

CHAPTER 2. ALTERNATIVES CONSIDERED

Introduction

This chapter describes and compares the alternatives considered for the Logan Creek Ecosystem Restoration Project. It includes a description and map(s) of each alternative considered. This section also compares alternatives, sharply defining the differences between each alternative and providing a clear basis for choice among options by the decision maker and the public. Some of the information used to compare alternatives is based upon the design of the alternative (e.g., proposing moderate dispersed retention versus high dispersed retention) and some of the information is based upon the environmental, social, and economic effects of implementing each alternative (e.g., the effectiveness of fuel reductions created by moderate dispersed retention versus high dispersed retention).

Alternatives for the Logan Creek project were developed from the issues described in Chapter 1. The IDT Team grouped the alternatives into one of two categories based on their level of feasibility. These categories are “alternatives considered in detail” and “alternatives considered but eliminated from detailed study.” Rationale will be given for alternatives not studied in detail.

Differences Between the DEIS and FEIS

Chapter 2 of the FEIS differs from the same chapter in the DEIS in that information about Alternative F was included and the following items were clarified or explained:

- Proposed slash treatment in units located within the wildland/urban interface (Units 1, 3, 4, 6, 11, 15, 21, 28A, 31A, 41A, 56, 59, 106, and 133) would occur soon after harvesting to reduce wildfire risk.
- Some slash piles would be left unburned in some heavy dispersed retention units.
- The way in which fish pools would be constructed is described.
- All existing roads currently closed to public motorized use would remain closed during implementation of proposed activities.
- Timber harvest and mechanized fuel reduction activities would not occur in Units 2, 3, 200, and 300 between October 15 and April 15 for big game winter range security.
- Some road reclamation would take place on roads that pass through or are adjacent to existing old growth habitat. Where these roads have downed trees laying across the roadway when the reclamation process begins, all logs must be left intact wherever possible and replaced across the roadway after reclamation is complete.
- Activities would be stopped or modified if a grizzly bear den, Canada lynx den, gray wolf den, gray wolf rendezvous site, or bald eagle nest is discovered in or close proximity to a project location.
- All contractors and others implementing the project would be required to comply with a food-storage and sanitation order.
- Native vegetation would be used in revegetation projects.
- Spring season underburning would occur when fuel and weather conditions allow.

- Parameters in Tables 2-12 and 2-13 were updated to reflect changes in these parameters as mentioned in Chapter 1. Some of the numbers in the body of these two tables have been updated from the DEIS based on new information or re-calculation.
- A table was added to the end of the chapter that outlines acres proposed for treatment within different management areas by alternative.

Alternatives Considered in Detail

The Forest Service developed five alternatives, which include the No-Action and Proposed Action alternatives. All alternatives, except No Action, are intended to meet the Purpose and Need for the decision, but used different approaches. Each alternative was formulated with cost efficiency as the primary consideration in meeting the objectives.

Features Common to All Action Alternatives

The Forest Service also developed the following features as design criteria to be used as part of all of the action alternatives. They will not be described again under each individual alternative.

Timing of Activities

If an action alternative were chosen, forest products from the proposed harvest units would be offered in four large sale packages between fiscal years 2004 and 2006. Smaller sales may be offered between fiscal years 2005 and 2008. Completion of harvest activities would be expected within three to five years after any given sale contract is awarded. Site preparation, reforestation, wildlife habitat improvement projects, fisheries habitat improvement projects, and all other projects would be completed as soon as possible and no more than five years after logging is completed. Road reclamation would be completed within five years of the date a decision is made and road closures for wildlife security purposes would be completed within two years of the decision date. A map showing the implementation schedule is in Exhibit E-1.

Soils

To minimize erosion and other detrimental impacts to the soil resource, all road construction, reconstruction, and timber harvest would be completed using Best Management Practices (BMPs) or Soil and Water Conservation Practices (SWCPs). The practices are described in detail in the Forest Service Soil and Water Conservation Handbook (FSH 2509.22), the Soil Management Handbook (FSH 2509.18), and the Flathead Forest Plan (pages II: 49-55). Included are such practices as providing for sufficient road drainage, limiting tractor logging operations to periods when soils are dry or under winter snow and less subject to compaction, seeding of landings and cut-and-fill slopes of roads, and maintaining vegetative buffer strips between cutting units and streams for sediment filtration. Each harvest unit and the proposed roadwork would be reviewed and applicable SWCPs identified on a site-specific basis for

protection of the soil and water resource. These practices will be listed and described for the Selected Alternative in the Record of Decision for this EIS.

Three soil groups based on soil characteristics are used to discuss the features common to action alternatives: sensitive soils, non-sensitive soils, and soils with potential for low organic matter. Soils are sensitive when they have a high content of clay and silt, few rocks or gravel, and high water-holding capacity. Non-sensitive soils have enough rocks and gravel to provide support to ground-based equipment operating on the soils. Water drains out of these soils and they do not hold enough water to make them soft for extended times. Soils with potential for low organic matter would lack woody debris or fine organic material after timber harvest and fuels reduction operations are completed, thus possibly resulting in low soil nutrients needed in forested soils.

Harvest Activities on Sensitive Soils

Sensitive landtypes vary from one area to another depending on climate, geology, and soil characteristics. Sensitive landtypes in the analysis area are those that have fine-textured soils with high water-holding capacity and few rocks. These soils have high productivity, but because of their physical characteristics are subject to compaction and displacement during management activities, especially those activities that use ground-based equipment. This disturbance is most likely to occur when the soils are wet. Within the analysis area, Landtype 14-2 and all riparian landtypes are sensitive.

Only Unit 101A, which is a component of all the action alternatives, is located on a sensitive soil type (14-2). This unit is proposed for timber harvest using a skyline yarding method and fuels reduction using broadcast underburning. No heavy equipment would be used in this unit. The only practice under all alternatives designed to reduce impacts on the sensitive soils in Unit 101A is that all fire lines would have water bars that direct water onto unburned soils outside the burn.

Harvest Activities on Nonsensitive Soils

The majority of proposed management activities in the analysis area are on nonsensitive soils (all units not listed as occurring on sensitive soils). Even though they are not particularly vulnerable to the effects of mechanized equipment, the following practices would be used to reduce impacts on harvest units that are not on sensitive soils.

- Conventional ground-based equipment such as feller-bunchers, dozers, and rubber-tired skidders would be allowed to disperse skid if soils are dry as determined by the sale administrator in the field. The sale administrator would use the method outlined in Exhibit H-20 (USDA 1998), using the dry or slightly moist categories as the criteria for dry soils. When soils are determined to be wetter than the slightly moist category but equipment is not yet causing soil displacement, equipment would be restricted to dedicated skid trails laid out in a pattern that occupies less than 15 percent of the timber harvest unit. The 15 percent threshold is described in Forest Service Manual 2554 (Exhibit H-19) and is further clarified with Exhibit H-9.
- If units are proposed for areas that have experienced previous soil detrimental effects, activities must be designed so past and proposed activities disturb no more than 15 percent

of the unit's area (Exhibit H-19). Units 25 and 26 show evidence of soil disturbance from undocumented timber harvesting early in the last century. In these two units, skid trails would be designated to use these previously disturbed sites and all disturbances, both historic and current, would occupy less than 15 percent of the timber harvest units. The sale administrator would approve the locations of the skid trails.

- Excavators used for site preparation or brush disposal can operate when soils are rated as *moist or drier* as determined in the field using the guide in Exhibit H-20. The intent is to reduce the severity of impacts from equipment use, and operating when soils are relatively dry does that (Alexander and Poff, 1985, p. 85).
- Log forwarders that operate on a mat of slash and debris on all skid trails can operate when soils are moist or drier as described in Exhibit H-20. Skid trails for this equipment can occupy up to 25 percent of the cutting unit because the slash protects the soil from displacement and compaction.

Harvest Activities on Soils With Potential for Low Organic Matter

Part of the intent of timber harvesting in the Proposed Action and all action alternatives is to reduce the amount of fuel by removing biomass that has accumulated desirable beyond levels. However, it is also necessary to retain fine woody and herbaceous debris (green needles, leaves, and branches less than 3" in diameter) because these materials contain a large portion of the nutrients available for plant growth and other ecosystem functions, particularly on sites that are currently somewhat deficient in organic matter. The value of fine woody and herbaceous material is particularly important in the first three to six months after timber harvest because decomposition and leaching of important elements occur during that period.

The following additional feature is prescribed to accomplish both goals of reducing fuels and maintaining nutrients on the site:

- For all units designated for Low and Moderated Dispersed Retention (LDR and MDR), slashing unmerchantable trees is required to occur the same season as harvesting. Subsequent piling and burning of hazardous fuels must be delayed three to six months (including one wet season) after the harvesting to allow sufficient time for leaching of important elemental nutrients into the soil. Units 1, 3, 4, 6, 11, 15, 21, 28A, 31A, 41A, 56, 59, 106, and 133 are excluded from this procedure due to concerns with short-term fuel accumulations in the wildland/urban interface. Slash within these units would be piled soon after harvesting to minimize the risk of wildland fire during the first summer after harvesting; piles would be burned as soon as weather conditions permit.

Water/Fisheries/Riparian

Many of the BMPs applied to protect the soil resource would also protect watershed, fisheries, and riparian values. The following measures, described by the Streamside Management Zone Act (SMZ-1993, also referred to as Montana House Bill 731), would protect all perennial and intermittent streams flowing adjacent to harvest units. The proposed units would also be consistent with guidelines and standards within the Inland Native Fish Strategy Environmental Assessment and its July 1995 Decision Notice.

Disturbed soil from road reclamation (waterbars and culvert removals) would be seeded. Culvert removal sites would be mulched with straw. Shrubs would be planted adjacent to streams in all culvert removal sites to stabilize soil.

Rehabilitation of drainage features on system roads as described in the Proposed Action is a feature common to all action alternatives, as is the culvert replacement on up to 11 identified sites on system roads. Additional culvert replacement may occur as opportunities are identified during project implementation.

All action alternatives propose placement of large woody debris (logs greater than 12 inches diameter and two-thirds the length of the channel width) in various locations within streams throughout the project area to create improved fisheries habitat. Woody debris would be placed at a density of approximately one piece per 50 to 100 feet of stream. This would improve stream bank stability and trap bedload resulting from past riparian zone disturbances. This activity would be conducted on as much as 3.7 miles of stream over 19 stream segments.

All action alternatives include the construction of larger fish habitat pools in the lower reaches of Logan Creek near Round Meadow (T31N, R23W, Section 8), and area with limited large pools. We are proposing to construct larger pools in about five locations to create better fisheries habitat. These pools would be constructed with an excavator by enlarging the pool with the bucket and placing large rocks on the upstream side of the pool. Proposed locations for the large pools and the large woody debris placement are shown on a map in Exhibits F-7 and F-8.

Air Quality

All prescribed burning conducted in this area would be in compliance with the Smoke Management Plan prepared by the Montana Air Quality Bureau and administered by the Montana State Airshed Group (Forest Plan, page II-64). Burning plans would be developed where prescribed burning is the method selected for slash hazard reduction, site preparation for reforestation, and browse stimulation. When feasible, prescribed burning would be done in the spring or summer instead of the fall. This would provide for better smoke dispersion conditions than normally occurs in the fall burning season. Nighttime burning that could affect local communities would be avoided because smoke dispersal is worst during this time. Stumps and heavy fuels (logs) would be fully extinguished adjacent to private land with residences to reduce the lingering smoke that can occur from these smoldering fuels; as well as to reduce the chance of escaped fire.

To manage the effect on air quality, all planned ignitions for post-sale site preparation/fuel reduction treatments would be conducted according to guidelines of the Montana Smoke Management Memorandum of Agreement. The Environmental Protection Agency (EPA) has approved these plans as meeting the requirements of the Clean Air Act as amended in 1987. These plans regulate the amount of forestry-related burning that can be done at any one time. The amount of burning that can occur on any given day depends upon the specific type of burning, the tons of material to be burned, and the atmospheric conditions available to promote mixing and transport of smoke away from sensitive areas.

Wildlife Habitat

Non-Game Wildlife Habitat

Amendment 21 of the Flathead Forest Plan specifies the minimum number of snags, snag replacement trees, and pieces of downed wood to be left in each potential vegetation group (PVG). Although the minimum diameters are not always present in a given stand, these would be retained to meet or exceed the intent of the Forest Plan under all alternatives wherever they exist (Exhibit Rd-3). To provide for these snag and downed wood retention needs, as well as living tree canopy and large trees, the following would be prescribed:

- All live larch and ponderosa pine greater than 18 inches at Diameter Breast Height (DBH) would be retained.
- All existing larch and ponderosa pine snags greater than 18 inches DBH would be retained, unless leaving them would compromise loggers' safety, as corroborated by the Forest Service sale administrator.
- Wherever present, at least two per acre Douglas-fir greater than 25 inches DBH would be retained unless they are infested with Douglas-fir bark beetles at the time of marking, or where leaving them would compromise safety.
- Snags that are felled for safety concerns would be left.
- Wherever present, at least 32 downed logs per acre that are 9 to 20 inches DBH and at least 20 feet long would be left evenly distributed across the units. If there are too few large enough logs, 6 to 9 inches DBH logs may be substituted to reach this number of pieces.
- Wherever present, at least 15 downed logs per acre that are greater than 20 inches DBH and at least 6 feet long would be left evenly distributed across the units.
- Some slash piles would be left unburned in units that have Heavy Dispersed Retention prescriptions, as described in Exhibit Rd-10.

Prescribed burning may consume some of these existing snags, an unavoidable consequence in order to achieve the desired fuel reduction, site preparation, and browse stimulation. Some of the live trees left on the site may also be killed by burning, but would likely remain standing and provide for current snag habitat needs and future downed woody material. The live trees that survive the burn would provide future snag replacements for snag-dependent wildlife species. They would also increase the vertical diversity of the vegetation within these units, enhancing wildlife habitat.

Wildlife Security

Hunting, transporting of hunters, and transporting of game would be prohibited by timber, road building, or other contract workers while working on or off roads closed to motorized vehicles to the general public.

Personal use firewood gathering would not be allowed by contractors or other workers on newly constructed roads or any other roads not open to motorized use by the general public.

Road access changes listed in Table 1-6 in Chapter 1, the Proposed Action, are common to all action alternatives (Alternative C includes additional access changes for elk and other wildlife security).

All newly constructed roads would be closed by sign or gate to public motorized use during and after road building and other activities. All existing roads currently closed to public motorized use would remain closed during implementation of all proposed activities.

Timber harvest and mechanized fuel reduction activities would not occur in Units 2, 3, 200, and 300 during the period between October 15 and April 15 for big game winter range security.

Big Game Habitat Enhancement

Supplemental shrub planting in harvest units is an opportunity that may be implemented if funding is available. Shrub planting would enhance big game forage, feeding and nesting sites for songbirds, and hiding cover values for a wide variety of wildlife species. Shrub planting would usually consist of willow, serviceberry, red-osier dogwood, mountain maple, and/or redstem ceanothus at a density of 100 to 300 plants per acre. Shrub planting would generally take place in those timber harvest units with light to moderate retention levels, generally with sources of water in the vicinity. Post-harvest site conditions and conifer regeneration success would determine which specific areas shrub planting would be conducted; however, the total maximum area to be treated would range from 100 to 500 acres by alternative.

Areas near riparian zones that experienced timber harvesting in the past are proposed for supplemental tree and shrub planting to promote browse and cover. This activity would be conducted on as much as 90 total acres adjacent to 19 stream segments. Proposed locations for tree and shrub planting are shown on a map in Exhibit F-8.

Threatened, Endangered, and Sensitive Wildlife

Activities will be stopped or modified if a grizzly bear den, Canada lynx den, gray wolf den, gray wolf rendezvous site, or bald eagle nest is discovered in or close proximity to a project location.

All contractors and others implementing the project would be required to comply with a food-storage and sanitation order.

Project-Specific Forest Plan Amendments

Features common to all action alternatives related to big game winter range may require two project-specific amendments to the Forest Plan if the features are selected in the Record of Decision. Management Areas 13 and 13A are delineated east of Star Meadow in the Forest Plan; however, these areas do not function as big game winter range. Snow depths in these areas are typically too great to allow for big game use in the winter. Other areas in the Logan Creek area function as big game winter range.

The first project-specific amendment would temporarily amend the Management Area 13 standards to allow for timber harvest without the harvest being specified in a Long Range Mule Deer and Elk Winter Range Activity Schedule for MA 13 lands in the project area. The second would temporarily amend the Management Area 13A standards to allow timber harvest for MA 13A lands in the project area.

Vegetation

Timber

In units to be naturally regenerated, phenotypically superior leave trees would be selected whenever possible to increase the likelihood of leaving superior genotypes as seed sources.

Fuels Reduction

Prescribed fire management plans ("burn plans") are written for each individual prescribed burn and include plans for ignition, holding, escaped fire contingency, mop-up, and patrol. This is to ensure that each burn meets the objectives prescribed for that particular area. The plan is designed to use the prescribed weather, personnel, and equipment that are needed to control the burn within the identified boundaries.

Submerchantable-sized trees would typically be felled or "slashed" and subsequently piled and burned in order to reduce the amount of ladder fuels in the residual stand.

Spring season prescribed underburning of brush fields, forest understory, and other forest vegetation would occur when fuel and weather conditions allow for safe and effective operations on approximately 566 acres in all alternatives. Some slashing or other pretreatment of forest vegetation may be necessary. This burning would reduce fuel levels, improve habitat for wildlife, and return the forest structure of these areas closer to historical conditions. See Table 1-2 and Figure 1-2 in Chapter One for a list and map of these underburning areas.

Fuels treatment without a commercial timber harvest or underburning would occur on about 182 acres in all alternatives. This treatment would reduce fuel levels and return the forest structure of these areas closer to historical conditions. Vegetative materials to be piled and burned are brush and small-diameter trees and existing down and dead fuel. The work would be accomplished using hand tools and chain saws to move, pile, and burn material. See Table 1-3 and Figure 1-2 in Chapter 1 for a list and map of these fuel treatment areas.

All action alternatives propose including a 200- to 300-foot wide fuel treatment zone in which handpiling and pile burning of slash would occur where a precommercial thinning unit is adjacent to private ownership. The exact acreage varies by alternative; either 15 or 83 acres would receive this treatment. Please refer to the Fire Effects section of Chapter 3 for further explanation.

Underburning for fuels reduction and other ecosystem processes would not consume commercial wood products that could be removed in an economically viable manner. However, it is possible that the fire would consume commercial-sized individual trees, both

live and dead, that are not located near existing roads, are scattered, or are on ground too steep to allow for removal without excessive cost.

Noxious Weeds

Invasion and spread of noxious weeds is a concern in the analysis area. New cut and fill slopes would be seeded with a certified weed-free grass species mix for erosion control and to prevent establishment of noxious weeds. Any non-native seed applied would be short-lived or non-invasive.

During project implementation, logging, site preparation, and road reclamation equipment used in the area would be washed to remove weed seeds. This action is consistent with recommendations in "An Evaluation of Noxious Weeds in the Lolo, Bitterroot, and Flathead Forests" (Losensky 1987). Roadside clearing should be limited to retain as much shade as possible to help inhibit the establishment and success of noxious weeds. A Forest-wide environmental analysis (Flathead National Forest Noxious and Invasive Weed Control Decision Notice and Finding of No Significant Impact, May 2001) set priorities and parameters for noxious weed control. Weed treatments in the analysis area would be consistent with this strategy.

Revegetation with Native Plants

In places where it is necessary to revegetate, the Regional Forester has determined that using native plant species is desirable to protect ecosystem integrity. Historically, non-native seed or seedlings were used in many cases to achieve soil stabilization or some other revegetation objective. The effect of that practice is to introduce species that might preclude establishment and persistence of species that are integral to the functioning of a particular ecosystem. It is currently the policy of Region One to collect seed or cuttings locally, cultivate, and subsequently outplant. That policy and practice will occur with any actions in the Logan Creek decision that requires revegetation to the extent that funds are available. In the event that funding is not available for planting native plants, short-lived or non-invasive non-native plants would be used.

Recreation

Trail construction near Tally Lake Campground is proposed to complete a short loop trail. Construction would be an extension of Trail 804 and consist of about 2000 feet of new trail. This proposed trail is shown on Figure 1-4.

Project-Specific Forest Plan Amendments

Management Area 2C emphasizes roaded, natural-appearing recreation opportunities. Timber management standards for MA 2C allow for removal of timber salvage using existing roads when recreation values can be protected or enhanced. The proposed treatment for Unit 20 does not meet this salvage standard, but is proposed in all alternatives but Alternatives D and F because treating it meets the purpose and need for fuel reduction (see Chapter 1). If Unit 20 as currently proposed for treatment is a component of the Selected Alternative, a project-

specific temporary forest plan amendment would need to be prepared for the Record of Decision.

Roads

Road Maintenance

Road maintenance actions consisting of brushing and blading may be needed on some of the haul roads within the project area. Other minor drainage work such as the placement of drain dips would likely take place. Dust abatement and blading would occur as needed on the main haul routes.

Road Reclamation

Some road reclamation would take place on roads that pass through or are adjacent to existing old growth habitat. Where these roads have downed trees laying across the roadway when the reclamation process begins, all logs must be left intact wherever possible and replaced across the roadway after reclamation is complete. This measure would help to retain downed wood habitat features and continuity of habitats in these old growth stands. See Exhibit Q-15 for details of roads that meet these criteria.

Temporary Road Obliteration

All temporary roads constructed for timber harvest would be obliterated immediately after mechanical slash reduction activities are complete or after the timber harvest activity is complete if the unit is to be underburned. Obliteration would consist of removal of any culverts, recontouring the slope, and revegetating the disturbed area with native grasses, shrubs, and trees.

Project-Specific Forest Plan Amendments

Temporary roads 13 and 18 are proposed to access timber harvest areas and are wholly or partially located on the MA 2C management allocation. If these roads were selected in the Record of Decision, a project-specific Forest Plan amendment would be needed to temporarily amend the MA 2C Standards to allow temporary road construction in and across MA 2C for the purpose of timber salvage. These two roads would subsequently be obliterated as described above.

Visual and Scenic Resources

The following are examples of techniques to be used to manage the effects of timber harvesting and fuels management on the appearance of the landscape. Implementation of these techniques would help ensure that scenic resource goals are met. These techniques are shown based on viewing distance zones.

Foreground viewing zones: "Foreground viewing zone is based upon distances at which details can be perceived. It would usually be limited to areas within 1/4 to 1/2 mile of the

observer, but must be determined on a case-by-case basis" (from Handbook 462 of the Visual Management System). The following guidelines would be used in foreground viewing zones:

- Use whole tree removal.
- Designate skid trails to angle away from line of sight.
- Sever stumps as close to the ground as feasible or angle cut away from viewers in the Tally Lake Campground area, adjacent to trails, and along road 2895.
- Protect screening vegetation between campsites.
- Above road 2895 in burn #200, reduce or eliminate ladder fuels by cutting smaller trees (3 to 4 inches DBH and less), pruning and hand piling them before under burning in order to reduce the potential for bole and tree crown scorching. This technique could also reduce the potential of beetle attacks on the large Douglas-fir trees by putting less stress on them during underburns.
- Dispose of burn piles during the same or second year of operation.
- Reduce the amount of road frontage burned at any one time.
- Leave unburned islands.
- Use backing fires to reduce fire intensity and minimize bole and crown scorching.
- Place hand piles back from the edge of roads and behind natural screens.
- In harvest units that have trails passing through them, protect the trail tread and leave some trees for screening adjacent to the trails.

Middle ground and background viewing zones: "Middle ground is defined as the zone which extends from the foreground viewing zone to 3 to 5 miles from the observer. Individual tree forms are usually only discernible in very open or sparse stands of trees. Background is defined as the distant part of a landscape or the area located from 3 to 5 miles to infinity from the viewer" (from Handbook 462 of the Visual Management System). The following guidelines would be used in middle ground and background viewing zones:

- Leave trees (10 to 180 trees per acre) and clumps of trees, thus minimizing visual contrasts.
- Shape units to merge with topographic features.
- Feather unit edges with partial cut prescriptions where feasible.
- Locate units adjacent to older cutting areas to minimize visual contrasts, link units together, and connect them to existing natural openings.
- Duplicate shapes of natural openings.
- Use prescribed fires to add vertical and horizontal diversity.

Cultural Resources

Field investigation in accordance with the National Historic Preservation Act is ongoing. This includes consultation with the State Historic Preservation Office, the Advisory Council on Historic Preservation, and local Native American tribes. Special timber sale contract provision "B6.24# Protecting of Cultural Resources" would be included in the timber sale contract to assure protection of cultural sites. One Indian scarred tree site is located in the analysis area and could be affected by a proposed activity. Treatment methods to protect the scarred trees have been developed and would be implemented at the time of treatment.

Monitoring

Monitoring is gathering information and observing management activities to provide a basis for periodic evaluation of Forest Plan goals and objectives. The purpose is to determine how well objectives have been met and how closely management standards have been applied during the timber sale activities. Evaluation of the monitoring results would assist in the review of the conditions of the land as required by National Forest Management Act regulations. It may result in decisions for further action, such as modifying management practices.

There are three basic types of monitoring:

- (1) **Effectiveness Monitoring** is used to determine if management practices as designed and executed result in the desired resource condition.
- (2) **Implementation/Compliance Monitoring** is used to determine if goals, objectives, standards, and management practices are implemented as detailed in the Forest Plan, this FEIS, or by other State or Federal agencies. This would be performed by contract administrators, the interdisciplinary team, and resource specialists.
- (3) **Validation Monitoring** examines the quality of the data and assumptions used in the analysis process.

Several sources of funding exist for resource monitoring. Many items would be funded with Knutson-Vandenberg (KV) funds, while other items would be funded with appropriated funds. No assignment of funding source to the monitoring would be made at this time because future availability of funds is unknown. Priorities for annual monitoring are established and agreed upon by the Interdisciplinary Team and the Responsible Official, and implementation would be based on annual budgets and program direction. All legally required monitoring would be performed.

Monitoring and evaluation of this proposal would be conducted according to the requirements outlined in the Implementation and Monitoring section of the Forest Plan on pages V-7 through V-21. In addition, monitoring activities specific to the Logan Creek proposal would be conducted. Monitoring activities will be discussed by environmental component, consistent with those used in the FEIS. Those components not specifically discussed tier to the monitoring described in the Forest Plan.

Soils

Effectiveness Monitoring:

Forest Service Region 1 Draft Soil Quality Standards, 1999, states that at least 85 percent of an activity area must have soil that is in satisfactory and productive condition. This same document describes conditions that are not satisfactory. To determine if this direction is met, several units would be monitored if an action alternative were selected. The units to be monitored would vary depending on the alternative that is implemented. Monitoring would

be concentrated on units with sensitive soils and severe erosion risks. These units are at a higher risk of exceeding the soil quality standards. The following units would be monitored:

Alternative B: Units 21, 24, 25, 26, 42, 75, 76A, 101A

Alternative C: Units 21, 24, 25, 26, 42, 75, 76A, 101A

Alternative D: Units 21, 24, 25, 26, 42, 74A, 101A

Alternative E: Units 21, 24, 25, 26, 42, 75, 76A, 101A

Alternative F: Units 21, 24, 25, 26, 42, 101A.

These units represent a cross-section of the management activities that would occur with the selection of an action alternative and would span the entire time frame for the project (approximately 10 years). Monitoring would follow the process outlined by Howes (undated) in Exhibit H-21. Monitoring would consist of random transects across the units. The condition of the soil surface would be recorded. Along with the condition of the soil surface, the amount of large woody debris and the percent organic cover would be determined. The objective for monitoring is to see that the productive potential of the land is maintained at a minimum of 85 percent of natural conditions.

Implementation Monitoring:

District fire personnel would monitor moisture conditions to ensure that burning occurs when soil and duff moisture content would promote fires that maintain organic matter and nutrients on the burned areas.

For units harvested by mechanical means (dozers, skidders, etc.), soil moisture levels would be monitored by the Sale Administrator to ensure that logging, fuel treatment, and site preparation activities are conducted during periods when soils are below the recommended moisture content and less susceptible to compaction. Effects of logging on soils in units harvested by mechanical methods would be monitored by on-the-ground review.

Vegetation/Timber Management

Reforestation surveys would be conducted for each regeneration harvest unit. Surveys would occur at a minimum during the first, third, and fifth year following completion of the initiating activity for reforestation (site preparation or planting). This monitoring is necessary to assure adequate stocking levels for stand certification (Flathead Forest Plan, Appendix I). Funding for this monitoring is assured because it would be incorporated into the Knudson-Vandenberg trust funds of the timber sale contracts.

Surveys would be conducted on all units before and after site preparation and fuel treatment activities are accomplished. These would perform the dual purpose of determining whether fuel management and site preparation objectives are met and to gather data on the current condition of stands for planting needs.

All harvest activities would be monitored by Forest Service Representatives to ensure compliance with contract specifications. Minor contract changes or contract modifications would be enacted, when necessary, to meet objectives and standards on the ground.

Timber sale layout, harvest unit prescriptions, and timber sale contract provisions would be reviewed by a district management team to determine compliance with Forest Plan and FEIS goals, objectives, and standards prior to sale award.

Assessment for any further noxious weed treatment would occur a few years after road reclamation activities.

Wildlife

Quantities of snags and downed logs would be monitored to determine if timber sale and site preparation activities maintained appropriate levels of present and future large woody debris. This should be done after the first several units are harvested in each sale. Monitoring of species associated with old growth would occur in accordance with Amendment 21 to the Forest Plan.

The timing and effectiveness of road closures would be monitored, and closure structures maintained.

Forage enhancement from activities such as underburning and shrub planting would be monitored.

Roads

All road construction and road maintenance would be monitored by Forest Service representatives to ensure compliance with specifications and to meet the intent of management practices. Specifications would be designed to meet objectives and management practices.

The Forest Service Representative would monitor the work performed by the Contractor to ensure that their methods of operation and work are in compliance with the specifications that were designed to meet the intent of the management practices. If the designed work is not meeting the objectives and management practices, a modification may have to be made by the Forest Service Representative to change the work to meet the objectives and management practices.

Watershed and Fisheries

Potential sediment sources (such as stream crossings and road construction/reconstruction) in the sale area would be monitored to assess the need for stabilization to protect habitat for cutthroat trout and other aquatic species. Areas of disturbed soil as a result of logging and road reclamation would be monitored for revegetation.

Alternative Summary and Descriptions

The table on the following page numerically summarizes the features of the alternatives. The activities proposed in each alternative are described in detail following the table.

Table 2-1. Summary of the Features of the Alternatives.

Feature	Alt. A <i>No Action</i>	Alt. B <i>Proposed Action</i>	Alt. C <i>Wildlife Security</i>	Alt. D <i>Old Growth and Connectivity</i>	Alt. E <i>Soil and Water</i>	Alt. F <i>Selected Alternative</i>
Road Reclamation	0	16.2 miles	16.2 miles	16.2 miles	16.6 miles	16.6 miles
Change in road restriction, open yearlong to closed yearlong <i>by a gate</i>	0	4.2 miles	4.2 miles	4.2 miles	6.2 miles	6.2 miles
Change in road restriction, open yearlong to closed yearlong <i>by road reclamation</i>	0	2.7 miles	2.7 miles	2.7 miles	1.3 miles	1.3 miles
Change in Road Restriction, total mileage changed from open yearlong to closed yearlong	0	6.9 miles	6.9 miles	6.9 miles	7.5 miles	7.5 miles
Change in Road Restriction, open yearlong to closed seasonal	0	0	0.7 miles	0	0	0
Change in Trail Restriction, motorized to seasonally nonmotorized	0	0	17.5 miles	0	0	12.7 miles
System road construction	0	4.4 miles	2.7 miles	2.7 miles	4.7 miles	3.8 miles
Temporary road construction	0	5.4 miles	3.6 miles	4.3 miles	4.9 miles	4.5 miles
Road Rehabilitation	0	141 miles	99 miles	124 miles	138 miles	133 miles
Trail construction	0	2000 feet	2000 feet	2000 feet	2000 feet	2000 feet
Timber volume estimate in million board feet	0	59	34	38	54	43
Total harvest acres	0	6624	4235	4724	6315	5521
- Light dispersed retention	0	921	430	311	829	523
- Moderate dispersed retention	0	4737	2549	2895	4231	3093
- Heavy dispersed retention	0	966	1256	1518	1255	1809
- Heavy aggregated retention	0	0	0	0	0	96
Precommercial thinning acres	0	3783	3783	310	3783	310
Fuel Reduction Projects						
- Prescribed burning acres	0	566	566	566	566	566
- Hand fuels treatment acres	0	182	182	182	182	182
- Fuel reduction acres in precommercial thin areas	0	83	83	15	83	15
Large Woody Debris placement in streams for fish habitat	0	3.7 miles	3.7 miles	3.7 miles	3.7 miles	3.7 miles
Pool construction sites for fish habitat improvement	0	5	5	5	5	5
Riparian planting of shrubs & conifers for wildlife habitat in previously harvested areas	0	90 acres	90 acres	90 acres	90 acres	90 acres
Planting of shrubs for wildlife habitat in newly harvested areas	0	100 – 500 acres	100 – 500 acres	100 – 500 acres	100 – 500 acres	100 – 500 acres

Alternative A - The No Action Alternative

Under the No-Action alternative, current management plans would continue to guide management of the project area. No fuel reduction, timber harvest, road improvements, or access changes would be implemented to accomplish project goals. None of the actions proposed in any of the other alternatives would occur. The analysis for the No-Action alternative in the following chapter will describe the possible or likely consequences of not managing the area as proposed in the action alternatives.

Alternative B – The Proposed Action

Alternative B, the Proposed Action, was developed to respond to the purpose and need for action in the Logan Creek area. The purpose and need for the project and the description for Alternative B is found in Chapter 1 of this Final EIS.

Alternative C – Wildlife Security

This alternative seeks to maintain and enhance security values for elk and numerous other wildlife species and is depicted in Figure 2-1. Alternative C addresses Issue 1 (Wildlife security) and Issue 6 (Road access) as described in Chapter 1.

Alternative C was developed using the proposed action as the base. This alternative dropped some harvest units and road building and increased the retention levels in some other units to maintain wildlife hiding cover and security. Additional road restrictions beyond those outlined in the proposed action (Alternative B) are included in this alternative to expand elk security areas.

Vegetation Management Proposals (refer to Vegetation Plan Map, Figure 2-1)

Alternative C would apply several different vegetation treatments within the Logan Creek drainage. Please refer to the Vegetation Management Proposal section of the Proposed Action in Chapter 1 for a more complete discussion of the individual treatments. These treatments would include approximately:

- 4235 acres of commercial timber harvest, which includes salvage harvest. Harvest activities would occur in 102 different units within the project area, as listed in Table 2-2. The number of trees remaining on site may range from low retention to high retention. The levels of retention and silviculture systems used in this alternative are the same as described for the Proposed Action in Chapter 1.
- 566 acres of spring season prescribed underburning of brush fields, forest understory, and other forest vegetation. This activity and number of proposed acres is the same as proposed for the Proposed Action as described in Chapter 1.

Figure 2-1.

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- 182 acres of fuels treatment without a commercial timber harvest or underburning. This activity and number of proposed acres is the same as proposed for the Proposed Action as described in Chapter 1.
- 3783 acres of precommercial thinning of sapling-sized trees of lodgepole pine, western larch, Douglas-fir, spruce, subalpine fir, and a minor amount of other tree species. Approximately 83 acres of these would have hand piling and subsequent pile burning to reduce the risk of wildland fire. This activity and number of proposed acres is the same as proposed for the Proposed Action as described in Chapter 1.

Table 2-2 Units for commercial harvest in Alternative C.

Unit Number*	Acres	Retention Level***	Treatment Method**	Regeneration Method	Site or Fuel Preparation	Logging System
1	166	MDR	SW w/R	Natural	Excavator pile	Ground based
2	65	HDR	CT	N/A	Excavator pile	Ground based
3	100	HDR	CT	N/A	Excavator pile	Ground based
4	95	MDR	SW w/R	Natural	Excavator pile	Ground based
5	33	HDR	CT	N/A	Excavator pile	Ground based
6	177	MDR	SW w/R	Natural	Excavator pile	Ground based
7A	25	MDR	SW w/R	Natural	Underburn	Skyline
8	104	HDR	CT	N/A	Excavator pile	Ground based
9	18	MDR	SW w/R	Natural	Excavator pile	Ground based
10	13	MDR	SW w/R	Plant	Excavator pile	Ground based
11	41	MDR	SW w/R	Natural	Excavator pile	Ground based
15	79	MDR	SW w/R	Natural	Excavator pile	Ground based
16	53	HDR	CT	N/A	Excavator pile	Ground based
18	6	MDR	SW w/R	Plant	Excavator pile	Ground based
20	147	LDR	ST w/R	Plant	Underburn	Ground based
21	33	LDR	ST w/R	Natural	Excavator pile	Ground based
23A	11	LDR	ST w/R	Natural	Underburn	Skyline
24	31	LDR	ST w/R	Natural	Underburn	Ground based
25	78	HDR	CT	N/A	Excavator pile	Ground based
26	93	HDR	CT	N/A	Excavator pile	Ground based
27	31	LDR	ST w/R	Plant	Excavator pile	Ground based
28A	21	LDR	ST w/R	Plant	Excavator pile	Skyline
29	33	MDR	SW w/R	Natural	Underburn	Ground based
30	35	LDR	ST w/R	Plant	Underburn	Ground based
31A	14	MDR	SW w/R	Plant	Excavator pile	Skyline
33	42	MDR	SW w/R	Natural	½ pile, ½ burn	Ground based
34	24	MDR	SW w/R	Natural	Underburn	Ground based
35	169	MDR	SW w/R	Plant	Excavator pile	Ground based
36	63	MDR	SW w/R	Plant	Excavator pile	Ground based
36A	38	MDR	SW w/R	Plant	Excavator pile	Skyline
38	6	MDR	SW w/R	Natural	Excavator pile	Ground based
38A	9	MDR	SW w/R	Natural	Underburn	Skyline
39	79	HDR	CT	N/A	Excavator pile	Ground based
39A	26	HDR	CT	N/A	Excavator pile	Skyline
39B	17	HDR	CT	N/A	Excavator pile	Skyline
40	52	HDR	CT	N/A	Excavator pile	Ground based
41A	127	MDR	SW w/R	Plant	Excavator pile	STS
42	31	HDR	CT	N/A	Excavator pile	Ground based
43	34	HDR	CT	N/A	Excavator pile	Ground based

Unit Number*	Acres	Retention Level***	Treatment Method**	Regeneration Method	Site or Fuel Preparation	Logging System
44	29	HDR	CT	N/A	Excavator pile	Ground based
45	15	HDR	CT	N/A	Excavator pile	Ground based
47	53	HDR	CT	N/A	Excavator pile	Ground based
49	28	HDR	CT	N/A	Underburn	Ground based
53	12	MDR	SW w/R	Natural	Underburn	Ground based
53A	10	MDR	SW w/R	Natural	Underburn	Skyline
56	69	MDR	SW w/R	Natural	Excavator pile	Ground based
57	9	LDR	ST w/R	Plant	Underburn	Ground based
58	14	MDR	SW w/R	Plant	Excavator pile	Ground based
59	8	MDR	SW w/R	Plant	Excavator pile	Ground based
60	27	HDR	CT	N/A	Excavator pile	Ground based
61	11	MDR	SW w/R	Plant	Excavator pile	Ground based
62	11	HDR	CT	N/A	Excavator pile	Ground based
63	14	MDR	SW w/R	Plant	Excavator pile	Ground based
64	65	MDR	SW w/R	Plant	Underburn	Ground based
67	39	HDR	CT	N/A	Excavator pile	Ground based
68	9	HDR	CT	N/A	Excavator pile	Ground based
68A	10	HDR	CT	N/A	Excavator pile	Skyline
69	18	MDR	SW w/R	Plant	Excavator pile	Ground based
69A	3	MDR	SW w/R	Plant	Underburn	Skyline
70	45	HDR	CT	N/A	Excavator pile	Ground based
71	73	HDR	SAN/SALV	N/A	Excavator pile	Ground based
71A	12	LDR	ST w/R	Plant	Excavator pile	Skyline
72	43	MDR	SW w/R	Plant	Excavator pile	Ground based
73	49	MDR	SW w/R	Natural	Excavator pile	Ground based
73A	64	MDR	SW w/R	Plant	Excavator pile	STS
74A	20	MDR	SW w/R	Natural	Excavator pile	Skyline
75	17	MDR	SW w/R	Plant	Excavator pile	Ground based
76	30	MDR	SW w/R	Natural	Excavator pile	Ground based
76A	10	MDR	SW w/R	Natural	Excavator pile	Skyline
76B	4	MDR	SW w/R	Plant	Underburn	Skyline
77	13	HDR	CT	N/A	Excavator pile	Ground based
86	16	HDR	CT	N/A	Excavator pile	Ground based
87	8	HDR	SAN/SALV	N/A	Excavator pile	Ground based
88	83	LDR	ST w/R	Plant	Underburn	Ground based
99	7	LDR	ST w/R	Plant	Excavator pile	Ground based
99A	10	LDR	ST w/R	Plant	Underburn	Skyline
100	62	MDR	SW w/R	Plant	Excavator pile	Ground based
100A	5	MDR	SW w/R	Plant	Excavator pile	Skyline
101	127	MDR	SW w/R	Plant	Excavator pile	Ground based
101A	14	MDR	SW w/R	Plant	Underburn	Skyline
102	9	MDR	SW w/R	Plant	Excavator pile	Ground based
105	18	HDR	CT	N/A	Excavator pile	Ground based
107	24	MDR	SW w/R	Natural	Excavator pile	Ground based
108	51	MDR	SW w/R	Natural	Excavator pile	Ground based
109	116	MDR	SW w/R	Natural	Excavator pile	Ground based
124	52	MDR	SW w/R	Plant	Excavator pile	Ground based
124A	48	MDR	SW w/R	Plant	Excavator pile	Skyline
126A	23	MDR	SW w/R	Plant	Underburn	STS
127A	59	MDR	SW w/R	Natural	Excavator pile	STS
128	52	HDR	CT	N/A	Excavator pile	Ground based
129	20	MDR	SW w/R	Natural	Excavator pile	Ground based
130	11	MDR	SW w/R	Natural	Excavator pile	Ground based

Unit Number*	Acres	Retention Level***	Treatment Method**	Regeneration Method	Site or Fuel Preparation	Logging System
132	17	MDR	SW w/R	Natural	Excavator pile	Ground based
132A	48	MDR	SW w/R	Natural	Underburn	Skyline
133	36	MDR	SW w/R	Plant	Excavator pile	Ground based
134	131	MDR	SW w/R	Natural	Excavator pile	Ground based
136A	31	MDR	SW w/R	Plant	Underburn	Skyline
137	14	MDR	SW w/R	Plant	Excavator pile	Ground
137A	25	MDR	SW w/R	Plant	Excavator pile	Skyline
138A	20	MDR	SW w/R	Plant	Underburn	Skyline
139	39	HDR	CT	Plant	Excavator pile	Ground
140	6	HDR	CT	Plant	Excavator pile	Ground
TOTAL	4235					

* Units with an A or B designation indicate a skyline logging system or a skyline tractor swing (STS) system. All other units are ground-based.

**Treatment Method:

SW w/R = Shelterwood-reserve; ST w/R = Seed Tree w/ reserve; CT = Commercial Thin; SAN/SALV = Sanitation/Salvage

***Retention Levels: (please refer to FEIS Chapter 3, Vegetation Affected Environment)

LDR = Light dispersed retention

MDR = Moderate dispersed retention

HDR = Heavy dispersed retention

HAR = Heavy aggregated retention

Transportation Management Proposals *(refer to Transportation Plan Map, Figure 1-4)*

Table 2-3 contains a detailed summary of proposed road construction involved with Alternative C. New road construction is proposed to allow access to the vegetation treatments described earlier. Forest "system roads" refer to the roads maintained by the Forest Service for current and future use. A temporary road refers to a road constructed for short-term use and is reclaimed soon after the use is completed.

Rehabilitation involves improving roads to meet or exceed Best Management Practices guidelines, a process that generally installs or improves drainage features. Rehabilitation is proposed for roads that we anticipate having heavy traffic.

✓ Road Construction and Improvement

- Approximately 2.7 miles of system road would be built to access harvest units.
- Approximately 3.6 miles of temporary road would be built; these temporary roads would be reclaimed after use. Temporary Road 3 to access Unit 24 in Sanko Creek would require construction of a crossing over an intermittent stream. This is the only stream crossing necessary for all proposed road construction.
- Rehabilitation of drainage systems to comply with Best Management Practices on approximately 99 miles of system roads. Where logs would be hauled on currently bermed roads within existing old growth habitat, all logs must be left intact wherever possible and replaced across the roadway after hauling is complete. This measure would

help to retain downed wood habitat features and continuity of habitats in these old growth stands. This would occur on Road 2913 for 3200 feet where it passes through 819-1-126 and on Road 2904 for 1250 feet where it passes through 811-2-75. A detailed list of roads that would be rehabilitated is found in Exhibit M-1.

- Road maintenance actions consisting of brushing and blading may be needed on some of the haul roads within the project area. Other drainage work such as the placement of drain dips and additional culverts would likely take place. Dust abatement and blading would occur as needed on the main haul routes.

Table 2-3. Proposed Road Construction, Alternative C

Type of Road and Number	Area	Length	Units Accessed
System Roads			
1	Oettiker Creek	2.68	41A, 134
		Total: 2.68	
Temporary Roads			
1	Highland Meadows	0.72	6, 7A
2	Evers Creek	0.41	15
3	Sanko Creek	0.10	24
6	Reid Creek	0.07	132A
9	Bill Creek	0.44	73, 74A
13	Meadow Creek	0.61	99, 99A, 100, 100A
14	Evers Creek	0.43	25, 26
15	Evers Creek	0.19	108
17	Meadow Creek	0.13	127A
18	Bill Creek	0.46	137, 137A
		Total: 3.56	

✓ *Road Reclamation*

Road reclamation planned for Alternative C is identical as for the Proposed Action, which includes reclamation of approximately 16.2 miles of road to improve water quality and wildlife security within the Logan Creek area. Refer to Table 1-5 for a list and Figure 1-4 for a map of roads planned for reclamation. This activity and number of proposed miles of road reclamation is the same as proposed for the Proposed Action as described in Chapter 1.

✓ *Road Restrictions*

Alternative C would implement road restrictions to improve wildlife security within the Logan Creek watershed. Approximately 4.2 miles of roads that are currently open year-round are proposed to be closed year-round to public motorized access. These closures would require installing one new gate and moving the location of another. Refer to Table 1-6. Snowmobile access would remain available on these roads from December 1 to May 14. The above road restrictions are the same as those described in the Proposed Action in Chapter 1. In addition for Alternative C, a 0.7-mile section of Road 9502 from Road 2896 to Road 9897 in the area south of Johnson Peak and in the upper Sanko Creek drainage would be seasonally

closed to all motorized use. The season of closure would be September 1 to June 30. This road restriction is shown on Figure 2-2.

✓ *Trail Construction*

Alternative C proposes trail construction near Tally Lake Campground to complete a short loop trail. Construction would be an extension of Trail 804 and consist of about 2000 feet of new trail. This proposed trail is shown on Figure 1-4 and is the same as described for the Proposed Action in Chapter 1.

✓ *Trail Restrictions*

To improve wildlife security within the Logan Creek watershed and to bring Alternative C up to at least a 30 percent elk security area, approximately 17.5 miles of trail would have a seasonal restriction on motorized use. The season of motorized closure would be September 1 to November 30. The first section of trail that this closure would be implemented on includes Trail 800 from Road 11536 eastward and northward along Reid Divide to the junction with Trail 294. The second section is Trail 176 from Road 9502 to Road 2904 via Johnson Peak. These proposed trail restrictions are depicted on Figure 2-2.

Fisheries and Wildlife Habitat Improvement

The fisheries and wildlife habitat improvement projects proposed for Alternative C are the same as those described for in the Proposed Action in Chapter 1.

Alternative D – Old Growth and Connectivity

This alternative was designed to respond to concerns about protecting old growth habitat and maintaining the forested connections across the landscape that are used as travelways and cover between larger blocks of forested wildlife habitat. This alternative is depicted in Figure 2-3. Alternative D addresses Issue 2 (Effects on existing old growth habitat and on late-seral/structural stage forests), Issue 3 (Landscape patterns – Connectivity), Issue 4 (Landscape Patterns – Seral/structural stage patch size and shapes), and Issue 6 (Road access) as described in Chapter 1.

Alternative D was based on the Proposed Action, then modified by dropping some harvest units and road building, changing some unit boundaries, and increasing the retention levels in other units to better protect old growth values and maintain connectivity. The areas of precommercial thinning and associated pile and burning of thinning slash described in the Proposed Action in lynx foraging habitat are eliminated in this alternative, as are the areas of timber harvest in later-seral lynx foraging habitats.

Figure 2-2. Alternative C Seasonal Road and Trail Restrictions

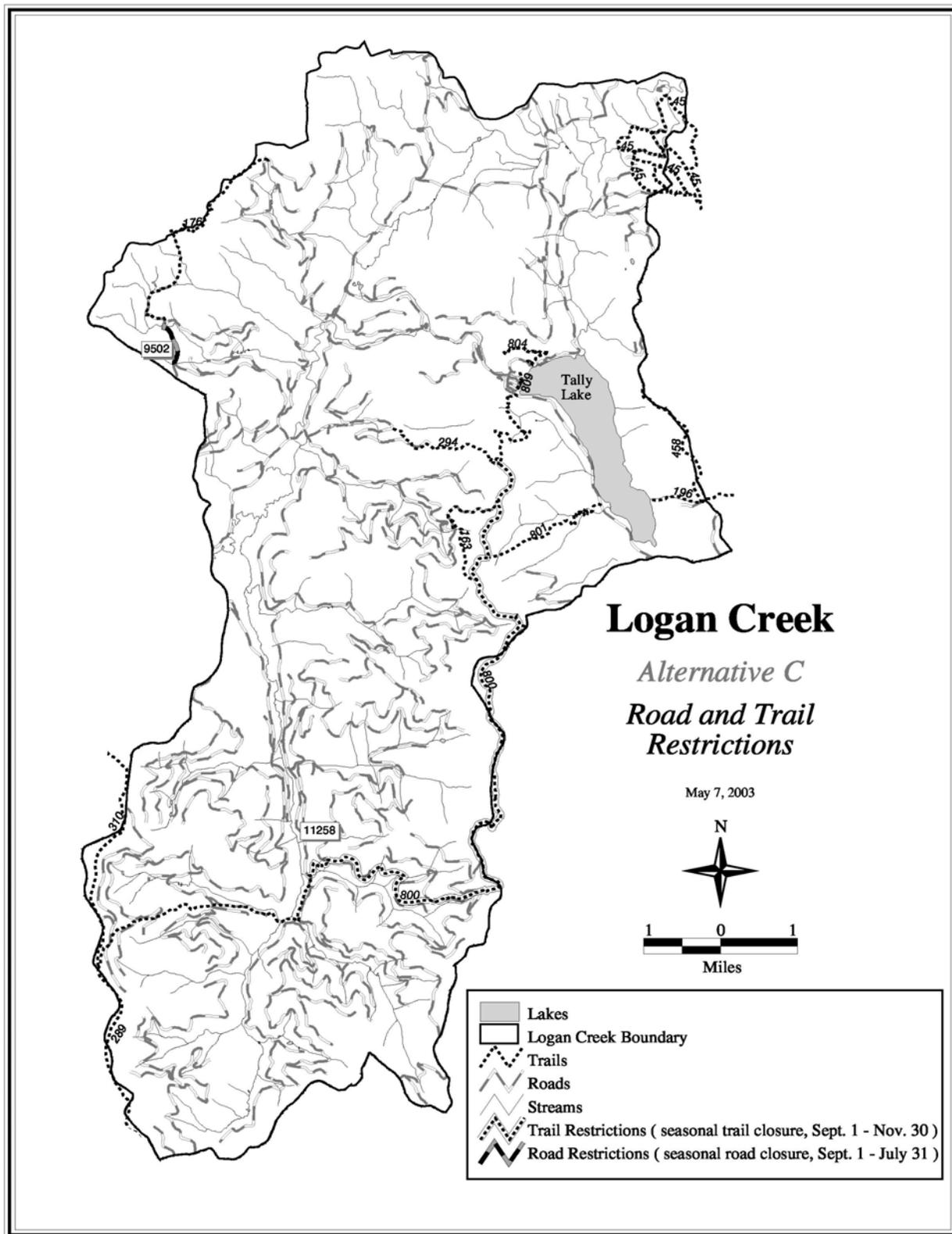


Figure 2-3.

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Vegetation Management Proposals (refer to Vegetation Plan Map, Figure 2-3)

Alternative D would apply several different vegetation treatments in the Logan Creek drainage. Please refer to the Vegetation Management Proposal section of the Proposed Action in Chapter 1 for a more complete discussion of the individual treatments. These treatments would include approximately:

- 4724 acres of commercial timber harvest, which includes salvage harvest. Harvest activities would occur in 113 different units within the project area, as listed in Table 2-4. The number of trees remaining on site would range from low retention to high retention. The levels of retention and silvicultural systems used in this alternative are the same as described for the Proposed Action in Chapter 1. A feature of Alternative D is that all Douglas-fir greater than 25 inches DBH would be retained unless they are infested with Douglas-fir bark beetles at the time of marking or where leaving them would compromise safety.
- 566 acres of spring season prescribed underburning of brush fields, forest understory, and other forest vegetation. This activity and number of proposed acres is the same as proposed for the Proposed Action as described in Chapter 1.
- 182 acres of fuels treatment without a commercial timber harvest or underburning. This activity and number of proposed acres is the same as proposed for the Proposed Action as described in Chapter 1.
- 310 acres of precommercial thinning of sapling-sized trees of lodgepole pine, western larch, Douglas-fir, spruce, subalpine fir, and a minor amount of other tree species. Approximately 15 acres of these would have hand piling and subsequent pile burning to reduce the risk of wildland fire. Treatment on these acres would promote the growth and health of the residual young trees in upland areas. These areas were not assigned unit numbers and are not described in tabular form. Please refer to the Alternative D Proposed Precommercial Thinning Map (Figure 2-4).

Table 2-4. Units for commercial harvest in Alternative D.

Unit Number*	Acres	Retention Level***	Treatment Method**	Regeneration Method	Site or Fuel Preparation	Logging System
1	166	HDR	CT	N/A	Excavator pile	Ground based
2	65	HDR	CT	N/A	Excavator pile	Ground based
3	100	HDR	CT	N/A	Excavator pile	Ground based
4	110	MDR	SW w/R	Natural	Excavator pile	Ground based
5	33	HDR	CT	N/A	Excavator pile	Ground based
6	177	MDR	SW w/R	Natural	Excavator pile	Ground based
7A	25	MDR	SW w/R	Natural	Underburn	Skyline
8	104	HDR	CT	N/A	Excavator pile	Ground based
10	13	HDR	CT	N/A	Excavator pile	Ground based
11	54	MDR	SW w/R	Natural	Excavator pile	Ground based
14	88	MDR	SW w/R	Natural	Excavator pile	Ground based
15	75	MDR	SW w/R	Natural	Excavator pile	Ground based
16	53	HDR	CT	N/A	Excavator pile	Ground based
21	33	LDR	ST w/R	Natural	Excavator pile	Ground based
25	78	HDR	CT	N/A	Excavator pile	Ground based
26	93	HDR	CT	N/A	Excavator pile	Ground based
27	31	LDR	ST w/R	Plant	Excavator pile	Ground based

Unit Number*	Acres	Retention Level***	Treatment Method**	Regeneration Method	Site or Fuel Preparation	Logging System
28A	28	LDR	ST w/R	Plant	Excavator pile	Skyline
29	33	MDR	SW w/R	Natural	Underburn	Ground based
32	123	MDR	SW w/R	Plant	Excavator pile	Ground based
34	24	MDR	SW w/R	Natural	Underburn	Ground based
36	63	HDR	CT	N/A	Excavator pile	Ground based
36A	38	HDR	CT	N/A	Excavator pile	Skyline
39	79	HDR	CT	N/A	Excavator pile	Ground based
39A	26	HDR	CT	N/A	Excavator pile	Skyline
39B	17	HDR	CT	N/A	Excavator pile	Skyline
40	52	HDR	CT	N/A	Excavator pile	Ground based
41	14	MDR	SW w/R	Plant	Excavator pile	Ground based
41A	127	MDR	SW w/R	Plant	Excavator pile	STS
42	31	HDR	CT	N/A	Excavator pile	Ground based
43	34	HDR	CT	N/A	Excavator pile	Ground based
44	29	HDR	CT	N/A	Excavator pile	Ground based
45	15	HDR	CT	N/A	Excavator pile	Ground based
46	17	MDR	SW w/R	Plant	Underburn	Ground based
47	53	HDR	CT	N/A	Excavator pile	Ground based
48	73	MDR	SW w/R	Plant	Excavator pile	Ground based
48A	7	MDR	SW w/R	Natural	Excavator pile	Skyline
49	28	HDR	CT	N/A	Underburn	Ground based
50	44	MDR	SW w/R	Natural	Excavator pile	Ground based
52	120	LDR	ST w/R	Plant	Excavator pile	Ground based
54	33	MDR	SW w/R	Plant	Excavator pile	Ground based
55A	132	MDR	SW w/R	Plant	Underburn	Skyline
56	69	MDR	SW w/R	Natural	Excavator pile	Ground based
57	9	LDR	ST w/R	Plant	Underburn	Ground based
58	14	MDR	SW w/R	Plant	Excavator pile	Ground based
59	8	MDR	SW w/R	Plant	Excavator pile	Ground based
60	27	HDR	CT	N/A	Excavator pile	Ground based
61	11	MDR	SW w/R	Plant	Excavator pile	Ground based
62	11	HDR	CT	N/A	Excavator pile	Ground based
63	14	MDR	SW w/R	Plant	Excavator pile	Ground based
66A	13	MDR	SW w/R	Natural	Underburn	Skyline
67	39	HDR	CT	N/A	Excavator pile	Ground based
68	9	HDR	CT	N/A	Excavator pile	Ground based
68A	10	HDR	CT	N/A	Excavator pile	Skyline
69	18	HDR	CT	N/A	Excavator pile	Ground based
69A	3	MDR	SW w/R	Plant	Underburn	Skyline
70	45	HDR	CT	N/A	Excavator pile	Ground based
71	73	HDR	SAN/SALV	N/A	Excavator pile	Ground based
71A	12	LDR	ST w/R	Plant	Excavator pile	Skyline
72	43	HDR	CT	N/A	Excavator pile	Ground based
73	49	MDR	SW w/R	Natural	Excavator pile	Ground based
73A	64	MDR	SW w/R	Plant	Excavator pile	STS
74	66	MDR	SW w/R	Plant	Excavator pile	Ground based
74A	20	MDR	SW w/R	Natural	Excavator pile	Skyline
75	17	HDR	CT	N/A	Excavator pile	Ground based
76	30	MDR	SW w/R	Natural	Excavator pile	Ground based
76A	3	MDR	SW w/R	Natural	Excavator pile	Skyline
76B	4	MDR	SW w/R	Plant	Underburn	Skyline
77	13	HDR	CT	N/A	Excavator pile	Ground based
78	10	MDR	SW w/R	Plant	Excavator pile	Ground based

Unit Number*	Acres	Retention Level***	Treatment Method**	Regeneration Method	Site or Fuel Preparation	Logging System
79	13	MDR	SW w/R	Plant	Excavator pile	Ground based
80	18	MDR	SW w/R	Plant	Excavator pile	Ground based
85	17	MDR	SW w/R	Plant	Underburn	Ground based
86	16	HDR	CT	N/A	Excavator pile	Ground based
87	8	HDR	SAN/SALV	N/A	Excavator pile	Ground based
91	14	MDR	SW w/R	Plant	Excavator pile	Ground based
100	51	MDR	SW w/R	Plant	Excavator pile	Ground based
100A	5	MDR	SW w/R	Plant	Excavator pile	Skyline
101	112	MDR	SW w/R	Plant	Excavator pile	Ground based
101A	14	MDR	SW w/R	Plant	Underburn	Skyline
102	9	MDR	SW w/R	Plant	Excavator pile	Ground based
103	42	MDR	SW w/R	Plant	Excavator pile	Ground based
105	18	HDR	CT	N/A	Excavator pile	Ground based
106	18	MDR	SW w/R	Natural	Excavator pile	Ground based
107	24	MDR	SW w/R	Natural	Excavator pile	Ground based
108	51	MDR	SW w/R	Natural	Excavator pile	Ground based
109	74	MDR	SW w/R	Natural	Excavator pile	Ground based
111A	21	MDR	SW w/R	Natural	Underburn	Skyline
112A	33	MDR	SW w/R	Natural	Excavator pile	Skyline
114	38	MDR	SW w/R	Plant	Excavator pile	Ground based
117	52	MDR	SW w/R	Plant	Excavator pile	Ground based
124	45	MDR	SW w/R	Plant	Excavator pile	Ground based
124A	48	MDR	SW w/R	Plant	Excavator pile	Skyline
126	25	MDR	SW w/R	Plant	Underburn	Ground based
126A	16	MDR	SW w/R	Plant	Underburn	STS
127	114	MDR	SW w/R	Natural	Excavator pile	Ground based
127A	116	MDR	SW w/R	Natural	Excavator pile	STS
128	52	HDR	CT	N/A	Excavator pile	Ground based
129	7	MDR	SW w/R	Natural	Excavator pile	Ground based
130	11	MDR	SW w/R	Natural	Excavator pile	Ground based
131	18	MDR	SW w/R	Natural	Excavator pile	Ground based
132	17	MDR	SW w/R	Natural	Excavator pile	Ground based
132A	48	MDR	SW w/R	Natural	Underburn	Skyline
133	36	MDR	SW w/R	Plant	Excavator pile	Ground based
134	107	MDR	SW w/R	Natural	Excavator pile	Ground based
135	29	MDR	SW w/R	Natural	Excavator pile	Ground based
136	10	MDR	SW w/R	Plant	Excavator pile	Ground
136A	31	MDR	SW w/R	Plant	Underburn	Skyline
137	14	MDR	SW w/R	Plant	Excavator pile	Ground
137A	25	MDR	SW w/R	Plant	Excavator pile	Skyline
138A	20	MDR	SW w/R	Plant	Underburn	Skyline
139	39	HDR	CT	Plant	Excavator pile	Ground
140	6	HDR	CT	Plant	Excavator pile	Ground
TOTAL	4724					

* Units with an A or B designation indicate a skyline logging system or a skyline tractor swing (STS) system. All other units are ground-based.

****Treatment Method:**

SW w/R = Shelterwood-reserve; ST w/R = Seed Tree w/ reserve; CT = Commercial Thin; SAN/SALV = Sanitation/Salvage

*****Retention Levels:** (please refer to FEIS Chapter 3, Vegetation Affected Environment)

LDR = Light dispersed retention

MDR = Moderate dispersed retention

HDR = Heavy dispersed retention

HAR = Heavy aggregated retention

Transportation Management Proposals *(refer to Transportation Plan Map, Figure 1-4)*

Table 2-5 contains a detailed summary of proposed road construction involved with Alternative D. New road construction is proposed to allow access to the vegetation treatments described earlier. Forest "system roads" refer to the roads maintained by the Forest Service for current and future use. A temporary road refers to a road constructed for short-term use and is reclaimed soon after the use is completed.

Rehabilitation involves improving roads to meet or exceed Best Management Practices guidelines, a process that generally installs or improves drainage features. Rehabilitation is proposed for roads that we anticipate having heavy traffic.

✓ *Road Construction and Improvement*

- Approximately 2.7 miles of system road would be built to access harvest units.
- Approximately 4.3 miles of temporary road would be built; these temporary roads would be reclaimed after use. Temporary Road 3 to access Unit 24 in Sanko Creek would require construction of a crossing over an intermittent stream. This is the only stream crossing necessary for all proposed road construction.
- Rehabilitation of drainage systems to comply with Best Management Practices on approximately 124 miles of system roads. Where logs would be hauled on currently bermed roads within existing old growth habitat, all logs must be left intact wherever possible and replaced across the roadway after hauling is complete. This measure would help to retain downed wood habitat features and continuity of habitats in these old growth stands. This would occur on Road 2904 for 1250 feet where it passes through 811-2-75. A detailed list of roads that would be rehabilitated is found in Exhibit M-1.
- Road maintenance actions consisting of brushing and blading may be needed on some of the haul roads within the project area. Other drainage work such as the placement of drain dips and additional culverts would likely take place. Dust abatement and blading would occur as needed on the main haul routes.

✓ *Road Reclamation*

Road reclamation planned for Alternative D is identical as for the Proposed Action, which includes reclamation of approximately 16.2 miles of road to improve water quality and wildlife security within the Logan Creek area. Refer to Table 1-5 for a list and Figure 1-4 for a map of roads planned for reclamation. This activity and number of proposed miles of road reclamation is the same as in the Proposed Action as described in Chapter 1.

Figure 2-4.

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Table 2-5. Proposed Road Construction, Alternative D

Type of Road and Number	Area	Length	Units Accessed
System Roads			
1	Oettiker Creek	2.68	41, 41A, 134
		Total: 2.68	
Temporary Roads			
1	Highland Meadows	0.72	6, 7A
2	Evers Creek	0.41	15
6	Reid Creek	0.07	132A
7	Oettiker Creek	0.27	50
9	Bill Creek	0.44	73, 74A
13	Meadow Creek	0.61	100, 100A
14	Evers Creek	0.43	25, 26
15	Evers Creek	0.19	108
16	Meadow Creek	0.53	127, 127A
17	Meadow Creek	0.13	127A
18	Bill Creek	0.46	137, 137A
		Total: 4.26	

✓ *Road Restrictions*

Alternative D would implement road restrictions to improve wildlife security within the Logan Creek watershed. Approximately 4.2 miles of roads that are currently open year-round are proposed to be closed year-round to public motorized access. These closures would require installing one new gate and moving the location of another. Refer to Table 1-6. Snowmobile access would remain available on these roads from December 1 to May 14. The above road restrictions are the same as those described in the Proposed Action in Chapter 1.

✓ *Trail Construction*

Alternative D proposes trail construction near Tally Lake Campground to complete a short loop trail. Construction would be an extension of Trail 804 and consist of about 2000 feet of new trail. This proposed trail is shown on Figure 1-4 and is the same as described for the Proposed Action in Chapter 1.

Fisheries and Wildlife Habitat Improvement

The fisheries and wildlife habitat improvement projects described in the Proposed Action in Chapter 1 are the same as those proposed for Alternative D.

Alternative E – Aquatic Resources

This alternative responds to issues raised involving water quality, water yield changes, and possible increases in sediment that may affect aquatic habitat. This alternative is depicted in Figure 2-5. Alternative E addresses Issue 5 (Water quantity and fine sediment deposition) and Issue 6 (Road access) as described in Chapter 1.

Alternative E was developed using the Proposed Action as the base. The Proposed Action would harvest timber in the Pike, Bill, Cyclone, and Reid Creek drainages where channel conditions and modeling of the existing condition suggest they are being affected by increases in water yield and peak flows. Alternative E proposes to reduce the amount of timber harvest and road building in these drainages over the Proposed Action in an effort to minimize potential impacts from water yield increases. Even with reductions in timber harvest in these drainages, some water yield increase is still predicted. Additional reductions in timber harvest were not recommended because most of the remaining harvest units are commercial thinnings (HDR) or salvage of bark beetle killed Douglas-fir, both of which have minimal impacts to water yield after harvesting.

A road reclamation plan was designed for Alternative E that better addresses water resource issues than the reclamation plan that was designed for the Proposed Action. In addition, road improvements for the Logan Creek Road 913 between Tally Lake and the Star Meadow Road are proposed to address chronic sediment deposition in Logan Creek (a stream listed as impaired on the State of Montana's 303(d) list).

Additional road construction is proposed in this alternative. A portion of Forest Road 2913 was originally constructed in the riparian area of a tributary to Reid Creek. This alternative proposes to obliterate the existing portion of road and construct a new road on the bench above the riparian area.

Vegetation Management Proposals (refer to *Vegetation Plan Map, Figure 2-5*)

Alternative E would apply several different vegetation treatments within the Logan Creek drainage. Please refer to the Vegetation Management Proposal section of the Proposed Action in Chapter One for a more complete discussion of the individual treatments. These treatments would include approximately:

- 6315 acres of commercial timber harvest, which includes salvage harvest. Harvest activities would occur in 137 different units within the project area, as listed in Table 2-6. The number of trees remaining on site may range from low retention to high retention. The levels of retention and silviculture systems used in this alternative are the same as described for the Proposed Action in Chapter 1.
- 566 acres of spring season prescribed underburning of brush fields, forest understory, and other forest vegetation. Some slashing or other pretreatment of forest vegetation may be necessary. This burning would reduce fuel levels, improve habitat for wildlife, and return the forest structure of these areas closer to historical conditions.
- 182 acres of fuels treatment without commercial timber harvest or underburning. This treatment would reduce fuel levels and return the forest structure of these areas closer to historical conditions. Vegetative materials to be piled and burned are brush and small-diameter trees and existing down and dead fuel. The work would be accomplished using hand tools and chain saws to move, pile, and burn material.

Figure 2-5.

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- 3783 acres of precommercial thinning of sapling-sized trees of lodgepole pine, western larch, Douglas-fir, spruce, subalpine fir, and a minor amount of other tree species. Approximately 83 of these acres would have hand piling and subsequent pile burning to reduce the risk of wildland fire. Treatment on these acres would promote the growth and health of the residual young trees in upland areas. These areas were not assigned unit numbers and are not described in tabular form. Please refer to the Proposed Precommercial Thinning Map (Figure 1-3).

Table 2-6. Units for commercial harvest in Alternative E.

Unit Number*	Acres	Retention Level***	Treatment Method**	Regeneration Method	Site or Fuel Preparation	Logging System
1	166	MDR	SW w/R	Natural	Excavator pile	Ground based
2	65	HDR	CT	N/A	Excavator pile	Ground based
3	100	MDR	SW w/R	Natural	Excavator pile	Ground based
4	128	MDR	SW w/R	Natural	Excavator pile	Ground based
5	33	HDR	CT	N/A	Excavator pile	Ground based
6	177	MDR	SW w/R	Natural	Excavator pile	Ground based
7A	25	MDR	SW w/R	Natural	Underburn	Skyline
8	104	HDR	CT	N/A	Excavator pile	Ground based
9	18	MDR	SW w/R	Natural	Excavator pile	Ground based
10	13	MDR	SW w/R	Plant	Excavator pile	Ground based
11	80	MDR	SW w/R	Natural	Excavator pile	Ground based
14	201	MDR	SW w/R	Natural	Excavator pile	Ground based
15	79	MDR	SW w/R	Natural	Excavator pile	Ground based
16	53	HDR	CT	N/A	Excavator pile	Ground based
17	64	LDR	ST w/R	Plant	Excavator pile	Ground based
17A	27	LDR	ST w/R	Plant	Underburn	Skyline
18	29	MDR	SW w/R	Plant	Excavator pile	Ground based
19A	70	LDR	ST w/R	Plant	Underburn	Skyline
20	147	LDR	ST w/R	Plant	Underburn	Ground based
21	33	LDR	ST w/R	Natural	Excavator pile	Ground based
23A	11	LDR	ST w/R	Natural	Underburn	Skyline
24	31	LDR	ST w/R	Natural	Underburn	Ground based
25	78	LDR	ST w/R	Natural	Excavator pile	Ground based
26	93	HDR	CT	N/A	Excavator pile	Ground based
27	31	LDR	ST w/R	Plant	Excavator pile	Ground based
28A	28	LDR	ST w/R	Plant	Excavator pile	Skyline
29	33	MDR	SW w/R	Natural	Underburn	Ground based
30	35	LDR	ST w/R	Plant	Underburn	Ground based
31A	14	MDR	SW w/R	Plant	Excavator pile	Skyline
32	101	MDR	SW w/R	Plant	Excavator pile	Ground based
32A	10	MDR	SW w/R	Plant	Underburn	Skyline
33	90	MDR	SW w/R	Natural	½ pile, ½ burn	Ground based
34	24	MDR	SW w/R	Natural	Underburn	Ground based
35	222	MDR	SW w/R	Plant	Excavator pile	Ground based
36	63	HDR	CT	N/A	Excavator pile	Ground based
36A	38	HDR	CT	N/A	Excavator pile	Skyline
38	6	HDR	CT	N/A	Excavator pile	Ground based
38A	9	MDR	SW w/R	Natural	Underburn	Skyline
39	79	HDR	CT	N/A	Excavator pile	Ground based
39A	26	HDR	CT	N/A	Excavator pile	Skyline
39B	17	HDR	CT	N/A	Excavator pile	Skyline
40	52	HDR	CT	N/A	Excavator pile	Ground based
41	14	MDR	SW w/R	Plant	Excavator pile	Ground based

Unit Number*	Acres	Retention Level***	Treatment Method**	Regeneration Method	Site or Fuel Preparation	Logging System
41A	127	MDR	SW w/R	Plant	Excavator pile	STS
42	31	HDR	CT	N/A	Excavator pile	Ground based
43	34	HDR	CT	N/A	Excavator pile	Ground based
44	29	HDR	CT	N/A	Excavator pile	Ground based
45	15	HDR	CT	N/A	Excavator pile	Ground based
46	17	HDR	CT	N/A	Underburn	Ground based
47	53	HDR	CT	N/A	Excavator pile	Ground based
47A	38	MDR	SW w/R	Natural	Underburn	Skyline
48	77	MDR	SW w/R	Plant	Excavator pile	Ground based
48A	7	MDR	SW w/R	Natural	Excavator pile	Skyline
49	28	HDR	CT	N/A	Underburn	Ground based
50	48	MDR	SW w/R	Natural	Excavator pile	Ground based
51	17	MDR	SW w/R	Natural	Underburn	Ground based
52	120	LDR	ST w/R	Plant	Excavator pile	Ground based
53	12	MDR	SW w/R	Natural	Underburn	Ground based
53A	10	MDR	SW w/R	Natural	Underburn	Skyline
54	33	MDR	SW w/R	Plant	Excavator pile	Ground based
55A	148	MDR	SW w/R	Plant	Underburn	Skyline
56	69	MDR	SW w/R	Natural	Excavator pile	Ground based
57	9	LDR	ST w/R	Plant	Underburn	Ground based
58	14	MDR	SW w/R	Plant	Excavator pile	Ground based
59	8	MDR	SW w/R	Plant	Excavator pile	Ground based
60	27	HDR	CT	N/A	Excavator pile	Ground based
61	11	MDR	SW w/R	Plant	Excavator pile	Ground based
62	11	HDR	CT	N/A	Excavator pile	Ground based
63	14	MDR	SW w/R	Plant	Excavator pile	Ground based
64	65	MDR	SW w/R	Plant	Underburn	Ground based
65	68	MDR	SW w/R	Natural	Underburn	Ground based
66A	13	MDR	SW w/R	Natural	Underburn	Skyline
67	39	HDR	CT	N/A	Excavator pile	Ground based
68	9	HDR	CT	N/A	Excavator pile	Ground based
68A	10	HDR	CT	N/A	Excavator pile	Skyline
69	18	HDR	CT	N/A	Excavator pile	Ground based
69A	3	MDR	SW w/R	Plant	Underburn	Skyline
70	45	HDR	CT	N/A	Excavator pile	Ground based
71	73	HDR	SAN/SALV	N/A	Excavator pile	Ground based
72	43	HDR	CT	N/A	Excavator pile	Ground based
73	49	MDR	SW w/R	Natural	Excavator pile	Ground based
73A	64	MDR	SW w/R	Plant	Excavator pile	STS
74	66	MDR	SW w/R	Plant	Excavator pile	Ground based
74A	20	MDR	SW w/R	Natural	Excavator pile	Skyline
76	30	MDR	SW w/R	Natural	Excavator pile	Ground based
76B	4	MDR	SW w/R	Plant	Underburn	Skyline
77	13	HDR	CT	N/A	Excavator pile	Ground based
79	13	MDR	SW w/R	Plant	Excavator pile	Ground based
80	18	MDR	SW w/R	Plant	Excavator pile	Ground based
81	43	LDR	ST w/R	Plant	Excavator pile	Ground based
82	26	LDR	ST w/R	Plant	Excavator pile	Ground based
85	17	MDR	SW w/R	Plant	Underburn	Ground based
86	16	HDR	CT	N/A	Excavator pile	Ground based
87	8	HDR	SAN/SALV	N/A	Excavator pile	Ground based
88	59	LDR	ST w/R	Plant	Underburn	Ground based
91	22	MDR	SW w/R	Plant	Excavator pile	Ground based

Unit Number*	Acres	Retention Level***	Treatment Method**	Regeneration Method	Site or Fuel Preparation	Logging System
99	7	LDR	ST w/R	Plant	Excavator pile	Ground based
99A	10	LDR	ST w/R	Plant	Underburn	Skyline
100	62	MDR	SW w/R	Plant	Excavator pile	Ground based
100A	5	MDR	SW w/R	Plant	Excavator pile	Skyline
101	127	MDR	SW w/R	Plant	Excavator pile	Ground based
101A	14	MDR	SW w/R	Plant	Underburn	Skyline
102	9	MDR	SW w/R	Plant	Excavator pile	Ground based
103	42	MDR	SW w/R	Plant	Excavator pile	Ground based
105	18	HDR	CT	N/A	Excavator pile	Ground based
106	18	MDR	SW w/R	Natural	Excavator pile	Ground based
107	24	MDR	SW w/R	Natural	Excavator pile	Ground based
108	51	MDR	SW w/R	Natural	Excavator pile	Ground based
109	61	MDR	SW w/R	Natural	Excavator pile	Ground based
110	25	MDR	SW w/R	Plant	Excavator pile	Ground based
111A	21	MDR	SW w/R	Natural	Underburn	Skyline
112	24	MDR	SW w/R	Natural	Excavator pile	Ground based
112A	33	MDR	SW w/R	Natural	Excavator pile	Skyline
114	44	MDR	SW w/R	Plant	Excavator pile	Ground based
115	48	MDR	SW w/R	Natural	Excavator pile	Ground based
117	68	MDR	SW w/R	Plant	Excavator pile	Ground based
120A	10	MDR	SW w/R	Plant	Underburn	Skyline
124	52	MDR	SW w/R	Plant	Excavator pile	Ground based
124A	48	MDR	SW w/R	Plant	Excavator pile	Skyline
126	25	MDR	SW w/R	Plant	Underburn	Ground based
126A	23	MDR	SW w/R	Plant	Underburn	STS
127	171	MDR	SW w/R	Natural	Excavator pile	Ground based
127A	116	MDR	SW w/R	Natural	Excavator pile	STS
128	52	HDR	CT	N/A	Excavator pile	Ground based
131	18	MDR	SW w/R	Natural	Excavator pile	Ground based
132	17	MDR	SW w/R	Natural	Excavator pile	Ground based
132A	48	MDR	SW w/R	Natural	Underburn	Skyline
133	36	MDR	SW w/R	Plant	Excavator pile	Ground based
134	175	MDR	SW w/R	Natural	Excavator pile	Ground based
135	87	MDR	SW w/R	Natural	Excavator pile	Ground based
136	10	MDR	SW w/R	Plant	Excavator pile	Ground
136A	31	MDR	SW w/R	Plant	Underburn	Skyline
137	14	MDR	SW w/R	Plant	Excavator pile	Ground
137A	25	MDR	SW w/R	Plant	Excavator pile	Skyline
138A	20	MDR	SW w/R	Plant	Underburn	Skyline
139	39	HDR	CT	Plant	Excavator pile	Ground
140	6	HDR	CT	Plant	Excavator pile	Ground
TOTAL	6315					

* Units with an A or B designation indicate a skyline logging system or a skyline tractor swing (STS) system. All other units are ground-based.

****Treatment Method:**

SW w/R = Shelterwood-reserve; ST w/R = Seed Tree w/ reserve; CT = Commercial Thin; SAN/SALV = Sanitation/Salvage

*****Retention Levels:** (please refer to FEIS Chapter 3, Vegetation Affected Environment)

LDR = Light dispersed retention

MDR = Moderate dispersed retention

HDR = Heavy dispersed retention

HAR = Heavy aggregated retention

Transportation Management Proposals (refer to Transportation Plan Map, Figure 2-6)

Table 2-7 contains a detailed summary of proposed road construction involved with Alternative E. New road construction is proposed to allow access to the vegetation treatments described earlier. Forest "system roads" refer to the roads maintained by the Forest Service for current and future use. A temporary road refers to a road constructed for short-term use and is reclaimed soon after the use is completed.

Rehabilitation involves improving roads to meet or exceed Best Management Practices guidelines, a process that generally installs or improves drainage features. Rehabilitation is proposed for roads that we anticipate having heavy traffic.

✓ Road Construction and Improvement

- Approximately 4.7 miles of system road would be built to access harvest units.
- Approximately 4.9 miles of temporary road would be built; these temporary roads would be reclaimed after use. Temporary Road 3 to access Unit 24 in Sanko Creek would require construction of a crossing over an intermittent stream. This is the only stream crossing necessary for all proposed road construction.
- Rehabilitation of drainage systems to comply with Best Management Practices on approximately 138 miles of system roads. Where logs would be hauled on currently bermed roads within existing old growth habitat, all logs must be left intact wherever possible and replaced across the roadway after hauling is complete. This measure would help to retain downed wood habitat features and continuity of habitats in these old growth stands. This would occur on Road 2904 for 1530 feet where it passes through 811-2-75; Road 2904 for 400 feet where it passes through 811-2-82; Road 2904 for 1400 feet where it passes adjacent to stand 811-2-82; and Road 2913 for 1600 feet where it passes through 819-1-126 after being joined by proposed Specified Road 2. A detailed list of roads that would be rehabilitated is found in Exhibit M-1.
- Road maintenance actions consisting of brushing and blading may be needed on some haul roads within the project area. Other drainage work such as the placement of drain dips and additional culverts would likely occur. Dust abatement and blading would occur as needed on the main haul routes.

✓ Road Reclamation

Alternative E includes reclamation of approximately 16.6 miles of road to improve water quality and wildlife security within the Logan Creek area. Refer to Table 2-8 for a list and Figure 2-6 for a map of roads planned for reclamation. A description of the types of activities involved with road reclamation is presented with the Proposed Action as described in Chapter 1.

Figure 2-6.

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Table 2-7. Proposed Road Construction, Alternative E

Type of Road and Number	Area	Length	Units Accessed
System Roads			
1	Oettiker Creek	2.68	41, 41A, 134
2	Reid Creek	0.37	35
18	Johnson Peak	1.55	North Johnson
22	Johnson Peak	0.14	North Johnson
		Total: 4.74	
Temporary Roads			
1	Highland Meadows	0.72	6, 7A
2	Evers Creek	0.41	15
3	Sanko Creek	0.10	24
5	Reid Creek	0.58	33
6	Reid Creek	0.07	132A
7	Oettiker Creek	0.27	50
9	Bill Creek	0.44	73, 74A
13	Meadow Creek	0.61	99, 99A, 100, 100A
14	Evers Creek	0.43	25, 26
15	Evers Creek	0.19	108
16	Meadow Creek	0.53	127, 127A
17	Meadow Creek	0.13	127A
18	Bill Creek	0.46	137, 137A
		Total: 4.94	

✓ Road Improvement on Road 913

Alternative E would involve road improvements for the Logan Creek Road 913 between Tally Lake and the Star Meadow Road are proposed to address chronic sediment deposition in Logan Creek. Improvement would take place over a length of about three miles. These improvements would include replacement or installation of several drainage culverts, buttressing toe of slumping cut bank slopes with rip-rap, armoring culvert catch basins with rip-rap, cleaning bridge surfaces, constructing drain dips, and installing filtering devices. Vegetation such as shrubs would be planted in the riparian area between the road surface and the stream bank to intercept side cast from road blading operations. A detailed description of this project with logs for Road 913 is found in Exhibit M-2.

✓ Road Restrictions

Alternative E would implement road restrictions to improve wildlife security within the Logan Creek watershed. Approximately 6.2 miles of roads that are currently open year-round are proposed to be closed year-round to public motorized access. These closures would require installing one new gate and moving the location of another. Refer to Table 2-9. Snowmobile access would remain available on these roads from December 1 to May 14.

Table 2-8. Roads Proposed for Reclamation, Alternative E

Road Number	Road Name	Reclaim Miles	Current Status
313	Logan Creek	1.00	Closed yearlong
313N	Pike Logan	1.00	Closed yearlong
313T	Pine Martin	0.50	Closed yearlong
313V	Logan Creek V	0.60	Closed yearlong
313Y	Logan Creek Y	1.50	Closed yearlong
2886	West Pike Creek	1.50	Closed yearlong
2886B	West Pike Creek B	1.00	Closed yearlong
2913	Reid Basin-Lost Creek	0.30	Closed yearlong
2915	Cyclone Logan	0.60	Closed yearlong
2917	Cyclone Creek	0.40	Closed yearlong
2971	Deer Meadows	0.30	<i>Open yearlong</i>
5395	That's It	0.10	Not on map (closed)
9502	Sanko Creek	1.00	Closed yearlong - berm
9504	Crow's Neck	0.80	Open Seasonally - brush
9506	Old Out House	0.50	Open Seasonally - brush
9524	Moose Basin	0.50	Closed yearlong
9537	Sanko Yew	0.40	<i>Open yearlong</i>
9538	Cyclone Basin	0.60	Closed yearlong
9583	Logan Knob	0.60	Closed yearlong
9617	West Tally	0.60	<i>Open yearlong</i>
9677A	Lower Boundary	0.60	Closed yearlong
9763D	Moose Hollow	0.30	Closed yearlong
9895	Johnson Hill	0.40	Closed yearlong
10268	Cyclone Bottom	0.80	Closed yearlong
10360	Sanko Pit	0.70	Not on map (closed)
	Total Miles:	16.60	

Table 2-9. Roads Proposed for Change to Yearlong Closure, Alternative E

Road Number	Road Name	Miles	Current Status
2909	Taylor Creek	3.60	<i>Open Yearlong</i>
2909B	Taylor Quarry	0.20	<i>Open Yearlong</i>
10436	Mushroom Cap	2.00	<i>Open yearlong</i>
11258	South Logan	0.40	<i>Open Yearlong</i>
	Total Miles:	6.20	

√ *Trail Construction*

Alternative E proposes trail construction near Tally Lake Campground to complete a short loop trail. Construction would be an extension of Trail 804 and would consist of about 2000 feet of new trail. This proposed trail is shown on Figure 1-4 and is the same as described for the Proposed Action in Chapter 1.

Fisheries and Wildlife Habitat Improvement

The fisheries and wildlife habitat improvement projects for Alternative E are the same as those described in the Proposed Action in Chapter 1.

Alternative F – Preferred Alternative

This alternative was developed in response to environmental analysis in the Draft EIS and public comment on that document. It attempts to balance the environmental impacts on resources described in the issues section of Chapter 1 while meeting the purpose and need to the greatest extent possible. This alternative is depicted in Figure 2-7.

Alternative F was crafted using the Proposed Action (Alternative B) as a base, but includes components and concepts from all the action alternatives described in the DEIS. It proposes fewer miles of road construction than the Proposed Action. Many proposed vegetation treatment units have been reduced in size to create a buffer between unit boundaries and stands identified as old growth. Retention levels sometimes were increased compared to the Proposed Action in response to concerns over wildlife connectivity and cover, concerns over impacts to streams and fisheries habitat, and/or in response to updated stand survey information. Several units were eliminated from this alternative to reduce impacts to streams and fisheries habitat. Others units were eliminated to avoid impacting old growth habitat or reducing connections among key habitat areas. Appendix E includes a table that displays the reason for the inclusion, exclusion, or modification of units in the Preferred Alternative as compared to the Proposed Action.

Vegetation Management Proposals

Alternative F would apply several different vegetation treatments over about 6600 acres within the Logan Creek area. Please refer to the Alternative F Proposed Vegetation Treatment Map (Figure 2-7). These treatments would include approximately:

- 5521 acres of commercial timber harvest, which includes salvage harvest. Harvest activities would occur in 126 different units within the project area as listed in Table 2-10. This table contains a column of Map Grid coordinates that relate to numbers and letters on the sides of Figure 2-7 allowing for easy location of units on the proposed vegetation treatment map. Openings would be created using a combination of shelterwood and seed tree harvest methods; followed by prescribed burning or excavator site preparation for seedling regeneration. Reserve trees would be left both in clumps and as individual trees. Some units would instead be commercially thinned, leaving the remaining trees dispersed across the stand.
- 566 acres of spring season prescribed underburning of brush fields, forest understory, and other forest vegetation. Some slashing or other pretreatment of forest vegetation may be necessary. This burning would reduce fuel levels, improve habitat for wildlife, and return the forest structure of these areas closer to historical conditions.

- 182 acres of fuels treatment without commercial timber harvest or underburning. This treatment would reduce fuel levels and return the forest structure of these areas closer to historical conditions. Vegetative materials to be piled and burned are brush and small-diameter trees and existing down and dead fuel. The work would be accomplished using hand tools and chain saws to move, pile, and burn material.
- 310 acres of precommercial thinning of sapling-sized trees of lodgepole pine, western larch, Douglas-fir, spruce, subalpine fir, and a minor amount of other tree species. Approximately 15 acres of these would have hand piling of thinning slash and subsequent pile burning to reduce the risk of wildland fire. Treatment on these acres would promote the growth and health of the residual young trees in upland areas. These areas were not assigned unit numbers and are not described in tabular form. Please refer to the Proposed Precommercial Thinning Map (Figure 1-3).

Table 2-10. Units for commercial harvest in Alternative F.

Unit Number*	Map Grid	Acres	Retention Level***	Treatment Method**	Regeneration Method	Site or Fuel Preparation	Logging System
1	D2	166	HDR	CT	N/A	Excavator pile	Ground based
2	D2	65	HDR	CT	N/A	Excavator pile	Ground based
3	D2	100	HDR	CT	N/A	Excavator pile	Ground based
4	D3	110	MDR	SW w/R	Natural	Excavator pile	Ground based
5	D2	33	HDR	CT	N/A	Excavator pile	Ground based
6	E2	177	MDR	SW w/R	Natural	Excavator pile	Ground based
7A	D2	25	MDR	SW w/R	Natural	Underburn	Skyline
8	D2	104	HDR	CT	N/A	Excavator pile	Ground based
9	E2	18	HDR	CT	N/A	Excavator pile	Ground based
10	E2	13	HDR	CT	N/A	Excavator pile	Ground based
11	E3	54	MDR	SW w/R	Natural	Excavator pile	Ground based
14	D1	150	HDR#	CT	N/A	Excavator pile	Ground based
15	C1	75	MDR	SW w/R	Natural	Excavator pile	Ground based
16	B1	53	HDR	CT	N/A	Excavator pile	Ground based
17	B1	64	LDR	ST w/R	Plant	Excavator pile	Ground based
19A	B1	70	LDR	ST w/R	Plant	Underburn	Skyline
21	A3	33	LDR	ST w/R	Natural	Excavator pile	Ground based
23A	B3	11	LDR	ST w/R	Natural	Underburn	Skyline
24	A4	31	LDR	ST w/R	Natural	Underburn	Ground based
25	C2	78	HDR	CT	N/A	Excavator pile	Ground based
26	C2	93	HDR	CT	N/A	Excavator pile	Ground based
28A	C3	28	LDR	ST w/R	Plant	Excavator pile	Skyline
29	B3	33	MDR	SW w/R	Natural	Underburn	Ground based
30	B3	35	LDR	ST w/R	Plant	Underburn	Ground based
32	A7	101	MDR	SW w/R	Plant	Excavator pile	Ground based
33	B4	42	MDR	SW w/R	Natural	½ pile, ½ burn	Ground based
34	B4	24	MDR	SW w/R	Natural	Underburn	Ground based
35	C4	94	MDR	SW w/R	Plant	Excavator pile	Ground based
36	C4	63	MDR	SW w/R	Plant	Excavator pile	Ground based
36A	C4	38	HDR	CT	N/A	Excavator pile	Skyline
37	C4	128	HDR	CT	N/A	Excavator pile	Ground based
39	B5	79	HDR	CT	N/A	Excavator pile	Ground based
39A	B5	26	HDR	CT	N/A	Excavator pile	Skyline
39B	C5	17	HDR	CT	N/A	Excavator pile	Skyline
40	B5	52	MDR	SW w/R	Natural	Excavator pile	Ground based

Unit Number*	Map Grid	Acres	Retention Level***	Treatment Method**	Regeneration Method	Site or Fuel Preparation	Logging System
41A	B5	127	MDR	SW w/R	Plant	Excavator pile	STS
42	C5	31	HDR	CT	N/A	Excavator pile	Ground based
43	C5	34	HDR	CT	N/A	Excavator pile	Ground based
44	C5	29	HDR	CT	N/A	Excavator pile	Ground based
45	B5	15	HDR	CT	N/A	Excavator pile	Ground based
46	C6	17	MDR	SW w/R	Plant	Underburn	Ground based
47	C5	53	HDR	CT	N/A	Excavator pile	Ground based
47A	C5	38	HDR#	CT	N/A	Underburn	Skyline
48	C6	73	MDR	SW w/R	Plant	Excavator pile	Ground based
48A	C6	7	MDR	SW w/R	Natural	Excavator pile	Skyline
49	C6	28	HDR	CT	N/A	Underburn	Ground based
51	B6	17	MDR	SW w/R	Natural	Underburn	Ground based
52	B6	120	LDR	ST w/R	Plant	Excavator pile	Ground based
53	B6	12	MDR	SW w/R	Natural	Underburn	Ground based
53A	B6	10	MDR	SW w/R	Natural	Underburn	Skyline
54	B7	33	MDR	SW w/R	Plant	Excavator pile	Ground based
55A	C7	132	MDR	SW w/R	Plant	Underburn	Skyline
56	A3	69	MDR	SW w/R	Natural	Excavator pile	Ground based
57	B7	9	LDR	ST w/R	Plant	Underburn	Ground based
58	C7	14	MDR	SW w/R	Plant	Excavator pile	Ground based
59	B7	8	MDR	SW w/R	Plant	Excavator pile	Ground based
60	B7	27	HDR	CT	N/A	Excavator pile	Ground based
61	B7	11	MDR	SW w/R	Plant	Excavator pile	Ground based
62	B7	11	HDR	CT	N/A	Excavator pile	Ground based
63	B7	14	MDR	SW w/R	Plant	Excavator pile	Ground based
64	B7	54	MDR	SW w/R	Plant	Underburn	Ground based
65	B7	68	HDR	CT	N/A	Excavator pile	Ground based
66A	B7	13	MDR	SW w/R	Natural	Underburn	Skyline
67	C8	39	HDR	CT	N/A	Excavator pile	Ground based
68	C8	9	HDR	CT	N/A	Excavator pile	Ground based
68A	C8	10	HDR	CT	N/A	Excavator pile	Skyline
69	C8	18	HDR	CT	N/A	Excavator pile	Ground based
69A	C8	3	MDR	SW w/R	Plant	Underburn	Skyline
71	B8	84	HAR#	SAN/SAL	Plant	Excavator pile	Ground based
71A	B8	12	HAR#	SAN/SAL	Plant	Excavator pile	Skyline
72	B8	43	HDR	CT	N/A	Excavator pile	Ground based
73	B8	49	MDR	SW w/R	Natural	Excavator pile	Ground based
73A	B8	64	MDR	SW w/R	Plant	Excavator pile	STS
74	B8	66	MDR	SW w/R	Plant	Excavator pile	Ground based
74A	B8	20	MDR	SW w/R	Natural	Excavator pile	Skyline
76	C8	30	HDR	CT	N/A	Excavator pile	Ground based
76B	C8	4	MDR	SW w/R	Plant	Underburn	Skyline
77	C8	13	HDR	CT	N/A	Excavator pile	Ground based
78	B9	10	MDR	SW w/R	Plant	Excavator pile	Ground based
79	C9	13	HDR	CT	N/A	Excavator pile	Ground based
80	C9	18	MDR	SW w/R	Plant	Excavator pile	Ground based
81	C9	43	LDR	ST w/R	Plant	Excavator pile	Ground based
82	C9	26	LDR	ST w/R	Plant	Excavator pile	Ground based
85	B9	17	MDR	SW w/R	Plant	Underburn	Ground based
86	B9	16	HDR	CT	N/A	Excavator pile	Ground based
87	B9	8	HDR	SAN/SAL	N/A	Excavator pile	Ground based
88	B8	36	LDR	ST w/R	Plant	Underburn	Ground based
91	B9	22	MDR	SW w/R	Plant	Excavator pile	Ground based

Unit Number*	Map Grid	Acres	Retention Level***	Treatment Method**	Regeneration Method	Site or Fuel Preparation	Logging System
99	B8	7	LDR	ST w/R	Plant	Excavator pile	Ground based
99A	B8	10	LDR	ST w/R	Plant	Underburn	Skyline
100	A8	62	MDR	SW w/R	Plant	Excavator pile	Ground based
100A	A8	5	MDR	SW w/R	Plant	Excavator pile	Skyline
101	A8	112	MDR	SW w/R	Plant	Excavator pile	Ground based
101A	A8	14	MDR	SW w/R	Plant	Underburn	Skyline
102	A8	9	MDR	SW w/R	Plant	Excavator pile	Ground based
103	A6	42	MDR	SW w/R	Plant	Excavator pile	Ground based
105	C3	18	HDR	CT	N/A	Excavator pile	Ground based
106	B1	18	MDR	SW w/R	Natural	Excavator pile	Ground based
107	B2	24	MDR	SW w/R	Natural	Excavator pile	Ground based
108	B2	51	MDR	SW w/R	Natural	Excavator pile	Ground based
109	B4	61	MDR	SW w/R	Natural	Excavator pile	Ground based
111A	B6	21	MDR	SW w/R	Natural	Underburn	Skyline
112A	C7	33	MDR	SW w/R	Natural	Excavator pile	Skyline
114	B9	38	MDR	SW w/R	Plant	Excavator pile	Ground based
117	B9	52	MDR	SW w/R	Plant	Excavator pile	Ground based
120A	B9	10	MDR	SW w/R	Plant	Underburn	Skyline
124	B8	52	MDR	SW w/R	Plant	Excavator pile	Ground based
124A	B8	48	MDR	SW w/R	Plant	Excavator pile	Skyline
126	B8	25	MDR	SW w/R	Plant	Underburn	Ground based
126A	B8	16	MDR	SW w/R	Plant	Underburn	STS
127	A7	171	MDR	SW w/R	Natural	Excavator pile	Ground based
127A	A7	116	MDR	SW w/R	Natural	Excavator pile	STS
128	A6	52	HDR	CT	N/A	Excavator pile	Ground based
131	A9	18	MDR	SW w/R	Natural	Excavator pile	Ground based
132	B4	17	MDR	SW w/R	Natural	Excavator pile	Ground based
132A	B4	48	MDR	SW w/R	Natural	Underburn	Skyline
133	B5	36	MDR	SW w/R	Plant	Excavator pile	Ground based
134	B5	131	MDR	SW w/R	Natural	Excavator pile	Ground based
135	C7	29	MDR	SW w/R	Natural	Excavator pile	Ground based
136	B6	10	MDR	SW w/R	Plant	Excavator pile	Ground based
136A	B6	31	MDR	SW w/R	Plant	Underburn	Skyline
137	B8	14	MDR	SW w/R	Plant	Excavator pile	Ground based
137A	B8	25	MDR	SW w/R	Plant	Excavator pile	Skyline
138A	B3	20	MDR	SW w/R	Plant	Underburn	Skyline
139	D3	39	HDR	CT	Plant	Excavator pile	Ground based
140	D3	6	HDR	CT	Plant	Excavator pile	Ground based
TOTAL		5521					

* Units with an A or B designation indicate a skyline logging system or a skyline tractor swing (STS) system. All other units are ground-based.

**Treatment Method:

SW w/R = Shelterwood-reserve; ST w/R = Seed Tree w/ reserve; CT = Commercial Thin; SAN/SALV = Sanitation/Salvage

***Retention Levels: (please refer to FEIS Chapter 3, Vegetation Affected Environment)

LDR = Light dispersed retention

MDR = Moderate dispersed retention

HDR = Heavy dispersed retention

HAR = Heavy aggregated retention

LAR = Light aggregated retention

Please see Chapter 3, Vegetation Section, Alternative B, Stand Groups for a detailed discussion of retention levels for these units.

Figure 2-7.

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Transportation Management Proposals *(refer to Transportation Plan Map, Figure 2-6)*

Table 2-11 contains a detailed summary of proposed road construction involved with Alternative F. New road construction is proposed to allow access to the vegetation treatments described earlier. Forest "system roads" refer to the roads maintained by the Forest Service for current and future use. A temporary road refers to a road constructed for short-term use and is reclaimed soon after the use is completed. Proposed road construction for Alternative F is depicted on Figure 2-7.

Rehabilitation involves improving roads to meet or exceed Best Management Practices guidelines, a process that generally installs or improves drainage features. Rehabilitation is proposed for roads that we anticipate having heavy traffic.

Road Construction and Improvement

- Approximately 3.8 miles of system road would be built to access harvest units. An approximately one-quarter mile section of proposed System Road 1 crosses land administered by the Montana Department of Natural Resources and Conservation (DNRC). Use of this section of road by the Forest Service would be by permit.
- Approximately 4.5 miles of temporary road would be built; these temporary roads would be reclaimed after use. Temporary Road 3 to access Unit 24 in Sanko Creek would require construction of a crossing over an intermittent stream. This is the only stream crossing necessary for all proposed road construction.
- Rehabilitation of drainage systems to comply with Best Management Practices on approximately 133 miles of system roads. A detailed list of roads that would be rehabilitated is found in Exhibit M-1.
- Road maintenance actions consisting of brushing and blading may be needed on some of the haul roads within the project area. Other drainage work such as the placement of drain dips and additional culverts would likely take place. Dust abatement and blading would occur as needed on the main haul routes.

✓ *Road Reclamation*

Alternative F proposed the same road reclamation plan as that proposed for Alternative E, which includes reclamation of approximately 16.6 miles of road to improve water quality and wildlife security within the Logan Creek area. This includes reclamation of 1.3 miles of road currently open for public use year round. Refer to Table 2-8 for a list and Figure 2-6 for a map of roads planned for reclamation. A description of the types of activities involved with road reclamation is presented with the Proposed Action as described in Chapter 1.

Table 2-11. Proposed Road Construction for Implementation of Alternative F.

Type of Road and Number	Area	Length	Units Accessed
System Roads			
1	Oettiker Creek	1.72	41A, 133
2	Reid Creek	0.37	35, 37
18	Johnson Peak	1.55	North Johnson
22	Johnson Peak	0.14	North Johnson
		Total: 3.78	
Temporary Roads			
1	Highland Meadows	0.72	6, 7A
2	Evers Creek	0.41	15
3	Sanko Creek	0.10	24
6	Reid Creek	0.07	132A
9	Bill Creek	0.44	73, 74A
13	Meadow Creek	0.61	99, 99A, 100, 100A
14	Evers Creek	0.43	25, 26
15	Evers Creek	0.19	108
16	Meadow Creek	0.53	127, 127A
17	Meadow Creek	0.13	127A
18	Bill Creek	0.46	137, 137A
19	Oettiker Creek	0.44	134
		Total: 4.53	

✓ *Road Improvement on Road 913*

Alternative F would involve road improvements for the Logan Creek Road 913 between Tally Lake and the Star Meadow Road are proposed to address chronic sediment deposition in Logan Creek. Improvement would take place over a length of about three miles. These improvements would include replacement or installation of several drainage culverts, buttressing toe of slumping cut bank slopes with rip-rap, armoring culvert catch basins with rip-rap, cleaning bridge surfaces, constructing drain dips, and installing filtering devices. Vegetation such as shrubs would be planted in the riparian area between the road surface and the stream bank to intercept side cast from road blading operations. A detailed description of this project with logs for Road 913 is found in Exhibit M-2. The location of this activity is shown on Figure 2-6.

✓ *Road Restrictions*

Alternative F would implement road restrictions to improve wildlife security within the Logan Creek watershed. Approximately 6.2 miles of roads that are currently open year-round are proposed to be closed year-round to public motorized access. These closures would require installing one new gate and moving the location of another. Refer to Table 2-9. Snowmobile access would remain available on these roads from December 1 to May 14. The above road restrictions are the same as those described in Alternative E above and shown on Figure 2-6.

✓ *Trail Construction*

Alternative F proposes trail construction near Tally Lake Campground to complete a short loop trail. Construction would be an extension of Trail 804 and consist of about 2000 feet of new trail. This proposed trail is shown on Figure 1-4.

✓ *Trail Restrictions*

To improve wildlife security within the Logan Creek watershed, approximately 12.7 miles of trail would have a seasonal restriction on motorized use. The season of motorized closure would be September 1 to November 30. The section of trail that this closure would be implemented on is Trail 800 from Road 11536 eastward and northward along Reid Divide to the junction with Trail 294. This proposed trail restriction is depicted on Figure 2-2.

Fisheries and Wildlife Habitat Improvement

The fisheries and wildlife habitat improvement projects proposed for Alternative F are the same as those described for in the Proposed Action in Chapter 1.

Alternatives Considered but Eliminated from Detailed Study

Federal agencies are required by NEPA to rigorously explore and objectively evaluate all reasonable alternatives and to briefly discuss the reasons for eliminating any alternatives that were not developed in detail (40 CFR 1502.14). Public comments received in response to the Proposed Action provided suggestions for alternative methods for achieving the purpose and need. Some of these suggested alternatives may have been outside the scope of one or more of the purpose and need statements, impractical to implement due to limited funding opportunities, or were determined to have components that would cause unnecessary environmental harm. Therefore, four alternatives were considered, but were dismissed from detailed consideration for reasons summarized below.

Use of Helicopter Harvesting Systems

We were requested to investigate the use of helicopters to harvest beetle killed or infested timber in areas far from roads. Helicopter yarding is a relatively expensive alternative to ground-based or cable yarding methods. Typically, the use of helicopters is only economically feasible in areas of high volumes of timber to be removed per acre, larger than average log sizes, and/or high valued timber. In addition, a large amount of helicopter yarding volume is necessary at one time to justify the considerable move-in and move-out costs. Post-harvest slash treatment and reforestation costs are typically higher with reduced access opportunities.

The Purpose and Need of this project targeted areas for vegetation treatment that would bring the landscape closer to historic patterns of structure size classes and patch sizes, not areas with high timber volume or value. The Purpose and Need could be achieved over most of the analysis area utilizing less expensive conventional logging equipment on primarily existing roads.

One area of primarily Douglas-fir trees either killed or currently infested with beetles is located on the east side of Tally Lake. This area was initially considered for vegetation treatments using a helicopter yarding system because no roads are located nearby. This portion of the planning area is located in Forest Plan Management Area 2A, which only allows for timber harvest with salvage of dead and dying trees. The long yarding distance to an appropriate landing (about two miles) and the scattered nature of the dead and dying Douglas-fir did not make this alternative economically feasible (see Exhibit N-1). Requiring helicopter yarding would create yarding costs in excess of the value of the logs being removed, bids would not be received on timber sale contracts, and vegetation treatments desired to meet this project's Purpose and Need would not be accomplished. Helicopter yarding was therefore not developed into an alternative.

Ecosystem Restoration Without Commercial Timber Harvest

We were requested to consider an alternative that consisted only of those projects in the Proposed Action that did not involve timber harvesting and road building. Examples of these projects are road reclamation, road rehabilitation, precommercial thinning, fuel reduction projects using prescribed burning and hand fuel treatments, large woody debris placement in streams, pool construction for fish habitat improvement, and riparian planting of shrub and conifers for wildlife habitat improvement.

A restoration alternative without commercial timber harvest was eliminated from detailed study because it would not meet most of the components of the project's Purpose and Need for action (please refer to page 1-4 of Chapter 1 on this document). Each of these purpose and need objectives will be discussed in the following paragraphs.

Reduce Hazardous Fuel. Some hazardous fuel reduction could be met by an alternative that does not harvest timber. Areas of prescribed burning and hand fuel treatments could be designated in areas that are described for timber harvest in the Proposed Action. However, the level of hazardous fuel reduction that could be implemented without timber harvest would be minor. The landscape approach taken by the Interdisciplinary Team during the design of the Proposed Action was to integrate existing fuel breaks and high priority areas for maximum effectiveness. Scattered attempts at fuel reduction without timber harvest would be minimally effective.

Restore Vegetative Cover Types and Structure Classes. Very little change to cover types and structure classes from the existing to historic levels could be accomplished without commercial timber harvest. Prescribed burning is an option to achieve some of this Purpose and Need, but burning is often imprecise and expensive. Timber sales whose end result is vegetative restoration while being economically viable allow for the large areas of treatment necessary to meet this purpose and need objective.

Reduce the Vulnerability of the Forest to Disturbances. The primary disturbance agents in the Logan Creek drainage at this time are the Douglas-fir bark beetle, *Armillaria* root rot, and wildland fire. The most effective process for reducing the impacts of these disturbances is to reduce the number of live trees, particularly Douglas-fir, from a given area. A reduced number of trees increases the individual health of the remaining trees and allows for increased resistance to disturbance agents. Timber harvesting is the only economically viable method to achieve this purpose and need objective.

Provide Economically Viable Removal of Timber. The proposed alternative would not meet this purpose and need objective to any degree.

The Knutson-Vandenberg Act of 1930 (PL 71-319, as amended) allows for funds generated from the sale of national forest timber to be used for forest improvement work within the sale area; these are called KV funds. Much of the proposed road reclamation, road restoration, wildlife habitat, and fisheries habitat work may be accomplished with these funds. Congressionally appropriated funds are often limited, and K-V funds are the only means to accomplish restoration activities.

Enhance Motorized Access

We were requested to consider increasing the amount of motorized access on roads and trails beyond what the Proposed Action involves. Enhancing motorized access was not an alternative considered in detail because of increased costs of road and trail maintenance and reduced wildlife security.

The Flathead National Forest is currently appropriated fewer funds than are necessary to maintain our system of roads and trails. Roads open to the public require a higher and more expensive level of maintenance than closed roads. Trails open to motorized vehicles also require a higher level of maintenance. Expanding the number of open miles would further reduce the level of maintenance and public safety for roads and trails open to the public.

Motor vehicle activity reduces wildlife security. Individual animals are less secure in areas of motorized access due primarily to increased hunting pressure. Wildlife habitat effectiveness is reduced due to reductions in snags removed for firewood gathering.

Increase Timber Harvest to Treat More Acres of Stands Infested with Douglas-fir Bark Beetles Than in the Proposed Action

We were requested to consider increasing the amount of timber harvesting in areas of Douglas-fir killed and infested with bark beetles over the Proposed Action. We did not develop this idea in an alternative for reasons outlined in the following paragraphs.

In addition to reducing the vulnerability of forested areas to Douglas-fir bark beetles, another objective of the Logan Creek project is to restore landscape patterns to more closely emulate historical conditions. To meet those historical conditions, the Proposed Action emphasizes treating stands that are either at risk of infestation by Douglas-fir bark beetles or currently have high numbers of infested trees. In addition, the harvest treatments in the Proposed

Action very closely approximate the historical distribution of forest structure and composition. When considering past actions as well as what has been proposed, harvesting additional acres would be outside the range of historical conditions and all of the associated effects.

To reduce bark beetle populations and future mortality, it is necessary to remove trees with bark beetles and thin dense stands of Douglas-fir trees. Bark beetle surveys from 2002 indicate 1800 acres were infested. The previous year, 2000 acres were infested. While it is impossible to know where bark beetles will invade, the Proposed Action proposes harvest on over 6000 acres. This action provides for harvesting stands that are currently infested as well as many areas that are at risk to future mortality by bark beetles. Increasing the number of acres of timber harvest beyond what is in the Proposed Action to address potential future Douglas-fir mortality would jeopardize other ecosystem functions.

Comparison of Alternatives

Although Chapter 3 presents a detailed discussion of the environmental effects of the alternatives, Chapter 2 concludes with a summary of the effects of the alternatives. Information in the tables is focused on activities and effects where different levels of effects or outputs can be distinguished quantitatively or qualitatively among alternatives. It also includes a table comparing the number of acres of vegetation treatments affected by Forest Plan management area.

Comparison By Issue

Each alternative is evaluated for its effects on resources emphasized by significant issues, which are the issues that drove the development of alternatives. Issue indicators are the parameters used to measure the effects of each alternative on the resources emphasized by those issues. The issue indicators for each alternative are presented in the following table. A comparison between the effects of the alternatives on resources of concern is summarized in narrative form in the Summary section at the beginning of this document.

Table 2-12. Response of Alternatives to Issues.

Issue and Issue Indicators:	Alt. A <i>No Action</i>	Alt. B <i>Proposed Action</i>	Alt. C <i>Wildlife Security</i>	Alt. D <i>Old Growth and Connectivity</i>	Alt. E <i>Soil and Water</i>	Alt. F <i>Preferred Alternative</i>
#1. Wildlife Security						
• Percent of analysis area in elk hunting season security area	33.2%	35.0%	42.3%	35.4%	34.2%	38.6%
• Percent of elk habitat analysis units with < 30% in elk hunting season security area	43%	71%	0%	71%	71%	14%
• Acres unavailable to elk (> 600' from cover)	129	827	438	549	792	681

Issue and Issue Indicators:	Alt. A <i>No Action</i>	Alt. B <i>Proposed Action</i>	Alt. C <i>Wildlife Security</i>	Alt. D <i>Old Growth and Connectivity</i>	Alt. E <i>Soil and Water</i>	Alt. F <i>Preferred Alternative</i>
<ul style="list-style-type: none"> Miles/sq. mile of roads open year-round Miles/sq. mile of roads open in summer Vulnerability to habitat loss via firewood cutting, in acres 	0.99	0.91	0.91	0.91	0.91	0.91
<ul style="list-style-type: none"> Miles/sq. mile of roads open in summer Vulnerability to habitat loss via firewood cutting, in acres 	1.34	1.27	1.26	1.34	1.26	1.26
<ul style="list-style-type: none"> Vulnerability to habitat loss via firewood cutting, in acres 	3706	3016	3100	3173	3065	3016
#2. Old Growth Habitat <ul style="list-style-type: none"> Acres of harvest in “possible” old growth habitat (would occur only if no longer old growth at time of sale prep) Acres (and %) reduction of late seral/structural forest Miles (and acres) of new high contrast edge along existing old growth habitat Feet of new road through existing old growth habitat (and acres of old growth harvested, assuming 4 acres harvested per mile of road) 	0	54	34	44	54	44
<ul style="list-style-type: none"> Acres (and %) reduction of late seral/structural forest 	0	4928 (16%)	2637 (9%)	2892 (10%)	4410 (15%)	4063 (13%)
<ul style="list-style-type: none"> Miles (and acres) of new high contrast edge along existing old growth habitat 	0 (0 ac)	11.7 (427 ac)	3.6 (129 ac)	0.0 (0 ac)	9.8 (356 ac)	0.0 (0 ac)
<ul style="list-style-type: none"> Feet of new road through existing old growth habitat (and acres of old growth harvested, assuming 4 acres harvested per mile of road) 	0 (0)	1300’ (1.0 acres)	0 (0)	0 (0)	1450’ (1.1 acres)	1450’ (1.1 acres)
#3. Landscape Patterns - connectivity <ul style="list-style-type: none"> Total of major forested connections severed Number of severed connections along ridgelines Number of forested riparian connections narrowed to less than 300 feet 	0	30	16	11	29	2
<ul style="list-style-type: none"> Number of severed connections along ridgelines 	0	5	0	3	5	0
<ul style="list-style-type: none"> Number of forested riparian connections narrowed to less than 300 feet 	0	3	1	1	3	0
#4. Landscape Patterns - structural patch size and shape <ul style="list-style-type: none"> Mean patch size (acres) <ul style="list-style-type: none"> Late seral Mid-seral Early seral Number of patches <ul style="list-style-type: none"> Late seral Mid-seral Early seral 	426	113	186	172	153	132
<ul style="list-style-type: none"> Mean patch size (acres) <ul style="list-style-type: none"> Mid-seral 	119	69	81	83	81	71
<ul style="list-style-type: none"> Mean patch size (acres) <ul style="list-style-type: none"> Early seral 	80	52	51	50	45	55
<ul style="list-style-type: none"> Number of patches <ul style="list-style-type: none"> Late seral 	71	224	149	159	169	204
<ul style="list-style-type: none"> Number of patches <ul style="list-style-type: none"> Mid-seral 	104	169	146	146	144	167
<ul style="list-style-type: none"> Number of patches <ul style="list-style-type: none"> Early seral 	232	472	426	437	528	407
#5. Water Quality & Quantity <i>Reid Creek</i> <ul style="list-style-type: none"> % of area past and proposed harvest Miles of road / square mile Predicted peak flow increases 	39%	63%	61%	56%	61%	61%
<ul style="list-style-type: none"> Miles of road / square mile 	3.6	3.3	3.3	3.3	3.4	3.4
<ul style="list-style-type: none"> Predicted peak flow increases 	none	7%	5%	4%	5%	5%

Issue and Issue Indicators:	Alt. A No Action	Alt. B Proposed Action	Alt. C Wildlife Security	Alt. D Old Growth and Connectivity	Alt. E Soil and Water	Alt. F Preferred Alternative
<i>Pike Creek</i>						
• % of area past and proposed harvest	35%	47%	35%	45%	43%	44%
• Miles of road / square mile	3.6	3.1	3.1	3.1	2.8	2.8
• Predicted peak flow increases	none	5 %	0%	4%	4%	4%
<i>Bill Creek</i>						
• % of area past and proposed harvest	44%	59%	59%	59%	56%	57%
• Miles of road / square mile	4.1	4.1	4.1	4.1	4.1	4.1
• Predicted peak flow increases	none	5%	5%	4%	4%	4%
<i>Cyclone Creek</i>						
• % of area past and proposed harvest	56%	68%	58%	62%	64%	64%
• Miles of road / square mile	5.1	4.9	4.7	4.7	4.3	4.3
• Predicted peak flow increases	none	3%	0%	1%	1%	1%
#6. Motorized Access						
• Net change in miles of road available for recreational access year-round	0	- 6.9	- 6.9	- 6.9	- 7.5	- 7.5
• Net change in miles of road available for recreational access seasonally (July 1 to August 30)	0	0	- 0.7	0	0	0
• Net change in miles of road available for management and fire suppression activities	0	- 0.6	- 2.3	- 2.3	+ 3.4	+ 3.4
• Percent of drivable roads that are open to public motorized use	48.8%	48.3%	48.7%	48.7%	48.0%	48.2%

Comparison By Purpose and Need

This section presents a comparison of alternatives by the need indicators presented in Chapter 1; these are a measure of how well each alternative addresses the purpose and need for action objectives as described in Chapter 1. Table 2-13 displays how well the alternatives respond to the purpose and need based on the established indicators.

Table 2-13. Response of Alternatives to Purpose and Need

Need Indicators:	Alt. A No Action	Alt. B Proposed Action	Alt. C Wildlife Security	Alt. D Old Growth and Connectivity	Alt. E Soil and Water	Alt. F Preferred Alternative
Reduce Hazardous Fuel - acres of fuel models 8, 8/10, or 10 converted to fuel models 2/5, 5, or modified 8 - total effectiveness rating - acres treated in condition class 2 for the mixed severity 2 and stand replacement fire regimes	0 11.93 0	7455 15.46 6784	5066 14.83 4579	5487 15.21 6584	7146 15.42 6584	6284 15.57 5853
Restore Vegetative Cover Types and Structure Classes - total acres of regeneration harvest and commercial thinning - average patch size by seral stage • Mean patch size (acres) Late seral Mid-seral Early seral • Number of patches Late seral Mid-seral Early seral	0 426 119 80 71 104 232	6624 113 69 52 224 169 472	4235 186 81 51 149 146 426	4724 172 83 50 159 146 437	6315 153 81 45 169 144 528	5521 132 71 55 204 167 407
Reduce the Vulnerability of the Forest to Insect Infestation - percentage of national forest land at moderate risk to Douglas-fir bark beetle - percentage of national forest land at high risk to Douglas-fir bark beetle	10% 8%	8% 4%	8% 5%	8% 5%	8% 4%	8% 4%
Provide Habitat for Wildlife Species - acres of understory treatment in potential goshawk and/or flammulated owl habitat - acres burned in ungulate summer range to slow conifer encroachment - percent of elk analysis units comprising >30% elk hunting season security	0 0 57%	1251 647 29%	1403 647 100%	1472 647 29%	1343 647 29%	1515 647 86%
Improve Water Quality and Reduce Sediment - number of stream crossings improved by BMPs or through road reclamation	0	122	93	110	122	114

Need Indicators:	Alt. A No Action	Alt. B Proposed Action	Alt. C Wildlife Security	Alt. D Old Growth and Connectivity	Alt. E Soil and Water	Alt. F Preferred Alternative
Improve Aquatic Habitat and Enhance Fisheries - number of culverts improved to allow increased fish habitat conditions	0	8	6	8	8	8
Provide Economically Viable Removal of Timber - million board feet of timber harvested	0	59	34	38	54	43

Comparison By Management Area Treated

This section presents a comparison of alternatives by the acres of vegetation treatment proposed in the alternatives for the various Forest Plan management areas. Refer to Appendix B for a description and map of the management areas for the Logan Creek area. Vegetation treatments represented in the acreage figures in include timber harvest, hand fuels treatments, and prescribed burning. Table 2-14 compares acres treated by alternative and management area.

Table 2-14. Acres of Vegetation Treatment (timber harvesting, hand fuels treatment, and prescribed burning) by Forest Plan Management Area and Alternative.

Management Area:	Alt. A No Action	Alt. B Proposed Action	Alt. C Wildlife Security	Alt. D Old Growth and Connectivity	Alt. E Soil and Water	Alt. F Preferred Alternative
MA 2A	0	180	180	180	180	180
MA 2C	0	261	240	163	225	153
MA 4	0	70	70	70	70	70
MA 5	0	73	73	73	73	73
MA 7	0	340	298	313	340	313
MA 12	0	68	58	43	66	70
MA 13	0	136	128	136	136	128
MA 13A	0	103	60	91	103	103
MA 15	0	6121	3856	4386	5852	5168
MA 15B	0	89	89	89	89	89