condition of sediment modeled with NEZSED includes the effects of past activities in the watershed. The Payette Forest models accelerated sediment using the BOISED model. BOISED is a predictive model used to aid in assessing cumulative sediment yields from road construction and use, silvicultural activities and fire. BOISED models both surface and mass erosion, thus sediment peaks modeled in BOISED are often much higher than sediment peaks modeled in NEZSED. The Payette Forest Plan does not have Forest Plan Standards for percent over natural sediment for each watershed. The BOISED model will also be used in the Cumulative Effects Section to estimate how much activity sediment is routed to the Main Salmon River and the Little Salmon River at specific routed reaches. The Salmon-Challis uses a Standard for percent of fine sediment in stream substrates, with a standard for anadromous fish and resident fish. This is measured and monitored with core samples in the stream to detect percent "depth fines". The goal for the Forest Plan Standard on the Salmon Challis Forest for anadromous fish is less that 20 percent fine sediment and for resident fish less that 29 percent fine sediment.

When the terrain is steep and hot burns occur, substantial increases in sediment yield can occur. This happens as infiltration decreases, interception and evapotranspiration decrease, and overland flow increases due to inability of soil to store water and loss of infiltration. Sediment is carried as suspended sediment in streams during overland flow, and sediment increases as higher than normal peak flow increase in-channel erosion. Mass wasting, such as an increase in debris torrents on steep slopes after fire also increase sediment.

Prescribed fire under controlled conditions can prevent most of the affects of high intensity, high severity fires as described above. Prescribed fire helps retain the forest canopy, thus reducing the effects of lost interception and evapotranspiration. Soil infiltration is retained due to cooler burns preventing hydrophobic soils and increase in bulk densities. A mosaic of conditions are found on the forest floor which help protect the soil surface from raindrop erosion and retain the water storage capacity of the soil.

Sediment Analysis for the Nez Perce Watersheds

Allison Creek, Van Creek, Kelly Creek, Robbins Creek, Face Drainages-Smith Canyon Creek, Gasper Creek, Flock Creek, Chamberlain Creek and Spring Creek

Alternative A - No Action

Currently all watersheds above are within Forest Plan Standards for Appendix A of the Nez Perce Forest Plan for percent sediment over natural. Under Alternative A conditions for sediment would remain the same or continue to decrease over time to more natural conditions. If fuels continue to accumulate and uncontrolled wildland fire occurs, acceleration of overland flow could occur which would increase the rate of surface sediment. If a high intensity rainstorm occurs after a high severity fire and surface soils are exposed and hydrophobic, runoff increases and pulses of sediment can occur if debris torrents become a result of in-channel failure.

Table 4 - 21. Percent Over Natural Sediment for Alternative B, C, and D - from 1998 - 2007

Watershed	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
Allison Cr.	12	13	12	12	32	16	13	12	12	12
Crawford Cr.	15	14	14	36	19	15	14	14	14	14
Van Cr.	2	2	2	2	2	41	11	4	3	2
Kelly Cr.	7	7	7	7	7	52	17	9	8	7
Robbins Cr.	6	6	6	6	6	52	16	8	6	6
Smith Cr.	0	0	0	0	0	26	6	2	1	0
Gasper Cr.	1	1	1	1	1	21	5	2	1	1
Flock Cr.	0	0	0	0	0	48	11	2	1	0
Chamberlain G.	0	0	0	0	0	34	8	2	1	0
Spring Cr.	0	0	0	0	0	18	4	1	0	0
Face	1	1	1	1	1	13	3	1	1	1
Sheep Gulch	0	0	0	18	4	1	0	0	0	0
Wet Gulch	0	0	0	27	6	1	0	0	0	0

Alternative B, C, and D

Allison Creek is the largest watershed in this group and it has the most restrictive standard for percent sediment over base and entries per decade. This is due to a high Fish/Water Quality Objective and the importance of the watershed in supporting the anadromous fishery. Allison Creek has not gone above the 45 percent Forest Plan Standard in the past decade, as documented for the Chinook Biological Assessment. This proposed action does not move the watershed above this 45 percent. Allison Creek is WQLS for sediment and is of special concern on the forest due to history of heavy timber harvest, roads and harvest in riparian areas, debris torrents and grazing in riparian zones.

Kelly Creek and Robbins Creek are not above the Forest Plan Standard for percent over natural sediment or entries per decade, but the peak sediment year is high, 52 percent over natural with the proposed action. This alone probably would not be a big concern because peak sediment would decrease within a couple of years. Existing condition is a concern for Kelly Creek and Robbins Creek due to past human activities in these watersheds. The headwater portions of these small watersheds have high road density, recent burning in Robbins Creek and heavy harvest and roading in riparian areas in Kelly Creek. As shown on the table, the sediment peaks decreases very fast within two years. Staged burning in alternative years with at least a year between burns will allow for vegetation recovery which would filter sediment movement into the streams and reduce the risk of a high sediment peak in one year. Prescribed burning is beneficial to the watershed in lowering risk of high severity wildland fire and there should be no detrimental effect with mitigation.

When evaluating small watersheds less that two square miles such as Flock Creek, Chamberlain Creek, and others, results from NEZSED must be interpreted with caution. Due to the small drainage area, relatively small amounts of activities can give high percent over natural sediment yields. Each situation should be evaluated individually. Van Creek and Flock Creek have higher peaks than most of the small watersheds, but sediment decreases within a couple years, and past activities in these watersheds show a high activity of past management, but no watershed problems of special concern. There should be no long-term detrimental effects with the proposed prescribed fire. Alternatives B, C, and D have about the same effect on watershed condition.

Alternative E

Table 4 - 22. Percent Over Natural Sediment for Alternative E - from 1998 - 2007

Watershed	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
Allison Cr.	12	13	12	12	12	12	19	13	12	12
WF Allison Cr.	4	4	4	4	4	4	4	4	4	4
Sheep Gulch	0	0	0	26	6	1	0	0	0	0
Wet Gulch	0	0	0	0	0	0	27	6	1	0

Alternative E burns only areas in the proposed action that are wilderness or roadless areas and this involves a lot less watersheds when compared to the proposed action, so Alternative E has a lower risk of increasing sediment than Alternative B. All of the watersheds in Alternative E are within standards for Appendix A of the Nez Perce Forest Plan. Allison Creek drops from a peak of 32 percent over natural sediment in Alternative B to a peak of 19 percent in alternative E. Wet Gulch remains the same for both Alternatives, and Sheep Gulch increases from 1 8 to 26 percent.

Lower Bargamin Creek, Lower Crooked Creek, Upper Indian Creek, Lower Indian Creek, Moccasin Creek, Cougar Creek, Rattlesnake Creek, and Unnamed Salmon River Face Watersheds

Alternative A-No Action

See Allison Creek.

Alternatives B, C, and D

Base sediment rates are shown for all watersheds in Chapter 3 except for Bargamin and Crooked Creek. All watersheds show zero percent harvest, because much of the area is roadless or designated wilderness. Lower Bargamin and Crooked Creek have a history of recent wildland fire, along with smaller wildland fires in the other small watersheds. The NEZSED sediment model is not available due to lack of database to model activity sediment generated by the proposed prescribed fire projects in these watersheds. Because existing human caused sediment in these watersheds is low, and sediment generated by wildland fire was 8 to 10 years ago, sediment rates are assumed to have dropped almost back to normal, except areas that burned with high severity and areas where the debris torrents occurred in Crooked Creek. These three alternatives will have about the same effect on the watershed. The mitigation identified in Chapter Two will maintain the watersheds within Forest Plan standards for sediment.

Alternative E

The affects of the prescribed burn project will be similar to alternative B, with a few acres that may be dropped outside of wilderness. The mitigation identified in Chapter Two will maintain the watershed within Forest Plan standards for sediment.

Fiddle Creek Watershed

Alternative A-No Action

The Fiddle Creek watershed is already a watershed with indicators that point toward poor watershed condition. The ECA is currently 19 percent, road density is 4 mi/sq. mi., failures on the road systems are common, stream channels in some reaches are in poor condition, and a high percentage of the watershed has high landslide prone landtypes. This condition is currently improving due to rehabilitation of roads with obliteration and recovering stream crossings. This will reduce erosion in streams and will help reduce road density. Forest stands

are regenerated and as they mature the ECA percent will decrease. Both of these factors will help reduce sediment in the stream channels.

Alternative B, C, and D

About 300 acres are proposed for these three alternatives. This will have very little effect. Currently the Fiddle Creek watershed is at 8 percent over natural sediment and is well within the Forest plan Standard of 60 percent. The area that will be burned is on BLM land and is below the Forest boundary, so it was not modeled in NEZSED. The area to be burned is so small that it would not improve or degrade the watershed condition.

Alternative E

Alternative E proposes no burning in Fiddle Creek watershed, so the effect is the same as Alternative A.

John Day Creek Watershed

Alternative A - No Action

See Allison Creek.

Table 4 - 23. Percent Over Natural Sediment for Alternative B, C, and D - from 1998 - 2007

Watershed	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
EF John Day	6	6	6	50	15	8	6	6	6	6
MF John Day	4	4	4	28	9	5	4	4	4	4
SF John Day	0	0	0	26	6	1	0	0	0	0

Alternatives B, C, and D

All of the watersheds are within standards in Appendix A of the Nez Perce Forest Plan for percent sediment over base and number of entries per decade (refer to Chapter 3). South Fork John Day Creek is roadless and has had very little timber harvest. The sediment increase from the proposed prescribed burn should not produce levels of sediment that are above the Forest Plan standards to the South Fork of John Day Creek. The Middle Fork of John Day Creek has timber harvest, roading history, and some history of failures. Other indicators such as a low ECA percent, moderate road density, and sediment estimates with NEZSED show that impacts to streams will be within the parameters set by the Forest Plan standards with the proposed burn. East Fork John Day Creek has a fairly high sediment peak when modeled in NEZSED.

Alternative E

Table 4 - 24. Percent over Natural Sediment for Alternative E - from 1998 - 2007

Watershed	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
EF John Day	6	6	6	27	10	7	6	6	6	6
MF John Day	4	4	4	13	6	4	4	4	4	4
SF John Day	0	0	0	0	0	0	25	6	1	0

All of the watersheds in the John Day 6th code HUC have less of an increase in percent sediment over natural than Alternative B. All of the prescription watersheds are within the Forest Plan guidelines for Alternative A. Alternative E will not have any detrimental effects from increase in sediment.

Slate Creek Watersheds

Alternative A- No Action

See Allison Creek. (pg 121)

Alternative B, C, and D

Table 4 - 25. Percent over Natural Sediment for Alternative B, C, and D - from 1998 - 2007

Watershed	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
No Business	0	0	51	11	3	1	0	0	0	0
L. Van Buren	2	2	51	12	4	2	2	2	2	2
Bear Gulch	2	2	30	8	4	3	2	2	2	2
L. Main Slate	4	4	10	5	4	4	4	4	4	4

Under Alternative B, C, and D, Little Van Buren exceeds standards in Appendix A of the Nez Perce Forest Plan by 11 percent. The percent over natural sediment guidelines is 40 percent. It does not exceed Appendix A of the Nez Perce Forest Plan for the number of entries per decade. The sediment peak is high and burning as stated in the proposed action may increase the risk of sediment delivery to streams. Burning on year 1 and year 3 would reduce the effect on the watershed and reduce the risk of a high sediment peak in one year. Prescribed burning is beneficial to the watershed in lowering risk of high severity wildland fire and there should be no detrimental effect with mitigation.

Lower Slate Creek and Bear Gulch are within standards in Appendix A of the Nez Perce Forest Plan and burning should cause no detrimental effects from increase in sediment.

Table 4 - 26. Percent over natural Sediment for Alternative E - from 1998 -2007

Watershed	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
No Business	0	0	51	11	3	1	0	0	0	0
L. Van Buren	2	2	48	12	4	2	2	2	2	2
Bear Gulch	2	2	10	4	3	2	2	2	2	2
L. Main Slate	4	4	10	5	4	4	4	4	4	4

Under Alternative E, Little Van Buren exceeds standards in Appendix A of the Nez Perce Forest Plan by 8 percent. The percent over natural sediment guidelines is 40 percent. It does not exceed Appendix A of the Nez Perce Forest Plan for the number of entries per decade. Lower Slate Creek and Bear Gulch are within standards in Appendix A of the Nez Perce Forest Plan and burning should cause no detrimental effects. Percent sediment over base of 30 percent in the Bear Gulch watershed discourses in the peak year of 2000 to 10 percent in Alternative E.

Nez Perce Lower Salmon River Watersheds

Alternative A - No Action

See Allison Creek.

Table 4 - 27. Percent over natural Sediment for Alternative B, C, and D - from 1998 - 2007

Watershed	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
Christie Cr.	1	1	1	1	1	1	59	14	4	2
Sherwin Cr.	1	1	1	1	1	1	70	16	4	2
China Cr.	1	1	1	1	1	1	57	13	4	2
Cow Cr.	3	3	3	3	44	12	5	3	3	3
Rhett Cr.	3	3	3	3	3	3	42	11	4	3
Elfers Cr.	1	1	1	1	1	39	9	3	1	1
Clark Cr.	11	11	11	11	11	77	25	14	12	11
SR Face	1	1	1	1	11	13	3	1	1	1

Alternative B, C, and D

China Creek and Christie Creek meet Appendix A of the Nez Perce Forest Plan standards for percent over natural of 60 percent, but only by a couple percent. China Creek at 57, and Christie Creek at 59 percent still show high peaks generated by proposed burning. Sherwin Creek exceeds the 60 percent objective for its peak year of 2004 at 70 percent over natural sediment. The peak sediment year for Cow Creek is in the year 2002 at 44 percent. This is within the 45 percent objective, but is still high enough to be a concern for Cumulative Effects. Sherwin Creek, China Creek and Cow Creek are expressed as watersheds of concern under the water yield section due to past impacts from roading , harvesting and grazing. As shown on the table, the sediment peaks decreases very fast in China Creek, Cow

Creek and Christies Creek, within two years. Burning on year 1 and year 3 would reduce the effect on the watershed and reduce the risk of a high sediment peak in one year. Prescribed burning is beneficial to the watershed in lowering risk of high severity wildland fire and there should be no detrimental effect with mitigation.

Rhett Creek, Elfers Creek and the Face watersheds show moderate peaks, and Clark Creek shows a very high peak. When evaluating small watersheds less than two square miles such as such Clark, Rete, Elvers and the Face watershed, results from NEZSED must be interpreted with caution. Due to the small drainage area, relatively small amounts of activities can give high percent over natural sediment yields. Each situation should be evaluated individually. Rhett and the Face watersheds have higher peaks than most of the small watersheds, but sediment decreases within a couple years, and past activities in these watersheds show a high amount of past management, but no watershed problems of special concern. Clark Creek and Elfers Creek have high ECA's, high road densities and moderate to high percent over natural sediment.

Alternative E -There is no proposed burning with this Alternative, so the effects are the same as Alternative A.

Mallard Creek Watershed

Alternative A - No Action

Under Alternative A conditions for sediment would remain the same or continue to decrease over time to more natural conditions. These watersheds have very little human caused disturbance, so most sediment generated is from natural disturbance such as wildland fire and floods. During the Ladder Creek Fire, Lower Mallard Creek had 1735 acres burned, which equaled 300 ECA acres. This included moderate and high severity areas. This burned area will continue to recover with sediment decreasing toward near natural levels.

Alternative B, C, and D

Table 4 - 28. Percent over natural Sediment for Alternatives B, C, And D - from 1998 - 2007

Watershed	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
Lower Big Mallard Cr.	3	3	36	10	4	3	3	3	3	3

Big Mallard Creek is within the 60 percent sediment yield standards for Appendix A of the Nez Perce Forest Plan. These alternatives do not exceed percent sediment over base or number of entries per decade. Alternative D burns a few more acres, but the sediment generated is similar, so it was not modeled separately. There should be not detrimental effects from increases in sediment for lower Big Mallard Creek.

Alternative E

Table 4 - 29. Percent over natural Sediment for Alternative E - from 1998 - 2007

Watershed	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
Lower Big Mallard Cr.	3	3	3	13	5	3	3	3	3	3

Alternative E has less effect on the Lower Mallard Creek watershed than the other action alternatives. Mallard Creek percent over natural sediment is within Forest Plan standards for Appendix A of the Nez Perce Forest Plan. The levels of accelerated sediment modeled in the Lower Mallard Creek watershed in Alternative should have no detrimental effects on the watershed.

Race Creek Watershed

Alternative A - No Action

See Allison Creek.

Alternative B, C, and D

Table 4 - 30. Percent over natural Sediment for Alternative B, C, and D - from 1998 - 2007

Watershed	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
Kessler Cr.	1	1	1	1	47	11	3	1	1	1
SF Race Cr.	1	1	1	1	31	8	3	2	1	1
WF Race Cr.	2	2	2	2	31	8	3	2	2	2

South Fork Race Creek and West Fork Race Creek are within the standards of Appendix A of the Nez Perce Forest Plan of 45 percent over natural sediment . Kessler Creek does exceed the 45 percent guideline, but does not exceed entries per decade. As discussed in the water yield section, Kessler Creek has had heavy impacts from past roading, grazing and timber harvest. High sediment, a road density of 3.5 and ECA of 14 percent indicate that there is a concern that the Kessler watershed could be further degraded from the burn proposal. These alternatives will have a detrimental effect on Kessler Creek watershed. These alternatives have the most impact on watershed condition, especially Kessler Creek which exceeds the Forest Plan. Prescribed burning is beneficial to the watershed in lowering risk of high severity wildland fire and there should be no detrimental effect with mitigation.

Alternative E

Table 4 - 31. Percent over natural Sediment for Alternative E - from 1998 - 2007

Watershed	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
Kessler Cr.	1	1	1	1	30	8	3	2	1	1
SF Race Cr.	1	1	1	1	31	8	3	2	1	1
WF Race Cr.	2	2	2	2	31	8	3	2	2	2

South Fork Race Creek and Kessler Creek are the same as Alternatives B, C, and D, but Kessler Creek decreases from 47 percent over natural sediment to 30 percent over base sediment. Kessler Creek is within the standard of Appendix A of the Nez Perce Forest Plan for sediment with this Alternative. This alternative has less detrimental effects that the other action alternatives.

Shingle Creek Watershed

Alternative A - No Action

Currently Shingle Creek watershed is within standards for Appendix A of the Nez Perce Forest Plan for percent sediment over base. Under Alternative A, conditions for sediment would remain the same or continue to decrease over time to more natural conditions. If fuels continue to accumulate and uncontrolled wildland fire occurs, overland flow could occur which would increase the rate of surface sediment. If a high intensity rainstorm occurs after a high severity fire and surface soils are exposed and hydrophobic, runoff increases and pulses of sediment can occur if stream channel failures result in debris torrents.

Table 4 - 32. Percent over natural Sediment for Alternative B, C, and D - from 1998 - 2007

Watershed	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
Shingle Cr.	1	1	31	7	2	1	1	1	1	1

Alternative B, C, and D

Shingle Creek watershed is within the Forest Plan Appendix. A Guideline for percent over natural and number of entries per decade. The main concern for Shingle Creek is disturbance in riparian zones such as past harvest and roading. Discussion for mitigation should be referred to in the Water Yield Section of Chapter 4. There should be no detrimental effects on Shingle Creek due to increase in sediment. Sediment drops to almost prefire levels within 2 years. These alternatives produce the highest amount of accelerated sediment of all of the action alternatives.

Alternative E

Table 4 - 33. Percent over natural Sediment for Alternative E - from 1998 - 2007

Watershed	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
Shingle Cr.	1	1	1	1	14	4	1	1	1	1

Shingle Creek watershed is within the Forest Plan Appendix. A Guideline for percent over natural sediment and number of entries per decade. Percent over natural sediment dropped from 30 percent in B to 14 percent in the year 2002 in alternative E. The main concern for Shingle Creek is disturbance in riparian zones such as past harvest and roading. This alternatives will produce less accelerated surface sediment than the other action alternatives B, C, and D.

Squaw and Papoose Creek

Alternative A - No Action

See Allison Creek (pg. 121)

Table 4 - 34. Percent over Natural Sediment for Alternatives B, C, and D - from 1998 - 2007

Watershed	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
Squaw Cr.	0	0	0	17	4	1	0	0	0	0
Papoose Cr.	2	2	2	19	5	2	2	1	1	1

For alternatives B, C, and D, Squaw and Papoose are within Forest Plan Guidelines for sediment for percent over natural. There should not be any detrimental effects on the watersheds from increase in sediment over base. When estimating percent over natural sediment, Squaw Creek drops to 0 percent within 3 years and Papoose Creek drops back to prefire levels within 3 years.

Alternative E

Table 4 - 35. Percent over natural Sediment for Alternatives E - from 1998 - 2007

Watershed	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
Squaw Cr.	0	0	0	15	5	3	0	0	0	0
Papoose Cr.	2	2	2	8	3	2	2	1	1	1

For alternative E, Squaw and Papoose are within Forest Plan Guidelines for sediment for percent over natural. There should not be any detrimental effects on the watersheds from increase in sediment over base.

Sediment Analysis using BOISED for the Payette Watersheds

The BOISED sediment yield model (R1/R4 Sediment Yield Guide, USDA Forest Service, 1981) is used to predict sediment delivered from each watershed based on past harvest, roads and fire events. . This model estimates natural or base sediment yield from landtype-derived mass erosion ratings (Benson and Larson 1969; Potyondy et al 1991). The measure "percent over natural (% ON)" is the predicted amount of sediment from management activities that is above the natural level for each watershed. Many watersheds in the Salmon River Canyon have high natural erosion rates because of the granitic geology, soil depths and vegetation. . The average natural sediment yield ranges from 13 to 73 tons per square mile per year.

The BOISED sediment model estimates sediment from surface and mass erosion, where the NEZSED model only estimates surface erosion. Due to this the peaks in percent sediment over natural are higher than the peaks modeled in NEZSED. The results from the NEZSED and BOISED model cannot be compared because of this. The Geologic Erosion Coefficients for the geology types that are used in the model often vary for each National Forest that uses variations of the R1/R4 sediment model. Each model is calibrated for the geology types on the National Forest it is used on. BOISED numbers are not to be used as absolutes. The intent of BOISED is to use as a comparison between different management scenarios. For BOISED sediment results see the appendix, *section XX*.

PAYETTE- LITTLE SALMON RIVER WATERSHEDS

Boulder Creek Watershed

No Action-Alternative A

The existing condition of the Boulder Creek watershed is 6.2 percent over natural. Upper Boulder Creek has been intensively managed for timber harvest, grazing and roads.

Alternative B, C, D and E

Increases in percent over natural sediment for Boulder Creek are the highest for alternatives B, C, and D. Sediment increases from 6.2 for the existing condition to 11.7 for these

alternatives. This is not considered a large increase in percent over natural sediment and in general will not further degrade the watershed condition. Increase in accelerated sediment over the watershed is not a main concern in the Boulder Creek watershed, but affects on riparian vegetation in RHCAs is a concern because of high road densities and past effects from timber harvest and grazing. Alternatives B, C, and D have the most effect on Boulder Creek. The main tributaries that have been affected by timber harvest and grazing should have mitigation to control intensity of fire in the riparian zone and amount of crown removed.

Alternative E

Increase in percent over natural for Boulder Creek goes from an existing condition of 6.2 to a peak sediment year of 9.3. This increase is percent over natural will not be detrimental to the watershed. Alternative E has the least affect on Boulder Creek of all of the action alternatives.

Indian Creek Watershed

Alternative A-No Action

The percent over natural for Indian Creek is currently 19.2 percent. This will continue to decrease if prescribed burning does not take place and channels continue to recover from debris torrents. Indian Creek is a steep watershed and increase in fuels over time could result in a stand replacing fire increasing the risk of increased surface erosion and mass erosion in channels such as debris torrents.

Alternatives B, C, D, and E

Indian Creek Watershed is a Water Quality Limited Stream with a goal of decreasing management related sediment sources, and prohibit further impairment of beneficial uses. Indian Creek has had a history of debris torrents within the channel. There was a large event in 1974 which deposited a large alluvial fan at the mouth of the stream on the Little Salmon. There were debris torrents in the tributaries and in main Indian Creek in 1994, which almost destroyed a residence at the mouth of the stream. Indian Creek is a steep breakland watershed, with very fast sediment delivery to stream channels. All of the action alternatives have the same effect on Indian Creek watershed for increase in percent over natural sediment. All alternatives increase the percent over natural sediment from 19.6 percent to 36 percent. All action alternatives have the same effect on Indian Creek. The main tributaries that have been affected by timber harvest and grazing should have mitigation to control intensity of fire in the riparian zone and amount of crown removed. This is also true of tributaries that have had debris torrents in the recent floods.

Lockwood Creek Watershed

Alternative A-No Action

Existing condition for percent over natural sediment is 3 percent. Lockwood Creek is a watershed that has had very little management and is in near natural condition. Lockwood is

a steep watershed and increase in fuels over time could result in a stand replacing fire increasing the risk of increased surface erosion and mass erosion in channels such as debris torrents.

Alternatives B, C, D, and E

Lockwood Creek watershed is a small watershed of 1924 acres with over 90 percent of the watershed planned for burning. All of the action alternatives show an increase of 3 percent for existing condition to 76 percent over natural during the burn year. Lockwood Creek is a steep watershed with breakland landtypes. These landtypes have high surface erosion hazards due to the steep slope and high sediment delivery efficiency to streams. Prescribed burning itself in smaller acreages would not be detrimental to Lockwood Creek, but the proposed action poses an increased risk for Lockwood Creek watershed in delivering detrimental amounts of sediment into Lockwood Creek. As shown above it takes about two years after the prescribed burn for sediment return to near natural levels. All action alternatives have about the same effect on increase in sediment, but any action alternative that applies spring burning would have less effect. The high peaks in sediment in Lockwood Creek are due to the highly erodible breakland landtypes, and the high percent of the watershed burned. It is recommended that Lockwood Creek either be burned in the spring, or if is burned in the Fall that the burn be staged so that one half is burned one year, and that sediment peaks have time to recover to near normal before the rest of the watershed is burned. This will take about two years. So one year of non burning is recommended for this watershed between burns.

Fall Creek

Alternative A-No Action

The existing condition for percent over natural sediment is 7.1 percent. This would remain the same if prescribed fire does not occur. Without prescribed fire there is a risk of wildland fire burning at severities that could increase surface and mass erosion in the watershed. The risk of this is not easy to verify.

Alternatives B, C, D, and E

Fall Creek watershed is a small watershed 2774 acres in size. All Action Alternatives increase the sediment percent over natural from 7.1 percent to 46.2 percent, and have the same effect on the watershed. Spring burning would decrease the effect of the action alternatives. About 53 percent of the watershed is proposed for burning under the action alternatives. This is planned as a fall burn. This proposal for burning effects a large portion of the watershed in one year. There is a risk of detrimental effects from this proposal from the action alternatives. Mitigation similar to Lockwood Creek needs to be developed for Fall Creek.

Camp Creek

Alternative A-No Action

Without prescribed fire the existing condition for sediment for percent over natural would remain the same. This watershed is in near natural condition and has had very little past management. If wildland fire occurred the percent over natural sediment could increase if the fire burned at high severity levels.

Alternatives B, C, D, and E

Camp Creek watershed is a small watershed of 796 acres. It is has had very little roading and management in the past. All alternatives show an increase in percent sediment over natural of 18.9 percent. All action alternatives have the same effect on the hydrologic risk for the watershed. There should not be any detrimental effects from the proposed fire on Camp Creek watershed with any of the action alternatives.

PAYETTE- LOWER MAIN SALMON RIVER WATERSHEDS.

Partridge Creek Watershed

Alternative A-No Action

Same as Camp Creek.

Alternatives B, C, D, and E

Patridge Creek is split into two subwatersheds, the upper and lower Partridge Creek watersheds. Only about 200 acres will be burned in the upper watershed and about 3000 acres in the Lower Partridge Creek watershed. All action alternatives show an increase from 0 percent to 47 percent over natural sediment. This sediment increase has the most effect on the lower watershed. Sediment that is produced in the lower watershed on the steep breakland landtypes has high sediment delivery efficiency , and a high risk of the sediment produced during burning reaching steep first order streams. Staging the burn in Lower Partridge Creek into two years, or spring burning will reduce the high sediment peak. As shown on the table, the sediment peaks decreases very fast within two years. Burning on year 1 and year 3 would reduce the effect on the watershed and reduce the risk of a high sediment peak in one year. Prescribed bring is beneficial to the watershed in lowering risk of high severity wildland fire and there should be no detrimental effect with mitigation.

Elkhorn Creek

Alternative A-No Action

The existing condition of Elkhorn Creek shows an existing percent over natural sediment of 18 percent an existing ECA of 33 percent, with an existing road density of 1.0 mi/mi^2. Without burning the stands in this watershed which have been intensely harvested will continue to recover and ECA will decrease. There is a risk of catastrophic fire if fuels build in some areas, but existing clearcuts help break up continuous fuel in this watershed. The No Action alternative will allow this watershed time to recover and improve watershed condition.

Alternative B, C, and D and E

Elkhorn Creek watershed has a high existing ECA of 33 percent. This is attributed to timber harvest, wildland fire and road building. Elkhorn Creek is a 14,178 acre watershed with around 5000 acres of burning proposed, all of the burning occurring in the Fall. The existing condition for sediment is 16 percent over natural, with an increase to 72.9 percent over natural with alternatives B, C, and D, and an increase of 60.8 percent over natural with alternative E. Alternatives B, C, and D have the most effect on Elkhorn Creek, but due to the existing condition of heavy past management, all alternatives increase hydrologic risk for Elkhorn Creek. At this time, due to the existing condition of the watershed and consultation with McCall District Hydrologist, burning to the extent of the acreage in the proposed alternatives is not recommended. Burns that are smaller in scope with buffers that protect ROAMs would lower the effects discussed above and may benefit the watershed.

French Creek

Alternative A No Action

The existing condition for sediment for French Creek is 14 percent over natural. French Creek has had recent timber harvest, wildland fire and grazing. Wildland fire historically occurs every few years in French Creek and prescribed fire can reduce severity of wildland fire when it occurs by lowering concentrated fuels. With the No Action alternative stands would continue to age and ECA would decrease, and percent over natural would decrease. If wildland fire occurs, both of these indicators could increase.

Alternative B, C, and D and E

All action alternatives for proposed burning have about the same effect on increase for percent over natural sediment, with an increase to 20 or 21 percent . This increase is within acceptable limits and should not cause any detrimental effects, in general for the watershed. Some of the riparian areas have been noted to be heavily affected by grazing, past wildland fire, timber harvest and roads.

PAYETTE- MIDDLE SALMON RIVER WATERSHEDS

Carey Creek

Alternative A-No Action

Carey Creek has an existing percent over natural sediment of 25.2 percent. Without burning the stands in this watershed which have been intensely harvested will continue to recover and percent over natural sediment will decrease. There is a risk of catastrophic fire if fuels build in some areas, but existing openings will help break up continuous fuel in this watershed.

Alternatives B, C, and D

Alternatives B, C, and D have the most effect on the watershed raising the percent over natural to 75 percent. Due to the small size of the watershed and the high acreage proposed for burning in the action alternatives (6016 watershed acres with a burn proposal of 2100 acres) the sediment peaks are high. As discussed under the water yield section, the combined concerns for existing ECA percents and the proposed peaks in the action alternatives percent sediment over natural become a concern for the watershed. Sediment peaks for the proposed burns increase the chance of sediment reaching streams, and delivering sediment to Carey Creek. The sediment peaks decreases very fast within two years. Prescribed burning is beneficial to the watershed in lowering risk of high severity wildland fire and there should be no detrimental effect because of the mitigation discussed in Chapter Two for this drainage.

Alternative E

Alternative E raises the percent over natural sediment to 55. Alternative E has less effect than the other action alternatives. But the same mitigation that is discussed for B, C, and D above should be implemented for alternative E.

California Creek

Alternative A-No Action

California Creek is a large watershed that has had very little past management and the existing condition for percent over natural sediment is less than 1 percent. Without prescribed fire this watershed could have a catastrophic wildland fire which could increase surface and mass wasting sediment such as debris torrents. This a common occurrence with wildland fire in the steep breaklands in this part of the Salmon River Canyon.

Alternative B, D, and E

Alternatives B, D, and E raise the percent over natural sediment. Because California Creek is a relatively large and unmanaged watershed, and recovery potential is high, this sediment increase should not have any long-term detrimental effects.

Alternative C

Alternative C raises the percent over natural to 30 percent. Because of the limited past management activities and the quick recovery time after a prescribed burn, this increase is not a concern.

Poly Creek

Alternative A-No Action

Poly Creek is a small watershed that has had very little past management and the existing condition for percent over natural sediment is less than 1 percent. Without prescribed fire this watershed could have a catastrophic wildland fire which could increase surface and mass

wasting sediment such as debris torrents. This a common occurrence with wildland fire in the steep breaklands in this part of the Salmon River Canyon.

Alternatives B, D, and E

Poly Creek is a very small watershed of 2320 acres. Action alternatives B, D, and E raise the percent over natural from 0 to 19.7 percent. These alternatives have the most effect on the watershed, but these increases are short term.

Alternative C

Alternative C has the least effect, only increasing the percent over natural sediment to 3 percent, and will have no detrimental effects on the watershed. Alternative C has the least effect, only increasing the percent over natural sediment to 3 percent. Based on the accuracy of the model, this alternative will not degrade the watershed.

Rabbit Creek

Alternative A-No Action

Same as Poly Creek.

Alternatives B, D, and E

A large portion of the watershed will be burned under alternatives B, D, and E. The percent sediment over natural will increase from 0 to 55 percent for these alternatives. These alternatives may increase sediment which may enter tributaries and main Rabbit Creek , although how much risk of routing sediment to streams is hard to predict. The watershed is in good condition and is largely unmanaged, so recovery potential is high. As shown on the table, the sediment peaks decreases very fast within two years. Burning on year 1 and year 3 would reduce the effect on the watershed and reduce the risk of a high sediment peak in one year. Prescribed burning is beneficial to the watershed in lowering risk of high severity wildland fire.

Alternative C

Alternative C has the least effect and increases the percent over natural sediment to 13 percent. Alternative C would have no detrimental effect on the watershed.

Rugged Creek

Alternative A-No Action

Same as Poly Creek

Alternatives B, C, D, and E

There has been very little past management in the watershed. Most of the watershed area is proposed to be burned under action alternatives B, C, D, and E. The percent over natural sediment is increased from the existing condition of 0 percent to 75 percent over natural. This increase is high enough on the breakland landtypes to increase surface erosion and mass erosion in the channels. All alternatives, due to the high percent of the watershed in the proposed burn have potential for detrimental effect from increase in sediment. Prescribed burning is beneficial to the watershed in lowering risk of high severity wildland fire and the increases in sediment are minimized due to the mitigation identified in Chapter Two and only last for a short period.

Cottontail Creek

Alternative A-No Action

Same as Poly Creek

Alternatives B, C, D, and E

Cottontail Creek is a small watershed with almost no roading or timber harvest and it is assumed to be in near natural condition. Action alternatives B, D, and E have the most effect increasing the percent sediment over natural from 0 to 45 percent. This is a high increase in sediment for a small watershed, but in an unmanaged watershed, there is more natural resiliency to wildland fire than managed watersheds. Spring burning is recommended as Mitigation in this watershed to lower risk of removing vegetation and exposing bare soil that can be routed as sediment and reach stream. Revegetation is also much faster in the spring.

Alternative C

Alternative C has the least effect and increases the percent over natural sediment to 18 percent over natural. This alternative is lower risk than the other Action alternatives and will not have a detrimental effect on hydrologic condition of the watershed.

PAYETTE- WILDERNESS SECTION SALMON RIVER

Fivemile Creek

Alternative A-No Action

Same as Poly Creek

Alternatives B, C, D, and E

Fivemile Creek is currently at 0 percent over natural sediment. Fivemile Creek is a wilderness watershed, has no history of roading or timber harvest, and is assumed to be near natural condition except for fire suppression. Action alternatives B, D, and E increase sediment to 13 percent which will have no detrimental effect on the watershed condition. There is no burning proposed for alternative C.

Little Fivemile Creek

Alternative A-No Action

Same as Poly Creek

Alternatives B, C, D, and E

Little Fivemile Creek is an unmanaged wilderness watershed of 5618 acres and is assumed to be in near natural condition. Alternative B, D, and E increase the percent over natural sediment to 38 percent. There should be a high recovery potential in the watershed due to the near natural condition. There is a slight increase that this could increase routing of sediment to streams if vegetation is removed from steep slopes on a large part of the watershed. There is no burning proposed for alternative C.

Lemhi Creek and Trout Creek

Alternative A-No Action

Lemhi creek and Trout Creeks are watersheds that have had very little past management and the existing condition for percent over natural sediment is less than 1 percent. Without prescribed fire these watershed could have a catastrophic wildland fire which could increase surface and mass wasting sediment such as debris torrents. This a common occurrence with wildland fire in the steep breaklands in this part of the Salmon River Canyon.

Alternatives B, C, D, and E

Lemhi Creek and Trout Creek are wilderness watersheds around 8000 acres in size. Existing condition for both watersheds is 0 percent over natural. Both watersheds are assumed to be near natural condition except for wildland fire and fire suppression effects on the watershed. Alternatives B, D, and E increase the percent sediment over natural in Lemhi Creek to 57 percent and in Trout Creek to 62 percent. This could cause an increase in sediment which could be routed to tributaries, main streams, and to the Salmon River. There is no burning for Alternative C. As shown on the table, the sediment peaks decreases very fast within two years. Prescribed burning is beneficial to the watershed in lowering risk of high severity wildland fire and the mitigation identified in Chapter Two will minimize the effects.

Little Trout Creek

Alternative A and C

Same as Poly Creek

Alternatives B, D, and E

Little Trout Creek watershed is a small watershed with highly erosive breakland landtypes. It is a wilderness watershed with a history of no management. Due to the high percent of the watershed acreage that is proposed in alternatives B, D, and E, the percent over natural sediment increases to a peak of 127 percent of natural. This presents a high hydrologic risk to the watershed of delivering sediment to streams and increasing the risk of in-channel erosion and mass wasting. There is no burning for alternative C. As shown on the table, the sediment peaks decrease very fast within two years.

Salmon-Challis Sediment Analysis using Percent Fine Sediment in Spawning Habitat as An Indicator

Sediment Analysis

Hot Springs-Gant, Clear Creek, and Garden Creek Watersheds

No Action-Alternative A

Under alternative A, there would be no change in use with the wilderness designation. Wildland fire may occur if fuels continue to increase. The combination of steep slopes, and highly erodible soils results in a high inherent erosion risk. The watersheds are not in the highest risk area for the high intensity storm track along the Salmon River, but high intensity thunderstorms still occur and provide risk for increased erosion with wildland fire.

Alternatives B, C,D, and E

Percent fine sediment in substrates was not monitored specifically for Hot Springs watershed. Looking at the monitoring stations on Panther Creek, which Hot Springs flows into, is the closest sediment data available. In general, monitoring stations on Panther Creek below Hot Springs Creek are within Forest Plan guidelines for anadromous fish at less than 20 percent fine sediment or within guidelines for resident fish at less than 29 percent fine sediment for the past few years. Most of the stations on lower Panther Creek show improving trends as percent fine sediment has been reduced from 1993 - 1998. The effect of burning on sediment is the same for alternatives B, C, and D and E, and the increase in sediment will be short term and should not degrade the watershed.

Percent fine sediment is within Forest Plan Standards for Clear Creek at the Clear Creek 1 monitoring site. Clear Creek watershed is mostly unmanaged and at near natural condition with most of the watershed designated as wilderness. Increase in sediment from fire was not modeled, but as discussed in the water yield section, 4893 acres of prescribed burn are low intensity, and 440 acres are a moderate intensity burn with no high intensity burn. The low intensity fire should help keep organic matter in place on the soil to prevent soil erosion on steep slopes. To reduce the risk of sediment being delivered to Clear Creek, fire should burn through riparian zones at very low intensity and with a low percentage of crown removal allowed to reduce chance of sediment delivery and reduce chance of dry ravel failures or debris torrents in the ephemeral draws. Alternatives B, D, and E have a similar effect on the risk of accelerating sediment. The proposed burn acres for B, D, and E are similar.

Alternative C proposes only about a fifth of the burn acres proposed in the other alternatives and it has a much lower risk of accelerating sediment.

Colson and Shell/Long Tom and Face Watersheds

No Action-Alternative A

Under this alternative, there would be no burning in the Colson Creek and Shell Creek watersheds. The road density and the harvest acres in Colson Creek watershed would stay the same as described in the current condition in Chapter 3. There would be very little change in Shell Creek because the watershed is in wilderness. Fuels conditions would remain the same as described in Chapter 3. Long Tom Creek and Ebenezer Creek would continue to recover from the Fountain Creek fire. Both of these watersheds burned over, resulting in over 50 percent of the watersheds in stands less than 20 years. As stand ages increase chance of overland flow and accelerated sediment decrease. The chance of sediment being delivered to a stream channel is decreased as more maturing stands provide buffers between the steep slopes and the streams.

Under this alternative, Colson Creek meets Forest Plan guidelines of less that 20 percent fine sediment for anadromous fisheries. There are no monitoring stations on Ebenzer Creek, Long Tom Creek, and Shell Creek. All of these streams are small Face watersheds that are very steep, high energy streams that move sediment through quickly.

Alternatives B and D

Alternatives B and D have the highest acres of stand mortality, with a total acreage of 153 acres. This is spread across the moderate and severe intensity burn acres and will occur as a mosaic crossed the landscape. This mosaic will distribute areas of stand mortality that may be up to a few acres in size, in areas of moderate and high severity burning. Distributing small areas of stand mortality reduces the chance of concentrating water on steep slopes and causing overland flow which increases movement of sediment. Alternatives B and D should not accelerate sediment at detrimental levels in Colson Creek and Shell Creek, if the watersheds are kept at burn intensity levels planned within the prescription. Alternatives B and D have the highest watershed risk of all of the action alternatives.

The road along Colson Creek is currently a sediment contributor to Colson Creek on some portions where the road is close to the stream. There has also been a recent burn on the east side of the road. The fire intensity and percent crown removal should be specified in the burn prescription for Colson Creek to reduce the risk of sediment from the steep slopes reaching the stream. Shell Creek is a steep high energy stream, and has a high potential for debris torrents if steep channels are burned hot. Burning in and near steep stream channels can cause dry ravel slides or debris torrents. Long Tom Creek and Ebenezer Creek have been recently burned and are a high hydrologic risk due to the condition of the stands in the watershed. The recommendation of the Salmon National Forest Hydrologist was not to burn Long Tom or Ebenezer watersheds in the next 10 year burn cycle.

Alternative C and E

These alternatives would only have 81 acres of stand mortality distributed crossed the moderate and severe intensity burn areas. This also includes large areas of low intensity and unburned areas. Alternatives C and E have a lower risk of increasing sediment from burning than alternatives B and D.

Corn Creek and Fountain Creek Watersheds

Alternative A-No Action

Under alternative A, there will be no change in Corn or Fountain Creek watersheds. Road density will not increase and levels of other human activity will stay the same. The watersheds are mostly roadless, and consist of steep highly erodible breaklands. Fuels may continue to increase over time which can increase the risk of a large wildland fire. Currently Corn Creek meets Forest Plan Standards for fine sediment in spawning habitat which is less that 20 percent. There has been no monitoring on Fountain Creek.

Alternative B, C, D, and E

All alternatives produce 153 acres of stand mortality spread across a several thousand acre prescribed burn. Only about 15 percent of the burn falls into the moderate and high severity burn categories, and within this 15 percent, 153 acres of stand mortality will occur in a mosaic pattern. The prescribed fire should not produce sediment that will reach the stream channel and produce fine sediment if the following mitigation is followed. Corn and Fountain Creeks occur on steep breaklands with high natural inherent erosion potential. They also lay geographically in the Salmon River Canyon high intensity storm track.

Indian Creek Watershed

Alternative A-No Action

Indian Creek has two monitoring stations on the main stream. At the upper sediment monitoring station, Indian Creek has meet Forest Plan Standards for most years from 1993 to 1996. At the lower monitoring station Indian Creek met the Forest Plan for the years 1993 to 1996, only in 1994, and in 1997 there was an increase in percent fine sediment to 31.6 percent. This was in response to a channel change during the runoff flood in 1997. The sediment increase was due to a debris jam causing a deposition of the streams bedload, channel filling and the cutting of a new channel. Under alternative A fine sediment will improve after the stream restoration project is finished. Under Alternative A the sediment will probably decrease in Lower Indian Creek as deposited bedload and fine sediment move through the channel. Road densities will stay the same and stands less than 30 years old will mature. Fuels will continue to build and may increase the risk of wildland fire.

Alternative B, C, and D

Alternative B, C, and D produce only 40 acres of stand mortality. This is due to most of the proposed burning being low intensity. There should be no detrimental effect on Indian Creek

from these three alternatives. As stated in the water yield section , The fire intensity and percent crown removal should be specified in the burn prescription for Corn Creek and Fountain Creek to reduce the risk of sediment from the steep slopes reaching the stream This will help mitigate the flood and road effects on Indian Creek.

Alternative E

The effect of this alternative is the same as Alternative A, because no burning is proposed.

East Fork Owl Creek Watershed

Alternative A-No Action

Only one of the monitoring stations on main Owl Creek meets Forest Plan guidelines for fine sediment. The other monitoring stations are showing improving trends. Under this alternative East Fork Owl Creek will continue to recover as young stands mature and recover from wildland fire. A large part of the watershed was burned over in 1985 which converted most of the watershed to stands less than 20 years and contributed to increase in fine sediment in the stream channel.

Alternatives B, C, and D

When evaluating the impact of the prescribed burn, the proposed action would not be detrimental to a watershed in good condition, but Owl Creek already has 49 percent of the stands less than 30 years of age due to the Long Tom Fire. Referring to the sediment analysis, the percent fine sediment in substrates is also high, and does not meet Forest Plan standards at most of the monitoring stations. After consultation with the Salmon National Forest Hydrologist, it is recommended due to the existing condition that Owl Creek not be burned in the next 10 year cycle until it is further recovered.

Alternative E

The effect of this alternative is the same as Alternative A, because no burning is proposed.
Sediment Analysis

Pine Creek Watershed

Alternative A-No Action

The percent depth fines in Pine Creek has fluctuated between meeting the Forest Plan guidelines for sediment one year, to going as high as 40 percent the next year. The percent depth fines fluctuated from 40 percent in 1996, down to 12.9 percent in 1997, and back to 40 percent in 1998. This may be related to stream discharge and the deposition and movement of sediment in the stream with the seasonally changing flow levels. The snowpack was 200 percent of normal in 1997 and this may have resulted in high flows that moved out sediment and reduced it in the channel. Under this alternative stands will continue to mature, fuels will continue to increase and may increase the risk of wildland fire.

Alternatives B, C, and D

There will be 173 acres of stand replacing fire in Pine Creek under these three alternatives. This will be distributed throughout the proposed burn acreages with patches of unburned and low intensity in between. This level of prescribed burning should not increase the percent of depth fines, as long as the high severity ground fire is distributed crossed the prescribed burn in small patches. This will break up any concentration of water on bare soil which could cause soil erosion and increase sediment production. Alternatives B, C, and D have the most impact on the watershed of all of the action alternatives, but there should be no long lasting detrimental effects from increase in sediment from this action.

Sawmill and Virginia Gulch have sensitive landtypes with high inherent erosion. They are located in the high intensity storm track of the Salmon River Canyon. The sensitivity of these areas was discussed in personal communication with the Salmon National Forest Hydrologist. Mitigation such as leaving filter strips along riparian zones, and planning spring burning in these areas would help prevent soil erosion after fire in Sawmill and Virginia Gulch areas.

Alternative E

Alternative E has less that 5 acres predicted of stand replacing fire. This is due to only 244 acres of moderate intensity fire and 0 acres of severe intensity fire. This is the lowest risk alternative of all the action alternatives for increase in fine sediment, and there should be no detrimental effects from increase in sediment under this alternative.

Spring Creek Watershed

Alternative-No Action

Under alternative A, Spring Creek meets the Forest Plan guidelines for less than 20 percent fine sediment in the substrate for anadromous fisheries. Under this alternative, Spring Creek watershed will continue to improve as stands less than 30 years of age mature. Road density will not change, but fuels may continue to increase raising the risk of wildland fire.

Alternative B, C, and D

These alternatives produce 65 acres of stand replacing fire distributed across the landscape. There should be no detrimental increase in sediment if the burn prescription is followed. If the burn escapes and becomes a wildland fire, the small Face watersheds below are a concern.

Sawmill and Virginia Gulch have sensitive landtypes with high inherent erosion. They are located in the high intensity storm track of the Salmon River Canyon. The sensitivity of these areas was discussed in personal communication with the Salmon National Forest Hydrologist. Mitigation such as leaving filter strips along riparian zones, and planning spring burning in these areas would help prevent soil erosion after fire in Sawmill and Virginia Gulch areas. These three alternatives all have equal risk of generating detrimental amounts of sediment.

Alternative E

Alternative E would be the same as Alternative A, because there is no proposed burning under this alternative.

Forest Plan Consistency

The lower monitoring site on main Indian Creek did not meet the Salmon-Challis Forest Standards for percent depth fines for anadromous fish for the years 1994 and 1997. All other years in the time period 1993-1996 the Indian Creek monitoring sites met less than 20 percent depth fine standard for anadromous fish. The 1997 increase in depth fines is attributed to channel changes that took place during the floods in 1997. The planned stream restoration project should reduce depth fines. The two years that Indian Creek did not meet Forest Plan Standards do not indicate that the stream is in poor condition. Other indicators such as the flood in 1997 are directly tied to increase in fines. In all years monitored the upper monitoring station met Forest Plan Standards. Pine Creek has shown the same pattern with depth fines fluctuating in 1996 and 1998 above Forest Plan Standards of less than 20 percent depth fines. Most years Pine Creek has met Forest Plan Standards. In consultation with the Forest Hydrologist, Salmon Challis National Forest, it was stated that changes in depth fines fluctuate some years when changes in flows between years vary greatly, especially during snowmelt, when fines move through the system. The years that Pine Creek and Indian Creek percent depth fines were above the less than 20 percent standards was not a concern that when considering effects of the proposed burns.

Main Owl Creek still has a high percentage of depth fines due to the Long Tom Fire in 1985. The three monitoring stations show improving trends for the main Owl Creek, but the percent fine sediment does not meet Forest Plan Standards for anadromous fish. Percent fine sediment is still to high to recommend burning in Owl Creek or its tributaries such as East Owl Creek.
Long Tom Creek does not have a Forest Plan monitoring station, but confirmation from the Salmon National Forest Hydrologist confirms that a high percentage of the watershed was burned over in the Fountain Creek Fire and observed sediment in the stream is very high. Most of the watershed has stands less than 30 years of age.

The remaining watersheds within the proposed action are within the appropriate Forest Plan standards for most years. (See Fine Sediment Tables in Chapter Three.)

Cumulative Effects

Cumulative Effects are the effects of the alternatives combined with conditions in the watersheds from past, present, and any foreseeable future actions. Cumulative effects from timber harvest, fire and roads may increase stream flow or introduce accelerated sediment that can alter the dynamic equilibrium of a stream system to the extent that beneficial uses are impacted.

Existing conditions and past events which are still showing impacts to the watersheds were incorporated into the sediment models. In addition, those activities listed at the beginning of

this chapter which are far enough in their analysis to allow resonable discussion of the effects of these activities are also incorporated into the modeling discussed.

Table 4 - 36. Effects Summary Table For the Payette and the Nez Perce Forest
(In Appendix F)

The table in Appendix F is only a display of indicators that were used to compare the effect of the alternatives against each other. The specific result of the proposed burns are discussed under the Direct and Indirect Effects Section in detail.

Crooked River and Bargamin Creek are in the wilderness and there are is not a watershed data base available so the ECA and percent sediment over natural can be calculated. These two watersheds are in near natural condition in the Lower Watersheds where the prescribed burns will take place. All alternative will have a similar effect on the watersheds.

Forest Plan Consistency

Watersheds that are listed below do not meet the standard for percent sediment over natural in Appendix A of the Nez Perce Forest Plan.

Under Alternative E, Little Van Buren exceeds Forest Plan guidelines in Appendix A by 11 percent. The percent over natural sediment guidelines is 40 percent. It does not exceed Appendix. A for the number of entries per decade. Sherwin Creek exceeds the 60 percent objective for its peak year of 2004 at 70 percent over natural sediment for Alternatives C, D, and E.

Kessler Creek does exceed the 45 percent guideline with a peak percent of base sediment of 47 percent, for alternatives B, C, and D, but does not exceed entries per decade.

Robbins Creek and Kelly Creek Watersheds

There are concerns in Robbins Creek due to recent burning during the Scott Fire. Refer to discussion in the Water Yield and Sediment Sections for details. Areas of concerns are stream channels and RHCA recovery, where fire burned with moderate/high severity. Kelly Creek, which adjoins Robbins Creek has had heavy harvest and roading in riparian zones, and should also be evaluated by the watershed specialist to see where specific mitigation is needed to protect riparian zones within the watershed. This should work well with mitigation for Robbins Creek, because they are adjoining watersheds.

Table 4 - 37. Salmon-Challis Effects table (In Appendix F)

The Forest Plan Standard for the Salmon Challis Forest is a goal of less than 20 percent fine sediment for anadromous fish habitat, and less than 29 percent for resident fish. The Salmon Challis Forest does not use a sediment model, such as the R1/R4 sediment model, but estimates the condition of sediment in watersheds with yearly monitoring at the Forest Plan monitoring stations. Percent of stands less that 30 years of age is used as an indicator for water yield. It is similar to ECA, but does not recover stands over time. The percent of

stands less than 30 years is calculated on composite watersheds such as Colson Creek, Shell/Lake Creek and Long Tom Creek.

[1]Salmon-Challis Hydrologist confirm Long Tom Creek has a high percentage of fine in substrates sediment in substrates. Shell/Lake watersheds are considered to be in near natural condition.

CUMULATIVE EFFECTS FOR THE SALMON CHALLIS WATERSHEDS

Summary of Analysis

There should be no long-term detrimental Cumulative Effects from water yield or increase in percent fine sediment in spawning gravels. Long Tom Creek, Ebenezer Creek and East Fork Owl Creek have a high percent of the watershed in stands less than 30 years of age. This indicates that water yield increases could increase peak flows in channels causing in-channel erosion. Observed sediment in channels and measurements at Forest Plan monitoring stations at Long Tom Creek, and Owl Creek, show that sediment is already too high in these watersheds. Burning is not recommended in this 10 year burn cycle in these watershed due to a high risk of a decline in watershed condition with the proposed burning.

Forest Plan Consistency

The lower monitoring site on main Indian Creek did not meet the Salmon-Challis Forest Standards for percent depth fines for anadromous fish for the years 1994 and 1997. All other years in the time period 1993-1996 the Indian Creek monitoring sites met less than 20 percent depth fine standard for anadromous fish. The 1997 increase in depth fines is attributed to channel changes that took place during the floods in 1997. The planned stream restoration project should reduce depth fines. The two years that Indian Creek did not meet Forest Plan Standards do not indicate that the stream is in poor condition. Other indicators such as the flood in 1997 are directly tied to increase in fines. In all years monitored the upper monitoring station met Forest Plan Standards. Pine Creek has shown the same pattern with depth fines fluctuating in 1996 and 1998 above Forest Plan Standards of less than 20 percent depth fines. Most years Pine Creek has met Forest Plan Standards. In consultation with the Forest Hydrologist, Salmon Challis National Forest, it was stated that changes in depth fines fluctuate some years when changes in flows between years vary greatly, especially during snowmelt, when fines move through the system. The years that Pine Creek and Indian Creek percent depth fines were above the <20 percent standards was not a concern that when considering effects of the proposed burns.

Main Owl Creek still has a high percentage of depth fines due to the Long Tom Fire in 1985. The three monitoring stations show improving trends for the main Owl Creek, but the percent fine sediment does not meet Forest Plan Standards for anadromous fish. Percent fine sediment is still to high to recommend burning in Owl Creek or its tributaries such as East Owl Creek.

Long Tom Creek does not have a Forest Plan monitoring station, but confirmation from the Salmon National Forest Hydrologist confirms that a high percentage of the watershed was burned over in the Fountain Creek Fire and observed sediment in the stream is very high.

Most of the watershed has stands less than 30 years of age. It is recommended that this watershed needs not be burned in this burn cycle until the stands have more time to recover and sediment decreases in the channel.

Cumulative Effects of Sediment in Relation to the Main Salmon River Basin

Risk of cumulative impact is a reasonable concern in the Salmon River Basin. The upper Salmon River has been impacted to a degree from human development, and both natural and human processes have influenced the function and processes of the river. Deposited sediment conditions in the middle and lower reaches of the Salmon River are determined through upstream influences and reach characteristics. The Main Salmon River Tributaries NE Biological Assessment, 1994, reported that a combination of erodible soils, fire history, and periodic intense climatic events resulted in substantial natural erosion and delivery of sediment to the Salmon River. In addition, the development of the Salmon River Basin has resulted in increased sediment yield to the river, associated with activities such as road construction, large scale mining efforts, grazing and upriver agriculture.

The proposed burning project will also has the risk of adding some sediment to the Little Salmon River. The Little Salmon River is affected by human impacts which have produced sediment from tributary upland activities such as grazing, roading, mining, and timber harvest. The Little Salmon River floodplain is heavily affected by channelization due to the highway, subdivision, and other human development. This has resulted in floodplain encroachment and total loss of natural floodplain in some reaches. A flood in the winter of 1997, scoured the river in some reaches, and deposited large amounts of bedload in other reaches. In some reaches, this resulted in a widened channel with heavy cobble and boulder size deposits.

Although it can be hypothesized that deposited sediment has increased due to activity in the Salmon river, it is apparent that the river has tremendous capability to transport sediment ranging from sand to large cobbles. Observations along the Salmon River from Sabe Creek to its mouth suggest a river bed with a wide variety of substrate conditions, but generally not highly sedimented. The bed appears to be largely composed of cobbles and boulders. Although interstitial deposition of fines is evident in some areas, certain habitats such as pool tailouts appear to be relatively free of fine sediment degradation.

In response to Term and Condition Number Four, for the Main Salmon River Tributaries Northeast Biological Opinion, April 15th 1997, sediment in tons/year for accrued natural sediment and accrued activity sediment was estimated to a routing point at the gauging station at Whitebird Idaho. This estimate was additive and was estimated for the river above Sabe Creek to several points on the river between Sabe Creek and the Whitebird gauge These estimates of accrued natural and activity sediment were estimated using BOISED, NEZSED, suspended sediment yields, discharge information from USGS, and bedload estimates. (Refer to the Sediment Yield Section in Response to Term and Condition Number Four for Methodology).

The sediment yield for a ten year burning period has been accrued by adding the activity sediment from the Salmon River Canyon Project alternative B. The sediment estimates were taken from NEZSED and BOISED runs for the Salmon River tributaries and routed with a

spreadsheet to the Salmon River. The natural sediment for the proposed burn area above Sabe Creek was included in the Term and Condition Number estimate, but the activity sediment for the Salmon-Challis watersheds cannot be estimated, because the R1/R4 sediment model is not used. Therefore, the routed activity from the Salmon River Canyon project that is used for this analysis if only for the Nez Perce and Payette Forests.

Table 4 - 38. Total Sediment For Alternative B For The Main Salmon River Sediment Tons/Year

	Natural and Activity Accrued Sediment	Proposed Burns over 10 year burn period. 1998-2008.	Total Sediment Tons/Year
Whitebird Gauge Routing Point	530,000		530,000
Payette Forest		3058.92	3,058.92
Nez Perce Forest		1243.61	1243.61
			534,302.00

The table above only accounts for the burns on the main Salmon River, and not the prescribed burns on the Little Salmon River. The total activity sediment for all of the Payette and Nez Perce proposed burn projects for a ten year accrued total is 4,302,53 tons per 10 years, 1998-2008, that will be routed to the Salmon River. The peaks of sediment will vary over the 10 year period depending on how many acres are burned per year. The ten year mean is 430.25 tons/year. If you compare the total sediment that is produced naturally and with activity sediment (530,000t/y) for the Salmon River at the Whitebird gauge, with the total sediment that is produced per year for the Nez Perce and Payette burns, (430.25/530,000T/Y) equals less than .0008 percent of the total sediment. Cumulatively the sediment produced for the Salmon River Canyon Fire Project has very little effect on the Salmon River Canyon Subbasin.

Cumulative Effects to Channel Stability and Temperature

There should be no long-term cumulative effects on channel stability from the prescribed burn projects unless that burn out of control, where a result of the burn could be debris torrents, that could destabilize channels. An out of control fire that is high severity could burn the riparian vegetation hot enough to destabilize streambanks, due to loss of vegetation with deep roots that stabilize banks. Special mitigation is listed for watersheds where existing condition for channel stability is a concern, or in sensitive stream channels exit such as steep a channels in granitic landtypes. There should not be any long term cumulative effects to stream temperature with the proposed burn projects.

Effects to Riparian Areas, Floodplains and Wetlands

Riparian areas, wetlands, and floodplains contribute to water quality and stream conditions. These areas play an important role in maintaining dependant resources (fish, water, wildlife, people). They also buffer fluctuations in water yield and erosion, thereby aiding in the

maintenance of stream stability. Fire plays a natural role in the riparian zones in the Salmon River Canyon. The processes that may detrimentally affect riparian zones in this proposal are fires that are stand replacing, high intensity and high severity. This type of fire may be increased without some level of prescribed burning. Reduction of fuels in riparian zones is considered as an important part of the scheme that help retain the large trees that provide shade that control stream temperature, provide the large wood that stabilizes stream channels and store sediment in first and second order headwater streams.

This burning proposal does not directly apply PACFISH buffers in RMOs, but designs mitigation for riparian areas that have special concerns, such as loss of shade from roads, timber harvest, grazing and past wildland fire. Other mitigation is designed on a watershed scale to mitigate increases in sediment and waters yield. This mitigation will be designed in the burn prescription. See specific mitigation above for watershed with riparian concerns.

There is always a low risk of a prescribed burn escaping, and the result of this may be an increase in hydrophobic soil, causing an increase in runoff which would in turn increase peak flows. This could increase in-channel erosion, and accelerate debris torrent mass wasting in stream channels.

Irreversible and Irretrievable Commitments

None of the proposed actions should constitute irretrievable or irreversible commitments to water quality or quantity over the long-term. None of the proposed actions constitute irretrievable or irreversible commitments to riparian Areas, floodplains and wetlands or watershed .

SOILS

Effects on the Soil Resource

The soil resource is one of the critical foundations of healthy ecosystems. Soils in degraded conditions that do not function normally will not be able to sustain water quality, water yield, or plant populations that have normal structure, composition, and function. Conversely, if plant communities are in an unnatural and unhealthy condition, the soil resource can be negatively affected. For example, the occurrence of mid to late seral plant communities on soils that normally support early to mid-seral communities creates changes in soil nutrient cycling and organic matter accumulation/decomposition rates that are likely beyond the normal ranges for a given soil. Such soils will not function normally. In the project area, treatments have been proposed on areas where shifts in plant communities have occurred over the last several decades due to fire exclusion. Much research, as documented in this NEPA document, presents good evidence of these major shifts in low to mid-elevation plant communities. Soils which normally supported fire tolerant, fire-disclimax plant communities such as open ponderosa pine and Douglas-fir forests now support fire intolerant mid-seral to plant communities approaching the climatic climax.

In addition to the negative effects on soil function this shift causes, the altered communities and fuel buildups associated with them create a condition of high risk for large, severe fires

which would in turn affect soil erosion and mass failure processes. Large, severe fires on soils that normally were associated with patchy, low severity fires, tend to consume excessive amounts of protective soil litter and other larger dead organic soil components necessary for healthy soil functioning. These types of fires can also excessively heat the mineral soil surface layers to the point that they become water repellent (hydrophobic). The result is that precipitation that normally infiltrates into the soil is repelled near the surface and instead of entering the soil, flows overland, causing excessive soil erosion, stream sedimentation, and altered water yield patterns. In extreme situations, the overland flow can concentrate in steep, small drainages and cause mass failures such as debris torrents. These are mass failures in which large channel flows cut deeply into the sides and bottoms of drainages, often down to bedrock, sending the eroded material down to major creeks and rivers. Debris avalanching, which is the mass failure of coarse soils that are shallow over bedrock, can be increased by the severe fire's excessive removal of live and dead plant materials that protect and anchor these soils in place. This mass failure soil material often enters drainages to become associated with debris torrents. In addition, these altered soils are more susceptible to weed invasions.

Soils have varying capacities to recover from disturbance. Generally, shallow soils, low in organic matter content, with loamy sand to coarse sandy loam textures, high rock content, and droughty east, to south to west aspects have low resiliency. Many of the treatments proposed will occur on these types of soils. Severe fires, however ignited, will have much more negative soil impacts on these low resiliency soils than on soils with moderate to high resiliency. In addition the negative effects will last much longer because these soils are slow to recover. Minimizing severe burning on these soil types should be a prime objective of this project, to the degree that the fire patterns and severities should not exceed the historic range of variability, both during project implementation and afterward.

The prescribed burns proposed in the project would be conducted during conditions favoring low intensity fires over the majority of the treatment unit area. This will help reduce the likelihood of excessive soil erosion and mass failures associated with severe burns. Under these low severity burn conditions, no negative impacts to soil physical condition or soil function are anticipated. This low severity fire prescription will mimic natural fire regimes over presettlement periods. However, not all areas within a treatment unit will be in prescription conditions when burned, and where fuels are heavy and fuel moistures are below prescription, severe burns are anticipated. These localized areas of severe burn may have detrimental effects on the affected soils as discussed above.

The analysis of effects of the proposed fire treatments concentrates on these areas of high intensity fires, but it must be remembered that these effects may need to be considered necessary trade-offs in order to avoid much larger and serious negative soil impacts in the future due to large, severe wildland fires. The soil effects analysis evaluates the following:

Direct and Indirect Effects

- Predicted acres of moderate and severe burn on soils with high mass movement hazard
- Predicted acres of moderate and severe burn on soils with moderate or high surface

Erosion Hazard

- Predicted acres of moderate and severe burn on soils prone to creation of water repellent (hydrophobic) soil

- Predicted acres of moderate and severe burn on soils that have a low resiliency to disturbance

(See below for discussion on definitions of these four criteria and for a listing of ratings of these soils based on Landtype Associations)

In addition, the alternatives will be evaluated for the anticipated amount of accelerated soil erosion that will result from fire, regardless of ignition source. Accelerated soil erosion is that portion of erosion which exceeds natural erosion that would be expected from burning within the historic range of variability. The erosion model used for this analysis is the Water Erosion Prediction Project (WEPP) model as adjusted by the Rocky Mountain Research Station, USDA Forest Service, Moscow, ID., for erosion prediction on steep forest soils that typify the project area. The model version used is the March 1999 release of FS WEPP Portal. This model is considered an improvement over existing erosion models such as the Universal Soil Loss Equation and the Revised Universal Soil Loss Equation for evaluating erosion in the mountains of this area. It is a process oriented model based on actual field plot erosion studies in the Rocky Mountains; whereas the other models are empirical models that have very little field verification for mountainous forestry applications. The Forest WEPP model evaluates hillslope sheet and rill erosion associated with timber harvest, road construction, and fire and also can be used to assess sediment delivery to drainages. Only the fire-related erosion capabilities of the model where utiilized for this analysis; sedimentation analysis is covered in the hydrology section and was based on other models such as NEZSED and BOISED. Note: WEPP models on- site erosion in terms of direct soil effects, while NEZSED and BOISED route the on-site erosion along the slopes and into streams. Some landforms deliver only a small portion of the on-site eroded material to the stream and others deliver much more. Therefore, depending on the watershed, the alternatives that produce the highest predicted increases in soil erosion may not necessarily be the alternatives that produce the highest increases in sedimentation.

Consistency with Forest Plans

None of the four Forest Plans have soil standards or guidelines specific to Management Areas that pertain to soil fire effects. Regarding Forest-wide Forest Plan standards the following apply:

Nez Perce NF

- Evaluate the potential for surface soil erosion for all ground-disturbing activities

- Maintain sufficient ground cover to minimize sheet erosion on activity areas

Salmon NF

- Maintain soil productivity, minimize man-caused soil erosion and maintain the integrity of associated ecosystems.

- Identify at the project level, filter-strip requirements immediately adjacent to streams.

- Maintain site productivity at a level equal to or greater than 90 percent of natural.

- A minimum of 80 percent of an activity area should remain in nondetrimentally disturbed condition.

Payette National Forest

Utilize the Payette NF coarse-woody debris guide.

- Maintain site productivity at a level equal to or greater than 90 percent of natural.

- A minimum of 80 percent of an activity area should remain in nondetrimentally disturbed condition.

Bitterroot NF

This project does not propose prescribed fire on the Bitterroot NF even though the project area does include portions of this Forest.

Regional Soil Quality Standards

Forest Service Regions 1 and 4 both have Regional Soil Quality Standards (SQS) that apply to this project. Region 1 requires that no more than 20 percent of an activity area can have soils in a detrimental condition at the close of project implementation. Region 4 Soil Quality Standards require 15 percent. Detrimental soil damage consists of:

- Soils compacted to greater than 15 percent (20 percent on volcanic ash soils) above the natural bulk density to a degree that a reduction of 50 percent or more in infiltration rate occurs.

- Soil displacement (removal of the topsoil) so that 1 inch or 1/2 of the A horizon is removed, whichever is less.

- Soil becomes puddled; e.g. shearing effects of heavy equipment wheel ruts or visual evidence of hoof prints in saturated soils

- Soils severely burned usually indicated by oxidation of most surface soil organic matter and/or creation of sterile soil and/or red, oxidized soil.

Forest Plan SQS follow these Regional SQS

DIRECT AND INDIRECT EFFECTS

Surface Soil Erosion Due to Overland Flow

The results of detailed soil erosion modeling of the treatment units are shown below.

Table 4 - 39. Soil erosion rate (tons of soil erosion) for the first year following burning.

Alternative A	Alternative B	Alternative C	Alternative D	Alternative E
1,423,194	653,608	845,225	653,608	1,008,069

These erosion rates are based on the Water Erosion Prediction Project (WEPP) soil erosion model. The values are based on the erodibility of the various soils, the landforms, the local climate, the expected post-fire vegetative cover, and the predicted fire severity (derived from the fire models) that would occur on those soils. These values represent the first year after the burn. The following years these erosion rates will diminish as vegetative and litter cover returns to protect the soil surface from raindrop splash erosion and rill erosion. The model predicts the highest erosion for the no action alternative (Alternative A). The fire/fuels model data used in this WEPP analysis predicts larger amounts of moderate and severe fire for Alternative A than the other alternatives and this drives the erosion rates upward. Although Alternatives C and E burn fewer acres as prescribed fire than Alternatives B and D, the erosion rate is higher than for Alternative B and D. This is because the units in Alternatives C and E not burned as prescribed fire are predicted eventually to burn to a large degree as wildland fire in the fuel/fire models. The WEPP model translates that increase in burn severity as increased soil erosion rates on per acre basis, causing the overall erosion rate for Alternatives C and E to increase. The erosion rate for Alternatives B and D is the lowest of the five alternatives, mainly because much of the land treated in these alternatives is burned with low intensity/low severity fire. This retains much more protective soil litter, duff, and larger organic debris. In addition, the low soil temperatures associated with low fire intensity substantially reduce the occurrence of water repellent (hydrophobic) soil conditions. This results in a predicted reduction in overland flow and subsequent soil erosion. The WEPP models takes into account this reduction in water repellency.

The values for all alternatives presented above only consider the same land areas included for treatment in Alternative B. These values only tell part of the story. Under Alternative A wildland fires would burn much of the land surrounding these areas. The Fire Effects analysis in this chapter discusses this condition and those conclusions were based on observations of large scale wildland fires of the recent past. Approximately 60 to 80 percent of the land within the fire perimeter burned during wildland fires will burn as large, contiguous stand-

replacing fires. The size of these fires will be larger for Alternative A, in part, because there are few fuel breaks on the landscape. Under Alternatives B and D, some fuel breaks will occur due to the treatment of 225,000 acres of land. These fuel breaks will likely help reduce the size of future wildland fires, and this in turn will reduce the amount of soil erosion. It is not possible to predict how much soil erosion will be reduced during wildland fires outside burn units by Alternatives B and D. Neither is it possible to predict the benefits of Alternatives C and E over Alternative A when analyzing effects of wildland fires, but the benefits would theoretically be somewhat less than for Alternatives B and D, since fewer acres are treated as prescribed fire with Alternatives C and E. Alternative C would probably be more beneficial than Alternative E at reducing soil erosion due to wildland fire on lands outside of treatment units.

In summary, regarding soil erosion due to the proposed treatments and to potential losses from wildland fire, Alternatives B and D yield the lowest soil erosion, followed by Alternatives C, E, and A (in increasing amounts of soil erosion).

Effects on Long-Term Soil Productivity and Ecosystem Function

When soil erosion becomes severe enough, the losses of soil organic matter, nutrients, and mineral particles can cause losses in the productive potential of the soil. This happens when these erosion rates exceed the natural rates of soil formation. Data on natural rates of soil formation in arid to semi-arid mountainous wildlands is scarce to non-existent. The rates likely are substantially lower than those of soils in humid, temperate lands with gentle slopes with long frost-free seasons. The Natural Resource Conservation Service utilizes a standard system of assessing a soil's ability to sustain productivity based on soil depth, climate, rates of rock weathering, parent material, and ability to improve soil conditions through management. This is the Soil Loss Tolerance (T-factor). The T-factor guide developed by NRCS in the National Soil Survey Handbook (p. 618-83, Exhibit 618-14) was used to evaluate the effects of soil erosion predicted by WEPP on maintenance of long-term soil productivity. Based on this guide, an overall T factor for the project area is taken to be about 3 tons per acre per year (3 t/ac/yr) soil erosion. This means that in areas where soil erosion exceeds this 3 t/ac/yr, the erosion rate is considered to be greater than the rate of soil formation. Consequently, losses in long-term soil productivity and ecosystem function are expected. Alternatives A and B were evaluated for these effects due to prescribed fire and wildland fire. Based on the WEPP soil erosion model about twice as many acres of land would be at risk for soil erosion losses exceeding the natural rate of formation. The model predicts 108,700 acres of land at risk for Alternative A; whereas 55,300 acres are at risk for Alternatives B and D. These values are estimates of the acreages that are predicted to experience soil erosion losses severe enough to cause losses in long-term soil productivity and ecosystem function based on the 3 t/ac/yr assumed T factor. The values for Alternatives C and E would fall between these two figures.

The WEPP model does not predict soil erosion due to mass movement. Estimates of soil loss due to mass movement can be found in the hydrology effects analysis of this chapter in which the BOISED sediment model was used to assess eroded and mass failure soil material entering channels. Not all soil material incorporated in mass movement reaches the stream channel. The percentage of soil that remains on the slope (not delivered to channels) ranges from about 40 to 80 percent of the mass failure material for the steep landscapes of the

Salmon River Canyon. This means that the sedimentation values predicted by the sediment models yield amounts of soil movement lower than what actually is displaced on the slopes by mass failure. In the Salmon River Canyon the mass movement material will primarily come from debris avalanche and debris torrent events. An assessment of risk of mass movement based on Landtype Associations is presented below.

Risk Assessment Related to the Soil Resource

The following table presents soil-related interpretations based on Landtype Associations (LTAs) used for the risk assessment on soils effects. LTAs are aggregations of the smaller LTs (Landtypes), which describe landforms, parent material of the soil, potential natural vegetation, and climate.

Table 4 - 40. Soil Interpretations

LTA Symbol	Surface Texture	Average Slope	Debris Torrent	Slump/ Earth-flow	Surface Erosion Hazard	Hydro-phobi-city	Rain on Snow	Resilie-ncy
10A	L	5	L	L	L	N	Y	H
12A	L	5	L	L	L	N	Y	H
13I	L	10	L	L	L	N	N	H
17V	SIL	20	L	L	M	Y	Y	H
20G	SL	75	H	L	H	Y	Y	L
20M	SL	70	H	L	H	N	Y	M
20Q	SL	75	M	L	H	N	Y	L
20V	SIL	65	M	M	H	N	Y	M
26M	SL	70	H	L	H	N	Y	L
30I	SL	50	M	M	H	Y	N	M
31I	SL	50	M	M	H	Y	N	M
32I	SIL	50	M	H	H	Y	N	H
33I	L	50	M	L	M	N	N	L
40I	L	75	M	L	H	Y	N	M
41I	L	75	M	L	H	Y	N	L
42I	SL	75	M	L	H	Y	N	M
46I	SIL	35	L	L	M	Y	N	L
47I	SIL	65	L	L	M	N	N	M
48I	L	65	H	L	H	Y	N	L
49I	SL	65	M	L	H	Y	N	L
50I	SL	65	L	L	M	Y	N	L
51I	SIL	20	L	M	L	Y	N	M
52I	L	25	L	L	M	Y	N	M
53I	SIL	20	L	L	M	Y	N	L
54I	SIL	25	L	M	M	Y	N	H
55I	L	25	L	L	M	Y	N	H
56I	SIL	25	L	M	M	Y	N	H
60G	SL	50	M	L	M	Y	N	L
60K	SL	50	M	L	M	Y	N	L
60M	SL	45	M	L	M	N	N	L
60Q	SL	50	L	L	M	N	N	L
60V	L	45	L	M	M	N	Y	H

70G	SIL	35	L	L	M	Y	N	M
LTA Symbol	**Surface Texture**	**Average Slope**	**Debris Torrent**	**Slump/ Earth-flow**	**Surface Erosion Hazard**	**Hydro-phobi-city**	**Rain on Snow**	**Resilie-ncy**
70K	SL	35	L	L	M	Y	N	L
70M	SIL	35	L	L	M	Y	N	M
70Q	SL	35	L	L	M	N	N	L
70V	L	35	L	L	M	Y	N	M
71M	L	35	L	M	M	Y	N	M
80Q	SL	45	L	L	M	N	Y	M
80V	L	45	L	M	M	N	Y	M
83K	SL	40	M	M	M	Y	N	L
85K	SL	40	L	M	M	Y	N	M
85M	SIL	40	L	M	M	Y	N	H
85V	SIL	30	L	M	M	N	Y	H
90U	L	55	M	H	H	N	Y	M
95V	SIL	35	L	L	M	N	N	H

LTA Symbol - Landtype Association Map Unit Symbol.

Debris Torrent - The relative hazard of the LTA for debris avalanche/debris torrent.

Slump/Earthflow - The relative hazard of the LTA for slump/earthflow.

Surface Erosion Hazard- The relative hazard of the LTA for erosion of the surface soil material when it is bared of live and dead plant material following fire.

Hydrophobicity - "Yes" indicates the presence of surface soil that may readily become water- repellent (hydrophobic) following a moderate to severe fire, increasing the risk of over land flow and soil erosion.

Rain/Snow - The LTA occurs at low elevations where the likelihood of rain on snow is high at a time when soils are unfrozen, partially frozen, or thawing and have high erosion or high landslide hazard rating.

Resiliency - The relative rating of soil to maintain long-term productivity following removal of above ground vegetation, forest floor, and major portions of the coarse woody debris by fire. "High" indicates soil is relatively resilient to this type of disturbance.

Table 4 - 44 can be used to better assess the risks of the four alternatives negatively affecting the soil resource.

The data in this table show that Alternatives B and D consistently yield the least risk to the soil resource regarding these four risk assessment categories. The risk to soils for the other alternatives increases in the order of: Alternative C; Alternative E; and Alternative A. Alternative A burns with moderate or severe fire on more than twice as many acres of soil with high mass movement hazard and on soils slow to heal following severe fire as Alternatives B and D. The differences among the four alternatives for risk of moderate or severe fire on erosive soils is not as dramatic. However, as discussed above, the amount of soil erosion for Alternative A is more than twice that predicted for Alternatives B and D.

Table 4 - 41. Acres predicted to burn moderately or severely on soils sensitive to erosion, mass movement, water repellency, and with low resiliency.

	Alternative A (acres)	Alternatives B,D (acres)	Alternative C (acres)	Alternative E (acres)
On moderately to highly erodible soils	57721	51360	53040	54702
On soils with high mass movement hazard	39553	18228	23519	28068
On soils prone to water repellency with severe fire	50695	35250	39062	42373
On soils that heal slowly following severe fires	67939	30215	39577	47641

Summary of Soil Effects, Direct and Indirect

For all the different analyses discussed above Alternatives B and D consistently are the least impactive to the soil resource. Alternative A is the most impactive and Alternatives C and E are between these two with Alternative C being somewhat less impactive than Alternative E.

Cumulative Effects on the Soil Resource

Cumulative effects on the soil resource include past effects from timber harvest, grazing, mining, and fire. Timber harvest typically causes substantial soil damage due to the use of heavy equipment for harvesting, yarding, and site preparation. The damage mostly includes soil compaction and displacement of the organic rich surface soil layers. Logging over the past several decades frequently has resulted in amounts of soil damage that do not meet the Forest Plan and Regional Soil Quality Standards of the Forests covered in this project. Where tractor yarding and tractor-piling have occurred, typically from 30 to 80 percent of a treated unit will have soils damaged to a degree that long-term soil productivity has been reduced substantially. The Soil Quality Standards currently specify that no more than 20 percent of an activity area (treatment unit) may have soils damaged to that extent.

Where heavy grazing has occurred in the past, there is also a likelihood that soils have been damaged to the degree that their productivity has been reduced. This is especially true in riparian areas. These areas generally have soils that are easily compacted and are areas where cattle tend to linger if not managed well. Mining also has significant effects on soil quality through soil compaction and displacement.

Severe past fires have consumed surface organics and volatilized nitrogen into the air. On some sites these severe burns are a natural process and therefore the inherent soil productivity can not be assumed to be reduced. On other sites, however, where typically low

intensity underburns occurred, high intensity wildland fires have consumed amounts of soil organics in excess of the historic range of variability. Furthermore, excessive soil heating in these intense fires likely resulted in creation of water repellent soils and therefore increased overland flow and soil erosion. In these cases, it can be assumed that the wildland fires have reduced long-term soil productivity.

Soil compaction damage typically is persistent in the project area; several to many decades of rest from further compactive forces are needed until adequate soil recovery occurs. Losses of organics due to displacement and severe fire also require decades to recuperate. This slow recovery from soil damage makes cumulative effects a major concern regarding soil productivity and soil hydrologic function.

Because data were not available to assess neither the degree or the areal extent of these previous impacts to the soil resource, a numerical evaluation of the cumulative effects of the four alternatives in this project could not be made. Most likely some of the areas that would be burned in these alternatives already have considerable soil damage and may even have damage that surpasses Soil Quality Standards. Further damage can be expected by all of the four alternatives. However, based on the direct and indirect soil effects analysis from above Alternatives B and D will have the least negative cumulative effects on soils, followed by Alternatives C, E, and A in increases negative effects.

Regarding cumulative effects and Soil Quality Standards (SQS), as discussed above, the SQS of all Forests require that no more than 20 percent (15 percent in R- 4)of a treatment unit may have soils damaged to a degree that long-term soil productivity and hydrologic function are reduced at the completion of the treatment. Since some areas already presumably have soils that do not meet these standards, and since no restorative treatments such as decompaction are planned under this project, these SQS will not be met. Nor is it necessarily advisable to attempt mechanical soil restoration on many sites in this steep, rocky, erosive land; for there is a very real potential that any such attempts will cause much more damage than already exists. For the most part, letting the soils heal themselves will likely be the best approach. Some benefit to damaged soils may be achieved through biologic mitigations such as shrub and tree planting, grass seeding, and fertilization (either organic or inorganic). There is no universal agreement on how to apply the SQS to areas with soils already damaged beyond the standards. It can be argued that the Forest Service can not add to the damage and that based on SQS must leave the soil within SQS at project completion. In light of the uncertainty of soil restoration in these mountain soils, that does not seem plausible. It can also be argued in the case of this project that in order to minimize future cumulative damage to soils already degraded, a prescribed fire is more desirable than a high intensity wildland fire, even though both will further impact soils that are not within SQS. The prescribed fire will in the long run have less cumulative negative effects on the soil than allowing future high intensity fires to burn through the no action alternative. It is beyond the scope of this analysis to resolve these types of debates.

Irreversible Or Irretrievable Commitment Of Resources

Accelerated soil erosion that is greater than the natural rate of soil formation and soil losses from mass movement are a loss of long-term soil productivity and constitute irreversible

commitment of the soil resource. All action alternatives and the no action alternative have the potential to initiate, inadvertently, accelerated soil erosion and mass movement, especially in areas of severe burn. Estimates for all five alternatives of risks of accelerated soil erosion and mass movement are discussed above in the soil effects analysis. The locations and acreage of actual loss of long-term soil productivity can not be determined because too many variables and combinations of variables involved are unpredictable. There are no irretrievable losses of the soil resource associated with any of the five alternatives.

AIR QUALITY

Fire history studies show that historically an average of 53,000 acres burned annually within the project area (Barrett 1998). From 1970-1998 the planning area averaged 14,000 acres of wildland fire and 3,000 acres of prescribed fire (mostly logging slash) per year. The natural range of variability for smoke in the planning area probably ranged from very clear and clean in the non-fire months (November to May) to hazy and smoky for extended periods during the fire months (June to October). Current air quality within the planning area during non-fire months is probably close to the natural range of variability, while during the fire months air quality is probably outside the natural range (i.e., cleaner), except when large wildland fires are burning in the region. This is because under current policies most wildland fires are suppressed, and therefore the amount of smoke has been greatly reduced from previous historical averages.

Alternative A (No Action)

There would be no direct effects to air quality from this alternative because no large scale prescribed burning would take place. Indirect effects would be that fuel loadings will continue to increase and large wildland fires will continue to occur. This would produce a two to four times greater amount of smoke than would be generated by prescribed fires (Quigley et al., pg. 906). Increased fuel accumulations combined with multiple fire starts will eventually produce large, higher intensity wildland fires that could exceed EPA standards for ambient air quality for most of the airsheds within or in proximity to the planning area. Not implementing large-scale management ignited prescribed fire precludes the forests' ability to reduce fuels. Thus during multiple fire starts, we lessen our ability to suppress fires that can help to mitigate poor air quality conditions.

Alternative B (Proposed Action)

Direct effects of this alternative would be an increase in short-term particulate matter concentrations that would result from the proposed acres to be burned (see table below). Indirect effects would be a decrease in long-term wildland fire emissions produced by a reduction in the overall fuel loadings following implementation of prescribed fire. Implementation of this alternative will increase our ability to manage natural ignitions due to the decrease of forest fuels and therefore fire intensities. As a result this may help to reduce the amount of smoke produced.

Alternative C

The direct and indirect effects of this alternative would be similar to the Proposed Action for those areas proposed for burning (see emission table below). The difference between this alternative and the proposed action is that air quality as related to the Class I and Class II portions of the Project Area would be less affected, because this alternative excludes burning in wilderness under this proposal. This alternative would also have less effect on air quality along the Salmon River because the units excluded from this alternative border the Salmon River.

Alternative D

The direct and indirect effects of this alternative would be very similar to the Proposed Action, Alternative B, (see emission table below). The primary difference would be due to the timing of the prescribed burns. In this alternative burning would occur from February through April and August through November. The effects to air quality would be less to those users that frequent the area during the months of May through July.

Alternative E

The direct and indirect effects of this alternative would be similar to the action alternatives for those areas that are proposed for treatment (see emission table below). These areas are wilderness or roadless, and comprise the least amount of prescribed burning when compared to all the action alternatives. This alternative would have less effect on the Hells Canyon Wilderness, a designated Class I airshed, and would also have less effect on areas around Riggins, Salmon and the Bitterroot Valley.

Particulate emissions were calculated using fuel loadings derived from fuel model classifications. Development of fuel models followed a process designed by Keane (1998). Fuel loadings, fuel moistures, and expected fire behavior were then calculated using the First Order Fire Effects Model. Particulate Matter (PM) of 2.5 microns and 10 microns in size are displayed in predicted tons/year by alternative over a five and ten year time frame for comparative analysis.

Smoke Dispersion and Concentration

NFSPUFF, a computer modeling program, was used to estimate potential air quality effects by modeling smoke dispersion and concentrations. Potential receptor sites were chosen that are expected to be affected from prescribed burning projects included in the action alternatives. These sites include: the Hells Canyon Wilderness and Selway Bitterroot Wilderness, both designated Class I airsheds; the Gospel Hump and Frank Church River of No Return Wilderness, both designated Class II airsheds; and the local communities of Missoula, Bitterroot Valley, Salmon, Grangeville, Riggins, Highway 95, Boise and McCall (see attached maps).

Table 4 - 42. Emissions By Alternative, Based On 5 & 10 Year Implementation

	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E
Spring Burn Acres (these are predicted smoke producing acres)		110,582 acres	85,266 acres	110,582 acres	57,343 acres
Fall Burn Acres (these are predicted smoke producing acres)		103,842 acres	82,535 acres	103,842 acres	63,997 acres
PM 10 Emissions 5 yr and 10 yr Implementation		3,477 tons/yr (5 yr impl.) 1,739 tons/yr (10 yr impl.)	2,773 tons/yr (5 yr impl.) 1,387 tons/yr (10 yr impl.)	3,477 tons/yr (5 yr impl.) 1,739 tons/yr (10 yr impl.)	2,106 tons/yr (5 yr impl.) 1,053 tons/yr (10 yr impl.)
PM 2.5 Emissions 5 yr and 10 yr Implementation		2,956 tons/yr (5 yr impl.) 1,478 tons/yr (10 yr impl.)	2,357 tons/yr (5 yr impl.) 1,179 tons/yr 10 yr impl.)	2,956 tons/yr (5yr impl.) 1,478 tons/yr (10 yr impl.)	1,790 tons/yr (5 yr impl.) 895 tons/yr (10 yr impl.)

Two separate runs were made with NFSPUFF. The first run modeled what is termed the worst case scenario, i.e., all of the Ranger Districts burning units simultaneously in the fall. The combined acres of six units equaled 3,000 acres burning per day, for a six day period. The following inputs to NFSPUFF were used to represent the expected worst case scenario:

- Background levels at each receptor site were set at 40 micrograms/cubic meter of PM 10 (this accounts for other sources, like agricultural and other forest burning).

- A burn period of September 15-20, as fall airsheds are typically most affected from prescribed burning.

- Weather and fuel conditions were selected to represent a possible worst case scenario. These were temperature inversion conditions for Riggins/Highway 95, with steering and transport winds sufficient to reach sites like Missoula. Fuel moisture inputs were 8 percent for 10 hour and 15 percent for 1000 hour fuels.

- Residual PM levels were also added to each day from previous days burning. Residual PM levels were modeled from actual PM levels measured on similar multiple day prescribed burns on the Okanogan forest (data provided by Tom Leuschen).

The probability that all six units would be burning at the same time over the same extended period is doubtful, due to all the variabilities that come into play. However it was felt that this represents the maximum smoke emissions expected to occur at one time.

The second NFSPUFF run modeled four Ranger Districts burning at the same time period in the fall. These four units modeled 2,000 acres per day for a six day period. This run represents the expected average maximum acres with expected average environmental conditions.

- Background levels were assumed to be 15 micrograms/cubic meter of PM 10. This accounts for other emission sources at this time of year, for example agricultural fires or other forest burning.

- A burn period of September 15-20 was used, with weather and fuel conditions that represent average fall conditions. Fuel moisture inputs were 12 percent for 10 hour and 25 percent for 1000 hour fuels.

It is estimated that four Ranger Districts burning units at the same time period in the fall would be quite likely. Residual PM levels were not added, as this represents good mixing and transport of smoke emissions.

Summary of Results

Modeling results were then compared against National Air Quality Standards for particulate matter and threshold levels developed in conjunction with Montana and Idaho DEQ to help coordinate and forecast potential smoke impacts due to wildland and prescribed fire. The threshold levels serve as guides to help manage smoke but have not been adopted into regulations by Montana or Idaho DEQ.

For the worst case scenario, Missoula, Hamilton and Salmon reach 98 and 99 twenty-four hour average particulate matter 10 concentrations on day six. This rates as poor quality but is within the NAAQS standards. Riggins 24 hour average PM 10 rates were 110-160, or unhealthy by the second day, and reaches hazardous levels by day six. A similar pattern and concentrations were predicted for Grangeville. This modeling shows that under these worse case scenarios, air quality could be compromised at several locations in the communities surrounding the project area.

Normal scenarios as described earlier show the following effects for the 24 hour average PM 10 concentrations. Missoula, Hamilton and Salmon would experience up to 30 micrograms per cubic meter 24 hour average levels of PM 10. This rates as well within air quality standards and just between a level I and Level II threshold.. Normal scenarios for Riggins, Grangeville, and McCall also show good air quality with up to 30 micrograms per cubic meter for 24 hour pm 10 levels. These 24 hour averages depend on steering and transport wind direction, therefore not all sites will experience these values at the same time.

Expected effects to Hells Canyon Wilderness and the Selway Bitterroot Wilderness, both Class I Airsheds, show a possible increase of 1-15 micrograms per cubic meter for the average 24 hour pm 10 levels. This indicates we would be at the maximum level allowed under the EPA standard for Prevention of Significant Deterioration in Class I airsheds, which is eight micrograms per cubic meter. Effects to the Gospel Hump Wilderness and Frank Church River of No Return Wilderness, both Class II Airsheds, show that under the normal scenario Gospel Hump can expect a 1-15 micrograms per cubic meter 24 hour PM 10 average. This is below the EPA standard for Prevention of Significant Deterioration in Class

II Airsheds of 30 micrograms per cubic meter. The Frank Church can expect a mix of 1-15 and 15-50 micrograms per cubic meter of the 24 hour PM 10 average; this indicates we would be at the maximum allowed under the standard set by EPA for Prevention of Significant Deterioration for Class II Airsheds.

Table 4 - 43. National Ambient Air Quality Standards.

Pollutant	Averaging Time	Standard
PM - 10	24 hours Annual	150 50
PM - 2.5	24 hours annual	65 15

Table 4 - 44. Suggested Air Quality Threshold Levels

Level	24 hr Average Particulate Matter Concentration (PM - 10)	Description
I	0 - 30	No restrictions to prescribed fires or fires used for resource benefits based on air quality information.
II	31 - 50	*Air Quality "watch":* No restrictions to prescribed fires or fires used for resource benefits based on air quality information but a closer watch on conditions by Smoke Management Coordinator. If conditions worsen, burners may be restricted by geographic region or airshed.
III	50 - 70	*Air Quality "Warning";* Air Quality conditions are worsening and are expected to persist. Depending on season and conditions, future prescribed and resource benefit fires may be restricted due to air quality concerns. Burners should consider reducing smoke impacts by limiting future resource benefit fires through their two hour go/no go decisions. Formal restrictions may occur at Air Quality Restriction Level IV.
IV	70 +	Air Quality "Alert"; Air Quality conditions are worsening and are expected to persist. Future prescribed and resource benefit fires may be restricted due to air quality concerns. An "Air Quality Coordinating Committee" composed of NWS, MT and ID DEQ, R - 1 and R - 4 FS, and others (BLM, NPS, etc) will interface with existing fire coordination centers and infrastructure on daily air quality restrictions and direction. Final decisions on air quality restrictions are always retained with the state regulator agencies. At this level, the process has to address the two hour go/no go decision timeframe required for resource benefit fires.

Spring burning was not modeled through NFSPUFF. Environmental conditions associated with spring burning (high fuel moistures, good mixing and transport, considerably less consumption) usually combine to lessen impacts to all airsheds. FOFEM (First Order Fire Effects Model) outputs of PM 10 emissions for spring burning versus late summer or fall burning show an average of 60 percent less emissions from spring burning than late summer or fall burning, for the proposed burn units within the Project Area. By using the 60 percent

less PM 10 factor and applying it to the normal scenario, all receptor sites modeled would rate as having good air quality (0-30 micrograms/cubic meter). While these predicted emissions for spring burning do not of themselves seem to compromise airsheds, we only have to look back to the spring of 1998 when a chain of events did compromise air quality in the springtime, and one of the many sources contributing to that event was prescribed burning from Forest lands.

The Nezperce National Forest is a participating member of the North Idaho Smoke Management Memorandum of Agreement, the Payette and Salmon-Challis National Forests will be members of the new South Idaho Smoke Management Memorandum of Agreement currently being formed and expected to be in effect in the year 2000. These agreements require members to submit a list of planned burns to the Monitoring Unit in Missoula, Montana. The Missoula Monitoring Unit issues daily decisions which can restrict burning when atmospheric conditions are not conducive to good smoke dispersion. Restrictions may be directed by airshed, elevation or by special impact zones around populated areas. This process will be in effect for all the proposed burn units and will provide overall monitoring of the airsheds involved. This monitoring should provide sufficient mitigation for air quality effects of the Salmon River Canyon Project.

SOCIAL VALUES/RECREATION

PHYSICAL SETTING

Wildland fire has played a natural role in this ecosystem thus appearance of fire is natural from an ecological standpoint. If suppression efforts were utilized, especially in the designated wildernesses, potential visual effects would be visual evidence of human suppression, for example wide and straight fire lines. Using Minimal Impact Suppression Techniques (MIST) Guidelines would reduce the effects of this activity.

SOCIAL SETTING

Residents

Smoke generated from the prescribed burning will result in decreased air quality within the planning area including the populated areas of Riggins, Salmon, Hamilton and Grangeville. The level of air quality degradation is dependent on the amount of area burned at one time and any other burning activities that are occurring. Due to seasonal dispersal patterns, this impact is expected to be most noticeable during the fall season when the fuels are generally dryer and inversion layers are more prevalent. The discussion of impacts to air quality can be found in the Air Quality section of this chapter.

Alternative A

This alternative would have no direct impact on the residential areas within or adjacent to the planning area. However, as fuel loading increased and fire suppression continued, the chances of wildland fires would increase. These fires would produce two to four times the

amount of smoke as using prescribed fire over the same acres. There is also no method of limiting the acres burned with a wildland fire, thus exacerbating the air quality degradation.

Alternatives B, C, D, and E

With all action alternatives, prescribed burning would result in some degradation in air quality in the spring and in the fall. Spring burning is expected to reduce this degradation through lower fuel consumption and normal weather patterns. Alternative D would have somewhat less effect because this alternative limits the period in which burning would be occurring to outside the growing season thus reducing the seasonal periods burning would occur.

Power boaters and floaters

Fires are a natural occurrence within the Salmon River Canyon. Rafters in July and August will often see either fire or smoke when traveling down the corridor. Most of these fires are from natural ignitions. If fires are active, some float parties may elect not to launch from Corn Creek because of perceived danger or health condition. Parties who become aware of fires while on the river may elect to end their trips prematurely to avoid smoke conditions and potential fire dangers (rolling rocks, snags etc.). This situation was observed during the 1994 fire season when parties elected to end their trips at Mackay Bar rather than float out. This may result in reduced income for some outfitters.

Most spring prescribed burning begins in March in the lower elevations. This burning is almost entirely done by the Forest Service, Bureau of Land Management, or the State of Idaho. This activity will continue as late as June in the higher elevations. Most fall prescribed burning generally ranges from September through November depending on burning conditions. Therefore, most recreational floaters will not experience extensive smoke from these alternatives in the river corridor during the main float season. However because power boating activities are highest during the fall months, they may be affected by fire activity. Like float boaters, power boaters may decide to reduce their time on the river where they are affected by smoke or rolling rocks or snags. Hunting parties may be affected because fires may move big game populations into other areas or reduced visibility may affect scouting for game animals. Fire extent and intensity may force area closures within some hunting units to ensure hunter safety.

Fires burning under prescribed conditions generally consume less fuels than wildland fires due to higher fuel moisture and higher humidity. Therefore, impacts of smoke to rafters is expected to be less than natural ignition fires. However, air inversions are more common during fall burning periods and thus the smoke may remain within the river corridor for longer periods of time.

Anglers

Anglers are expected to be most affected by the smoke during most of the fall salmon run (approximately September through November). Mitigation measures designed to reduce the impacts to the population centers are expected to reduce the degradation but will not eliminate smoke in the air. While burning with all alternatives will occur during heavy use

periods of time for both spring and fall runs, the weather patterns and low smoke emissions resulting from spring burning are expected to greatly reduce the impacts during those periods. Areas of heaviest use during these periods are between the Little Salmon River and Vinegar Creek and between the Middle Fork of the Salmon River and the North Fork of the Salmon River.

Hunters

All alternatives are expected to alter wildlife habitat and movement patterns. Burning is expected to initially reduce forage for big game and eventually result in succulent forage. There is a possibility this could result in use pattern shifts of big game.

Areas where fall burning occurs may also result in area closures while the burning is occurring. These areas would be closed only during the period of active fire behavior and the impacts are expected to be minimal. The impacts from smoke will be similar to those mentioned above for fall burning.

Hikers

As much of the hiking occurs during the portions of the year outside the spring prescribed burning period, the impacts to hikers during that season should be minimal. Fall burning may result in some hikers avoiding some trails during burning. While there may be some displacement of hikers during these burning activities, this displacement is expected to be minimal because not all units or areas will be ignited at the same time. Signs posted at trailheads informing hikers of upcoming burns will increase awareness and reduce use in those areas.

General Recreation

The proposed action and all alternatives to the proposed action would result in temporary access restrictions during burning operations. In addition, spring burning in some areas may result in loss of berry picking areas for the year of the burn. This burning is expected to increase the amount of berries available the following year. All action alternatives would result in improved outdoor experiences conditions as the landscape is opened up and undergrowth is reduced.
While none of the action alternatives would reduce the risk of a wildland fire occurrence, reduction in fuels would have the effect of reducing the wildland fire intensity. This could have the effect of protecting those camp sites within the burn areas from the devastation of a high intensity wildland fire.

Permittees

Livestock Grazing

Grazing permittees are discussed in Range (pg 192)

Outfitter and Guides

Potential effects to outfitter and guides due to project implementation are the same effects for the hunters, anglers, and boater user groups listed previously. Additionally, there could be some potential temporarily economic loss to these businesses. As mentioned above, guided parties on the river trips may cancel trips due to smoke conditions or take out of the river earlier than planned. While this may result in economic loss to some outfitters, the effects are expected to be less than in a wildland fire situation. That is because wildland fires most often occur during the most heavily used time of year for outfitter rafting.

Hunting outfitters may be affected due to burning within or near outfitter camps. The advanced notification will minimize this impact by allowing them to schedule alternative hunting camps during the burning operations. The burned areas are expected to provide extra forage the following year and may result in increased opportunity for successful hunts within the burned areas.

Other Resources

Timber

While elimination of the competing undergrowth has shown to increase growth of the overstory trees, none of the alternatives are expected to affect the timber industry or affect the economic conditions of the communities dependent on the timber industry.

All action alternatives use prescribed fire within areas designated as suitable for timber production. These prescribed fires are designed to burn under controlled conditions with low flame lengths and low intensities. However, past burns have shown that some commercial-sized trees will be killed with the use of prescribed fire. These trees are sparsely spaced and it is usually not economically feasible to remove them. In the event that a sufficient amount of timber is killed to allow economically viable removal, the Forests may prepare the timber for sale following appropriate disclosure of environmental documents. This timber would be available in non-wilderness units with all action alternatives. However, alternative E would provide less of an opportunity for salvage of burned trees due to non-wilderness units benerally less accessible (i.e. RARE II areas).

Cumulative Effects

The proposed action and all alternatives will be burning within the Salmon River canyon. There is the potential for extended periods of smoke through agency activities, state burning, and wildland fires. While mitigation measures have been incorporated to minimize the health and recreational impacts of all alternatives, repeated seasons of smoke may have cumulative impacts on outfitters through losses in revenue from cancelled trips. This is also possible for one season if smoke from the proposed activities occur after an extended fire season. Residents of adjacent communities may also be impacted under these conditions through losses in business revenues and longer periods of poor air quality related health problems.

Environmental Justice

Executive Order 12898 requires an analysis of the impacts of the proposed action and alternatives to the proposed action on minority and low income populations. It is designed in part :...To identify, prevent, and/or mitigate, to the greatest extent practicable, disproportionately high and adverse human health or environmental effects of USDA programs and activities on minority and low income populations..."

No alternatives considered in detail, including the no action alternative, will have a disproportionate impact on minority or low income populations. All affected communities have been involved in the NFMA and scoping portions of this project and will have an opportunity to comment on the DEIS.

RANGE - Livestock Grazing

General Fire Effects to Rangeland Vegetation

The response of native grass and shrub species to fire has been described elsewhere in this document. The action alternatives will focus on igniting in those potential vegetation types (PVTs, as described in chapter 3) which historically have had frequent fire. In the planning area, these are typically adjacent to the non-forested communities. The Conifer/Grassland PVT typically borders the upslope side of the Dry Grassland PVT and the downslope side of the Warm Forest with Ponderosa Pine PVT, especially along the main Salmon River.

Low to moderate intensity fire stimulates regeneration of those species which have become decadent due to fire exclusion. Within the Mesic Shrubland PVT, the root crown sprouting shrubs species particularly benefit. If conifers are present, and are killed by the fire, this opens up the canopy and also enhances regeneration of those species which are shade-intolerant; this includes many of the root sprouting shrubs. This is evident on the moister sites (particularly on the north-facing or higher elevation sites on the Payette National Forest), where large shrubfields dominated by maple, alder, ceanothus, and/or ninebark are maintained by frequent fire, resulting in bushy shrubs with dense foliage. Root crown sprouting species include: Rocky Mountain maple, serviceberry, netleaf hackberry, oceanspray, poison ivy, cascara, currant, syringa, ceanothus, ninebark, chokecherry, Wood's rose, and elderberry. Sprouting after fire occurs in varying degrees, depending on burn severity (Fire Effects Information System - FEIS). If the fire is moderate or high intensity, there may be some shrub mortality, depending on the species.

In dry shrubland communities, Wyoming, mountain, and basin big sagebrush do not regenerate from root crown sprouting. Almost all fires, except the non-lethal, will kill the sagebrush. However, mountain big sagebrush can quickly recolonize the site by seed sources (Hironaka and others 1983). Curlleaf mountain-mahogany also may depend on fire to reduce conifer competition and produce favorable soil conditions for seedling establishment, although individual mahogany are severely damaged by fire (FEIS). Mountain-mahogany often grows on extremely rocky sites which are unlikely to burn, which is another adaptation to surviving in a frequent fire regime vegetation type (FEIS).

In both dry shrubland and grassland communities, grass species response to fire varies, based on amount of dead residual leaves, plant vigor, and timing of the burn. Idaho fescue is especially susceptible to mortality, especially in the late summer (Tisdale 1986). This is due to its tight, rolled, fine leaves at the budding zone and its densely tufted habit (Conrad and Poulton 1966). The root crown may die if the above conditions create a hot burn. Early spring burns damage Idaho fescue the least when it is dormant; there typically will be healthy post-burn root crown regeneration. Soil moisture is less important than dormancy in fescue survival (Britton and others 1983). Bluebunch wheatgrass recovers quickly, even after a severe burn, since the reproductive buds are well below the soil surface (FEIS). Needle-and-thread grass, common in the dry grasslands of the planning area, may be more susceptible to summer burns than bluebunch wheatgrass, due to the dense leaves at the base of the tuft (FEIS). It will regenerate from seed, most likely transported from unburned areas by animals or wind, and has the greatest chance of survival during dormant season burning.

If cheatgrass is a dominant in the undergrowth of dry shrubland communities, fire will increase cheatgrass at the expense of native bunchgrasses and sagebrush (Tausch and others 1995). Too-frequent fires favor cheatgrass by eliminating competing perennial vegetation. Cheatgrass seeds can survive in mineral soil even if some of the litter is consumed. Conversely, burning cheatgrass may reduce the next year's plant production, although seed production may increase (FEIS).

Direct, Indirect, and Cumulative Effects from Fire and Grazing

Both fire and grazing are disturbance factors in upland ecosystems. Dead plant material is removed, areas are opened up for seeding, and plant diversity and vigor increase and stay productive with periodic burning. Periodic fires, whether natural or prescribed, enhance vigor of most perennial grasses, remove decadent shrubs and encroaching conifers, and encourage sprouting of certain shrub species, depending on fire timing and intensity. This increases available livestock forage. Prescribed burning has been identified in the Salmon Forest Plan, among others, as a tool to restore vigor to rangeland grass communities.

Depending on forage, water, and steepness, among other things, not all areas of each allotment are used equally by livestock. Overgrazing can remove desirbable plant species and encourage infestations of exotic and noxious weed species, and affect riparian areas. Livestock patterns of use could be further affected by the proposed burning. Pastures within burn units may possibly have to be rested prior to burning in order to create sufficient fine fuels to carry fire. This will be determined for each unit by the Forest Rangeland Specialist and Fire Management Officer. Following ignition in all allotments and pastures in the proposed action, adjustments in turn-out dates and grazing duration would be evaluated by Forest/District rangeland management specialists and permittees. Where possible, burning and post-burn vegetation recovery would coincide with pasture rest rotations. The burn schedule in Appendix B shows total acres to be burned in the spring and fall in each unit for each alternative. For many permittees, the proposed project may involve short term displacement, while long term project results would improve forage. All range improvements (springs, fences, etc.) will be protected, according to the mitigation presented in chapter 2.

Past cumulative effects on non-forest rangeland vegetation in the planning area include the timing, permitted numbers, and duration of grazing; fire events; and timber harvest activities.

Season-long grazing involving common use by cattle and sheep were historic uses that altered upland and riparian conditions. Plant diversity likely decreased where perennial grass communities were invaded by exotic and noxious weed species. Portions of allotments were under-used, due to water scarcity, steep terrain, etc., leading to decadent plant conditions associated with decreased vigor. In riparian zones, livestock concentrations likely decreased plant vigor and led to replacement of desirable aquatic plants (e.g., sedges) by less stable, grazing-tolerant grasses (e.g., Kentucky bluegrass).

Current and future cumulative effects in the planning area include fire, grazing, and noxious weed management. Numbers of animals have been reduced since grazing regulation began around 1940 (see chapter 3). Proposed prescribed fire plans and wildland fires will slow conifer and sagebrush encroachment, thereby maintaining vigorous native grasslands (see Effects of No Action, below). Noxious weed management is occuring throughout the planning area, and is described in the Noxious Weeds section elsewhere in this chapter.

General Effects of No Action

Most of the non-forested plant communities in the planning area have experienced conifer encroachment due to fire exclusion. The Dry and Fescue Grassland potential vegetation types (PVTs) that border the Warm Forest with Ponderosa Pine PVT typically have seedling and sapling conifers at the transition zone between the two types. If fire continues to be excluded from both the forest and non-forest PVTs which have historically had frequent fires, these types will become dominated by conifers. The non-forested communities will decrease in size. True grassland communities, or those that don't require fire to maintain them, still have a history of fires which maintains vigorous and regenerating vegetation. Lack of fire can lead to decadent plants, even among herbaceous species. "Wolf" bunchgrass plants are common in communities where individual plants have not had top growth removal, through either fire or grazing. Most herbaceous species will either regenerate by seed or by sprouting of root crowns and rhizomes (underground stems).

The Mesic Shrubland PVT is dominated by root crown sprouting species which are well-adapted to fire. Frequent fires of varying regimes promoted shrub regeneration and dominance through root crown sprouting, and kept the shade tolerant young conifers (e.g., grand fir, Douglas-fir) from maturing and dominating. Fire exclusion has resulted in more decadent shrub species, with growth forms that can be mostly dead stems, with foliage confined to the tops of the shrubs.

The Dry Shrubland PVT will be least affected by the no action alternative. If fire is excluded from these communities, particularly those sagebrush types with high cover of cheatgrass, they will continue in a "stable state" indefinitely (Tausch and others 1995). The Conifer/Grassland PVT will probably have an increase in seedling and sapling conifers with fire exclusion.

Effects by Action Alternative:

Table 4 - 45 (below) shows those proposed burn units which occur in active allotments, and the percentage of each allotment which is affected. Acreages are displayed for all

alternatives. For each unit, acres to be burned in spring and fall and proposed years of burning are shown in Appendix B.

Table 4 - 45. Active allotment acres affected by each alternative.

Unit No.	Alts. B and D Burn Acres	Alt. C	Alt. E	Allotment	Allotment acres	Total % of affected area in allotments for Alts. B and D
2A	3,882	3,882	1,346	Cannonball	24,050	16%
2B	5,054	5,054	1,834	Papoose	12,350	41%
2C	8,694	8,694	1,712	Race Creek	2,580	
2D	6,390	6,390	0	Cow Creek	30,180	
2E	9,781	9,781	0	Sherwin Creek	4,060	100%
				Christie Creek	8,400	
4C	14,975	14,975	1,717	Allison/Berg	37,910	40%
4D	8,108	8,108	0	Allison/Berg	37,910	
5	5,001	3,182	2,094	Mallard Creek	30,800	
8	4,073	4,073	2,666	Boulder Creek	17,608	
9	2,159	2,159	2,159	Fall Cr. -White Bird Ridge	21,327	10%
10	2,113	2,113	2,113	Fall Cr. -White Bird Ridge	21,327	10%
11	12,304	12,304	10,063	Hershey Lava	20,220	15% of combined 3 allotments
				French Cr.	25,924	
				Bear Pete	34,285	
					total 80,429	
23	5,235	5,236	0	Indian Ridge	50,445	
				Sage Creek	12,638	

Alternative A

This alternative should have no direct impact to permittees. There would be no need for grazing deferment. In the event of a wildland fire, the impacts to the permittee would be expected to be longer deferral periods over larger portions of their allotments. One of the indirect effects of this alternative would be the continued encroachment of brush and small trees in historically open areas, resulting in continued loss of forage and foraging areas. Vigor of perennial grasses and sprouting shrubs would be decreased.

Alternatives B, C, and E

These alternatives are expected to result in increased forage on all allotments within the burned areas. However, these alternatives burn the most acres that are used by permittees. Percentages of allotment affected varies by alternative, and ranges from 10% in the Fall Creek--White Bird Ridge allotment (Payette National Forest) to 100% of the Sherwin Creek allotment (Nez Perce National Forest). Where possible, scheduling of burning to coincide with pasture rest rotations will minimize these effects. Table 4 - 45 displays acres for each allotment which will be affected in each alternative. In the Cannonball, Papoose, Cow Creek, Sherwin Creek, and Christie Creek allotments, the north facing slopes will be ignited

in the fall and the south facing slopes ignited in the spring. This is expected to allow grazing on portions of the allotments throughout the grazing season.

For Alt. E, the Cannonball, Papoose, Cow Creek, Sherwin Creek, and Christie Creek allotments would be minimally affected because only small portions of these allotments are inside roadless areas.

Alternative D

Increase in forage, acres burned, and effects to permittees would be the same as Alternative B. This alternative will have the greatest positive effect on those grass and shrub species which are most sensitive to non-dormant season fire. In particular, Idaho fescue and needle-and-thread grass will have a higher survival rate using this alternative.

Forest Plan Consistency

Prescribed burning has been identified in the Salmon Forest Plan as a tool to restore vigor to rangeland grass communities.

Irreversible or Irretrievable Commitment of Resources

There is no irreversible or irretrievable commitment of resources.

WILDERNESS

The effects of management-ignited fire in Wilderness occur on many levels. Some of the hardest to analyze and resolve are those of a philosophical nature. There is no question that fire suppression has changed natural conditions and natural processes within some Wilderness areas (Arno 1985, 1980, Blackburn 1993, Dennis 1985). However, there is considerable debate about how to address these changes in the context of the Wilderness Act. The Wilderness Act states that Wilderness should be fundamentally "natural," "unmanipulated," "untrammeled," and "wild." The Code of Federal Regulations 36CFR293.2 states that "National Forest Wilderness resources shall be managed to promote, perpetuate, and where necessary, restore the wilderness character of the land...." It further states that "natural ecological succession will be allowed to operate freely to the extent feasible."

This raises the question as to what is the "natural" condition of American forests. Fire exclusion has changed the character of dry western forests, from the open, park-like character typical of pre-settlement times to denser, more closed-canopy forest types. (Arno 1988). This change parallels the shift in fire regimes, from frequent low-intensity fires to more infrequent, high intensity fires (Fire Regimes, Chap 3). Some authors note that this change was already underway before large scale-fire suppression became widespread:

> "A substantial reduction in wildland fire occurred over much of the west by 1880 or even before. It coincided with the disintegration of the cultures of native peoples in the area, virtualy all of whom actively used fire as a major land management tool." (MacCleary 1998).

There is abundant literature that documents Native American use of fire in western forests (Anderson 1990, Arno 1985, Pyne 1982, Williams 1995), and some anecdotal reports of fire use on the Payette and Nez Perce National Forests around the turn of the century (F. Donica, pers. comm.). Native Americans burned to improve grazing, attract game, and to eliminate underbrush, among other reasons. In the absence of Indian burning, natural lightning fires in many forested areas would have been both less frequent, and more intense than Indian fires (MacCleary 1998, Pyne 1982).

The cumulative fuel build-ups occurring all over the west are largely the result of human intervention in the form of fire control, but the open stands encountered by 19th century settlers, which we call "natural," were to some extent a product of human intervention as well. If a natural forest is one in which humans have played no significant role, this kind of forest would be hard to find since human beings have occupied North America for over 8,000 years.

Post-European interference during this century in present-day wilderness has in some ways created unnatural conditions and made present-day wilderness less "wild." Further interference, in the form of management- ignited fire, would move conditions and processes back towards "natural" and thus restore wilderness character, but at the same time, this very activity could be viewed as still more human manipulation in the wilderness landscape.

Alternative A - No Action Alternative

Direct, Indirect, and Cumulative Effects

For Wilderness, the No Action Alternative would continue the current management policy - i.e., under extreme conditions the FS will suppress some lightning-caused fires, while under other conditions lightning- caused ignitions would be allowed to take their natural course. The Forest Service may completely and quickly extinguish fires while they are small, or there may be some burned acreage, either because suppression is not immediately effective or because the chosen strategy utilizes natural barriers. Allowing a lightning-caused fire to run its natural course may also result a high volume of burned acreage or, in some cases, virtually none, depending on the weather, fuel conditions, or the location of the fire.

As fire exclusion efforts continue and vegetation patterns continue to be altered, fire intensity and acreage burned under Alternative A would probably increase from historic levels. Noxious weed spread may be exacerbated by large intense fires in susceptible habitats, and by suppression activities (see Noxious Weeds section in this chapter). Therefore, under Alternative A (No Action) natural processes will continue to be affected by human intervention, and wilderness character will continue to be compromised. Fire suppression activities, including aircraft use and fireline construction, may disturb and diminish the wilderness experience.

Natural Integrity

Alternative A would continue to degrade the natural integrity of the wilderness, especially within the frequent, low-intensity regimes. In the event of a wildfire, stands which historically would have withstood a fire will have a significantly higher probability of overstory

mortality. Some Wildland Fires Used for Resource Benefits (formerly Prescribed Natural Fires) will be allowed when guidelines are met.

Natural Appearance

As discussed in Chapter 3, the vegetation could appear natural to the casual observer, but may in fact be substantially different from what historically existed in the area.

Solitude

The solitude within the planning area would not normally be affected unless a wildfire occurred. If this happened, firefighting efforts could affect the solitude of the area.

Primitive and Unconfined Recreation Opportunities

The No Action alternative would result in continued encroachment of historically open areas, thus eventually reducing opportunities for places to camp. However, this would be minimal because many areas outside the proposed burn areas would still be available.

Alternative B

Direct, Indirect, and Cumulative Effects

The proposed action would ignite approximately 45,000 acres in the Wilderness. This would reintroduce fire in places which have historically experienced numerous lightning fires, but where fire has been largely excluded for the last 100 years. Introduction of fire would move the landscape back towards historic conditions, and thus allow natural processes to return. Areas within the burn units would move in the direction of the historically more characteristic Non-Lethal fire regime. The effects of management ignited fire, as described in chapter 3, would be within the Historic Range Of Variability for the planning area, and this would help restore wilderness character to the vegetation in these fire regimes. Prescribed fire equipment and activities such as helicopters, ignition crews, smoke, fireline, or other remnants associated with burning activity could affect a visitor's wilderness experience.

Natural Integrity

Alternative B would begin to restore wilderness character with respect to fire's role in the ecosystem. As a result of the expected fuel reduction, future wilderness fires could be managed as Wildland Fires Used for Resource Benefits (formerly Prescribed Natural Fires). While most lightning fires throughout the project area, including the wilderness, occur in summer and fall, lightning fires have also been known to occur in May and June. At other times of the year, the proposed ignition would not necessarily be "natural." At this time, the timing of Native American burning is not specifically known for the project area.

Natural Appearance

Fire is a natural occurrence within the planning area. Under Alternative B, burned areas and occasional burned trees will be apparent until the understory vegetation regrows.

Solitude

As explained in the Mitigation section of chapter 2, a minimum tool analysis will be completed for each burn unit within wilderness. For helicopter ignition, the solitude within wilderness would be affected during the burning operations by helicopters and support crews. For hand ignition, impacts would include ignition crews, jetboats for transporting crews, and fuel storage areas. Monitoring of treated areas will occur following ignition. In wilderness, the monitoring would be designed to be compatible with wilderness values, in other words foot and pack animal travel only, with no permanent visible markers.

Primitive and Unconfined Recreation Opportunities

This alternative will result in short-term impacts to the recreation opportunities within and adjacent to the proposed burn units. People looking for a primitive experience may be affected by helicopter noise, smoke, fire crews, etc. Indirectly, this alternative would result in more open areas for camping, walking, and viewing by removal of excess fuels.

Alternative C

Since there would be no management ignition in wilderness with this alternative, the effects would be the same as Alternative A.

Alternative D

The effects of this alternative would be similar to those discussed for Alternative B. As in Alternative B, early spring and late fall/winter dormant season burning does not coincide with the season for natural lightning ignitions. However, dormant season burning has the least effect on native vegetation and has the least chance of increasing noxious weed spread (see discussion in TES plants and noxious weeds sections).

Alternative E

This alternative would have the same effects on wilderness as Alternative B.

CULTURAL RESOURCES

Cultural resources may be identified as those resources either directly or indirectly related to the material "lifeways" of a cultural group, or groups, as specified by the Code of Federal Regulations (CFR), 36 CFR 296.3. Cultural resources may refer to sites, areas, buildings, structures, districts, and objects which possess scientific, historic, and social values. The significance or the National Register of Historic Places (NRHP) eligibility of cultural resources is determined by the Forest Archaeologist in consultation with the State Historic Preservation Officer (SHPO).

Cultural resource properties are non-renewable resources. As such, Federal regulations have been passed which prohibit destruction of significant cultural sites and obligate Federal

agencies, including the Forest Service, to protect and manage cultural resource properties (CRPs). The Antiquities Act of 1906, the Historic Sites Act of 1935, the National Historic Preservation Act (NHPA) of 1966 with its 1992 Amendments, the Archaeological and Historic Preservation Act of 1974, the Archaeological Resources Protection Act (ARPA) of 1979, and the Native American Graves Protection and Repatriation Act (NAGPRA) of 1990 exemplify the long and progressive history of regulations concerning the protection of significant archaeological resources.

The proposed fuel treatment activities could affect some cultural resources. These effects can vary greatly, depending upon the intensity of the fire and the physical location of the materials (on the ground surface vs. buried underground). If surface artifacts are burned there may be minimal damage, especially if they are inorganic items (e.g. stone tools). If the artifacts are more recent in origin, they could be severely damaged or lost altogether (wood structures, metal cans, glass bottles, etc.) Pre-ignition surveys will identify those cultural resources which may be lost due to implementation of the proposed action.

A low intensity underburn could be beneficial to the preservation of historic structures within the burn units, as the fires will reduce ground vegetation sufficiently to lessen the risk of future wild fires consuming those buildings. The removal of some surface vegetation will also result in larger areas of exposed ground, which in turn may help to identify previously unknown cultural resource sites or artifacts. Post ignition monitoring will occur in selected areas once they have been treated.

As discussed in Chapter 3, there are 515 known, previously recorded cultural resource sites within the Salmon Canyon Project area. One hundred sixty-nine sites are located within proposed burn units. The remaining sites are located within the boundaries of the proposed project area, but outside of the actual burn units. Of the 169 total sites located within the proposed ignition areas, 116 have been determined to be eligible for listing in the National Register of Historic Places (NRHP). Twenty sites are not eligible for listing in the NRHP. Thirty-five sites have yet to be formally evaluated regarding their NRHP status and two sites have no formal records for them. Additional areas of high probability for the presence of CRPs do exist and will be examined during field inventories of the proposed ignition areas.

Some burn units within the Payette National Forest have been already inventoried. Burn unit units 8, 9, 10, and 12 have been inventoried by Forest Archeologists and reviewed by the Idaho State Historic Preservation Office, which agreed to a determination of No Effect, providing that identified Cultural Resource sites are not burned over. Burn Units 11, 15, 16 and 17 have had partial Cultural Resource Inventories done, and reports are in progress.

In those areas outside of the proposed ignition zones but still within the overall proposed project area, there exist another 213 previously documented cultural sites. Of these, 170 are NRHP eligible, while only 20 are not eligible for inclusion in the NRHP. Additionally, 15 sites have not yet been evaluated and 4 sites have no records for them.

Within the Salmon-Challis National Forest portion of the project area, 133 sites have been previously located. Of these, 45 (33.8 percent) are prehistoric sites and 88 (66.2 percent) are historic sites. Regarding the NHRP status of these sites, 54 (40.6 percent) are considered

eligible for inclusion in the NRHP, 36 (27.1 percent) are not eligible for inclusion in the NRHP, and 43 (32.3 percent) have not been evaluated.

All areas of proposed ignition will be field inventoried by an archaeologist to determine if additional cultural resource properties are present within those areas. If previously unknown NRHP eligible cultural sites exist in the proposed alternative action areas, there is potential for impacts to those sites. However, after the high probability areas (where cultural properties are likely to be found) have been surveyed, the majority of sites will have been located and recorded. If new sites are located, these areas would also need to be managed so as not to adversely affect the CRP in question. If significant properties are found, mitigation measures to reduce effects would then be developed in order to preserve the CRP for future study.

NRHP eligible cultural sites located within areas of potential effects will be protected and managed in accordance with Forest Plan standards (Forest Plan, Chapter II, p. 17). Specific protection and mitigation measures (e.g., avoidance) for such sites will be recommended in order to achieve a determination of "No Adverse Effect" where such sites are indeed located. The State Historic Preservation Officer (SHPO) will be consulted for site preservation and mitigation measures in compliance with the Section 106 Process of the 1966 NHPA. The appropriate Native American Tribe will be consulted regarding any site or artifact which may be significant to them. Unless previously inventoried, cultural resource surveys of the selected alternative will be performed and potential effects from the project will be assessed prior to project implementation.