Chapter 2. Alternatives

2.1 Introduction

This chapter presents and compares a no-action alternative and four action alternatives considered in detail for the Diamond Project. These alternatives include

Alternative A – No action. The Forest Service is required to analyze a no-action alternative (40 Code of Federal Regulations [CFR] 1502.14(d)).

Alternative B – The Forest Service proposed action (see Map 1).

Alternative C – The proposed action modified to use alternative methods to herbicide for controlling noxious weeds (specifically, Canada thistle), where practical (see Map 1).

Alternative D – The proposed action modified to accommodate the most economical logging system and associated road costs (see Map 2).

Alternative F – The proposed action modified to integrate economical logging systems, reduce old-forest-dependent wildlife habitat impacts, and reduce watershed impacts (see Map 3).

Alternatives E, G, H, and I were considered but eliminated from detailed analysis. The reasons for eliminating these alternatives are described in section 2.2.7 in this chapter.

2.2 Description of the Alternatives Considered in Detail

The Forest Service Interdisciplinary Team (ID Team) reviewed public comments and data collected during the 2004 and 2005 field seasons to identify issues related to the proposed action. The ID Team focused on issues that provide comparative measures between the proposed action and other management scenarios considered for this project. The ID Team, in conjunction with the Responsible Official, developed alternatives to the proposed action in response to the following issues: (1) use of herbicides, (2) economics of logging systems and associated roads, (3) degradation of habitat for old-forest-dependent wildlife species, and (4) management activities in subwatersheds that are over the Threshold of Concern.

To provide a clear basis for choice among the options, measurement indicators were used in the analysis to not only quantify and describe how well the proposed action and alternatives would meet the project objectives, but also to compare how each alternative responds to the four issues listed above.

The Diamond Project Area comprises approximately 100,000 acres. Table 2-1 below summarizes the proposed treatments that would take place in the 54 Defensible Fuel Profile Zone (DFPZ) Units in the Diamond Project Area. The Diamond Landscape Assessment was used to identify the 54 DFPZs and 31 Area Thinning Units. This assessment and field survey data were used to narrow the locations of where treatments would occur in these units. The DFPZ Units and Area Thinning Units were delineated to comply with the land allocations described in the 2004 Sierra Nevada Forest Plan Amendment Record of Decision. The maps (Maps 1, 2, and 3) that accompany this document display the approximate locations of the DFPZ Units and Area Thinning Units. All proposed treatments (other than roads) would occur within these Units. Appendix A provides a detailed list of treatments proposed for each DFPZ and Area Thinning Unit.

Fuel treatments in the 54 DFPZ Units would be implemented to construct a network of shaded fuel breaks as described in the 1999 *Herger-Feinstein Quincy Library Group Forest Recovery Act Final Environmental Impact Statement* (HFQLG Act final EIS). Additional treatments, including group selection, aspen treatments, and Riparian Habitat Conservation Areas (RHCA) treatments, would also occur in the DFPZ Units. The locations of the 54 DFPZ Units were determined by evaluating the existing condition of vegetation and fuels, topography, road access, and strategic locations for fire suppression activities.

Table 2-1. Summary of treatments proposed in DFPZ Units, by action alternative.

Treatments in DFPZ Units	Alternatives B and C	Alternative D	Alternative F
	(number of acres)		
Fuel Treatment—Mechanically thin trees up to 30 inches dbh and 35 to 45 percent canopy cover and prescribed burn	3,369	3,001	2,073
Fuel Treatment—Mechanically thin trees up to 20 inches dbh and 50 percent canopy cover and prescribed burn in CWHR size classes 5M and 5D	N/A	N/A	976
Aspen stands—Mechanically thin conifer trees up to 30 inches dbh and prescribed burn	170	170	66
Aspen stands—Hand thin conifers and prescribe burn within stands	50	50	22
Plantations—Mechanically thin and/or masticate trees	293	293	293
Fuel Treatment—Prescribed burn only	575	575	576
Fuel Treatment—Masticate only	138	138	139
RHCAs—Mechanically thin trees up to 20 inches dbh and 50 percent canopy cover or hand thin and prescribed burn	595	548	551
RHCAs—Mechanically thin trees up to 20 inches dbh and 50 percent canopy cover or hand thin or masticate	24	24	24
RHCAs—Masticate only	19	19	19
RHCAs—Prescribed burn only	140	140	140
Group Selection	179	130	61
Total Acres of Proposed Treatments within DFPZ Units	**5,552**	**5,088**	**4,940**

Notes: dbh = diameter at breast height.
CWHR = California Wildlife Habitat Relationship.
RHCA = Riparian Habitat Conservation Area.

A variety of treatments would be implemented in the 31 Area Thinning Units to improve forest health and reduce hazardous fuels. These proposed treatments (see table 2-2) include mechanical thinning treatments, fuel treatments, group selection, aspen treatments, and RHCA treatments. The locations of the 31 Area Thinning Units were determined by evaluating the existing condition of vegetation and fuels, topography, road access, and connectivity of proposed and pre-existing fuel treatments.

Table 2-2. Summary of treatments proposed in Area Thinning Units, by action alternative.

Proposed Treatments in the Area Thinning Units	Alternatives B and C	Alternative D	Alternative F
	(number of acres)		
Group selection—(helicopter – 108 acres; cable yarding – 55 acres; tractor – 787 acres)	949	802	549
Mechanical—Thin trees up to 30 inches dbh and 40 percent canopy cover and prescribed burn (within CWHR size classes 4M and 4D)	N/A	2,645	2,109
Mechanical—Thin trees up to 30 inches dbh and 50 percent canopy cover and prescribes burn	4,650	1,270	1,036
Aspen stands—Mechanically thin conifers up to 30 inches dbh and prescribed burn within aspen stands	239	91	67
Aspen stands—Hand thin conifers and prescribed burn	88	88	78
Fuel treatment—Masticate only	329	329	329
Fuel treatment—Prescribed burn only	1,763	1,763	1,763
Baker cypress fuel treatment—Mechanically thin conifer trees up to 30 inches dbh and 40 percent canopy cover and prescribed burn	57	57	57
Baker cypress fuel treatment—Mechanically thin conifer trees up to 30 inches dbh and 40 percent canopy cover and prescribed burn in the Mud Lake Research Natural Area	74	74	74
RHCAs—Mechanically thin trees up to 20 inches dbh and 50 percent canopy cover or hand thin and prescribe burn; six locations of stream channel stabilization and seven locations of fish passage improvements	671	590	232
Total Acres of Proposed Treatments in the Area Thinning Units	**8,820**	**7,709**	**6,294**

Notes: dbh = diameter at breast height.
CWHR = California Wildlife Habitat Relationship.
RHCA = Riparian Habitat Conservation Area.

2.2.1 Alternative A: No Action

No treatments would be implemented under alternative A to accomplish the purpose and need for the Diamond Project as described in chapter 1. That means there would be no fuels treatments, DFPZ construction, group selection or area thinning harvest, transportation system improvements, noxious weed treatments, or riparian restoration.

Forest conditions under alternative A would continue to change in response to natural and human factors. With fire exclusion, an understory of fir and cedar has developed beneath the overstory, creating high stand densities with moderate to dense canopy closure. Trees in stands considered for treatment would continue to grow, and canopy closure in these stands, especially in the overstocked stands, would continue to increase. This would favor shade-tolerant species such as white fir and incense-cedar. Stand densities would increase, and trees would begin to die from competition and

associated mortality agents (drought, insects, and disease). The result would be an increase in surface fuels and associated fire hazard. Conifer encroachment on riparian areas and meadows would gradually increase. Under the no-action alternative, weed species would continue to spread along roadsides and into riparian and other native plant communities. Compared to alternative B (the proposed action), there would be a continued risk of high-severity wildfire, which could cause substantial loss of forest cover and degrade watersheds and wildlife habitat. No fuel-reduction or riparian restoration activities would be implemented.

Without implementation of the Diamond Project, the main National Forest System roads in the area would remain in a condition that is less than satisfactory, allowing poor road access for the public and fire management to persist in some areas. Roads in good condition would continue to provide access for emergency response, woodcutting, mining, sightseeing, and other recreational activities. Roads not decommissioned would continue to contribute to accelerating erosion processes, thus altering water quality and aquatic habitat and increasing cumulative watershed effects.

Alternative A would not meet the intent of the 1988 *Plumas National Forest Land and Resource Management Plan* (the "Forest Plan"), as amended by the 1999 Record of Decision on the HFQLG Act final environmental impact statement (EIS) and the 2004 Record of Decision on the Sierra Nevada Forest Plan Amendment (SNFPA) final supplemental EIS. The desired condition set forth in the HFQLG Act of an uneven-aged (all-aged), multistory, fire-resilient forest would not be achieved, and the ecological health of the forest would not be improved and maintained.

This EIS describes the effects of the no-action alternative because it serves as a baseline for comparison of the effects of the action alternatives. Alternative A complies with the Council on Environmental Quality (CEQ) regulations for implementing the *National Environmental Policy Act* (NEPA) (40 CFR 1502.14(d)).

2.2.2 Alternative B: Proposed Action

Alternative B proposes an integrated approach to meeting the Diamond Project purpose and need, as represented by the following six actions:

Action 1: Implement fuel treatments and DFPZs

Action 2: Implement group selection

Action 3: Implement area thinning that includes aspen stand and Baker cypress fuel treatments

Action 4: Implement riparian and watershed improvements with area thinning, fuel treatment, stream restoration, and fish access

Action 5: Implement noxious weed treatment with hand, mechanical, and chemical methods

Action 6: Implement transportation system improvements

2.2.2.1 Action 1: Implement Fuel Treatments and DFPZs

Alternative B proposes a 5,600-acre strategic network of DFPZs identified on the ground by 54 DFPZ units. A DFPZ is a portion of land approximately 0.25 mile in width on which fuels, both living and dead, have been modified. DFPZs are designed to respond to the need for reducing the potential for sustained crown fire and allowing fire suppression personnel a safer location from which to take action against a wildfire, and where potential fire severity (mortality) is reduced in the event of a wildfire.

The treatments listed in table 2-3 would occur in the 54 DFPZ Units as shown on "Map 1 – Alternatives B and C" (which accompanies this EIS). The proposed treatments are designed to achieve the DFPZ conditions described in the HFQLG final EIS (1999, appendix J, page 5) and to comply with the standards and guidelines set forth in the 2004 Record of Decision on the SNFPA final supplemental EIS (pages 67–68). The basic principle of fuel reduction treatments would be used to modify fire behavior by reducing surface, ladder, and crown fuels (Agee and Skinner 2005; Peterson et al. 2005). Fuel treatments are also proposed in the Area Thinning Units, which are described below in section 2.2.2.3 ("Action 3: Implement Area Thinning").

Table 2-3. Alternative B – proposed treatments in the DFPZ Units.

Proposed Treatments in the DFPZ Units	Alternative B (number of acres)
Fuel Treatment—Mechanically thin trees up to 30 inches dbh and 35 to 45 percent canopy cover and prescribed burn	3,369
Aspen stands—Mechanically thin conifer trees up to 30 inches dbh and prescribed burn	170
Aspen stands—Hand thin conifers and prescribed burn within the stands	50
Plantations—Mechanically thin and/or masticate trees	293
Fuel Treatment—Prescribed burn only	575
Fuel Treatment—Masticate only	138
RHCAs—Mechanically thin trees up to 20 inches dbh and 50 percent canopy cover or hand thin and prescribed burn	595
RHCAs—Mechanically thin trees up to 20 inches dbh and 50 percent canopy cover or hand thin or masticate	24
RHCAs—Masticate only	19
RHCAs—Prescribed burn only	140
Group Selection—All tractor logging	179
Total Acres of Proposed Treatments in the DFPZ Units	**5,552**

Notes: dbh = diameter at breast height.
RHCA = Riparian Habitat Conservation Area.

The proposed treatments in the DFPZ Units would employ a combination of mechanical harvest, mastication, hand thinning, underburning, and pile burning. Whole-tree harvest and biomass removal (trees up to 10 inches dbh) are proposed in these Units. In addition, underburning only is proposed in stands where burns can be conducted safely and feasibly and where mechanical treatment may not be possible. Treatment of naturally occurring and harvest-generated surface fuels (slash) would occur based on unit-by-unit post-treatment evaluations. Follow-up treatments of slash would include underburning, jackpot burning, hand piling and burning, grapple piling and burning, yarding to a landing and burning, masticating, chipping, and/or other appropriate methods.

Alternative B proposes to mechanically thin approximately 3,369 acres of California Wildlife Habitat Relationship (CWHR) size classes 3 and 4 to 35–40 percent canopy cover, and CWHR size class 5 to 40–45 percent canopy cover, while retaining trees greater than 30 inches dbh.

The CWHR system (Mayer and Laudenslayer 1988) was developed for vegetation throughout California. This system is used to generally typify wildlife habitat by vegetation type, size class, and density. Common CWHR size class 3 stands are represented by an average tree size of 6 to 11 inches in diameter; CWHR size class 4 has an average tree size of 11 to 24 inches; CWHR 5 has an average diameter greater than 24 inches.

Within the DFPZ Units, mechanical thinning is proposed on approximately 170 acres of aspen stands, and hand thinning is proposed on about 50 acres of aspen stands. In addition, about 293 acres of tree plantations are proposed for mechanical thinning and/or mastication. Approximately 575 acres are proposed for prescribed fire only and 138 acres of mastication only.

The treatments proposed for RHCAs within DFPZ Units are designed to meet the Riparian Management Objectives and fuel reduction objectives. Riparian Management Objectives were identified in the Scientific Analysis Team Guidelines and were incorporated into the HFQLG EIS. Alternative B proposes to mechanically thin or hand thin approximately 619 acres of RHCAs to 50 percent canopy cover, while retaining all trees greater than 20 inches dbh. Hand thinning would occur where mechanical equipment is restricted. An equipment restriction zone would be established adjacent to stream channels. This restriction zone would be based on slope steepness and stream type (see the "Design Criteria Common to All Action Alternatives" section [2.2.6] in this chapter). For each stream type and slope class, equipment would be restricted within the prescribed distances from the channel. Based on post-treatment evaluations, prescribed burning is proposed on 595 acres, and mechanical or hand thinning or mastication is proposed on 24 acres. Approximately 19 acres of RHCAs are proposed to be treated with mastication only and about 140 acres of prescribed burning only.

2.2.2.2 Action 2: Implement Group Selection Harvest

Group selection is not a fuel treatment; rather it is used to modify forest structure and species composition in order to promote the development of an uneven-aged, multistoried, fire-resilient forest. Alternative B proposes approximately 1,128 acres of group selection. Approximately 179 acres would be in DFPZ Units (as shown above in table 2-3), and 949 acres would be in Area Thinning Units (numbered 101 through 131). Table 2-4 displays the number of acres of proposed group selection by logging system within the Area Thinning Units.

Group selection would range in size from 0.5 acre to 2 acres. Group selection would primarily be located in CWHR size class 4 stands (with tree diameters ranging from 12 to 24 inches dbh) and in CWHR size class 5 stands (with diameters 24 inches dbh and greater). Approximately 5.7 percent of the available and suitable land base in the Diamond Project Area would be treated by group selection harvest under this proposal. This is based on a projected 10-year reentry period and equates to a group selection harvest level of 0.57 percent of the available land base per year. All live trees larger than 30 inches dbh would be retained except as necessary for operability. Incidental healthy, undamaged, shade-intolerant trees less than 10 inches in diameter could be retained; however, most trees under 30 inches in diameter would be removed.

Table 2-4. Alternative B – proposed group selection, by logging system, in the Area Thinning Units.

Area Thinning Unit Number	Number of Acres for Each Logging System			
	Helicopter	Tractor	Yarder	Total
101		43		43
102		48		48
103		50		50
104		4		4
105		2		2
106		25	5	30
107		3		3
108		33		33
109	8	56	10	74
110		25		25
111	20	82	12	113
112		34		34
113		26		26
114		49		49
115		36		36
116		12		12
117		9		9
118			22	22
119		48		48
120		40		40
121	7	4	4	15
122	73			73
123		19		19
124		29		29
125		11		11
126		7		7
127		7		7
128		5	2	7
129		4		4
130		1		1
131		75		75
Total Acres	**108**	**787**	**55**	**949**

On slopes 35 percent or less, ground-based equipment would be used with whole-tree yarding wherever feasible to minimize harvest-related additions of surface fuel. Treatment of naturally occurring and harvest-generated surface fuels (slash) would occur based on post-treatment harvest evaluations. Surface fuels would be mechanically or hand treated. Surface fuel mechanical treatments would primarily involve machine piling but could include mastication or chipping and removing treated fuels. Hand treatments would include hand thinning, bucking, and piling of surface and ladder fuels.

On sustained slopes greater than 35 percent, group selections would be harvested using a combination of skyline cable logging systems and helicopter logging. Whole-tree yarding, wherever

feasible, would be used to reduce fuel loadings. Residual excess surface and ladder fuels would be hand treated where practical. Hand treatments would include hand thinning, bucking, and piling or scattering the treated fuels.

Site preparation and regeneration needs would be evaluated after harvest. The group selections requiring natural and activity slash treatment would undergo "site preparation" via machine piling, brush raking, hand piling, and/or underburning to clear any activity slash and debris that would prevent site regeneration.

Artificial and natural regeneration would both be used to reforest group selections. The group selections within the true fir forest type may be naturally regenerated. In all other forest types, a combination of natural and artificial regeneration would be used to achieve desired stocking levels, with an emphasis on regenerating shade-intolerant species. Those group selections requiring artificial regeneration would be planted with a mix of species native to the ecological forest type. Species to be planted would include Jeffrey pine, ponderosa pine, rust-resistant sugar pine, Douglas-fir, and incense-cedar. Natural regeneration would be used for white fir and red fir species.

After regeneration is established, release treatments (grubbing, pre-commercial thinning, and/or mastication) would be used to reduce competing vegetation to favor the growth and development of desired species. Without release treatments, shrub and naturally regenerated tree species would likely compete with desired species and slow growth and development into subsequent seral stages. Over time, these treatments would contribute to the development from CWHR size classes 1 and 2 to CWHR size class 3, represented by a quadratic mean diameter greater than 6 inches.

2.2.2.3 Action 3: Implement Area Thinning

The area thinning treatment combines thinning from below and crown thinning where individual trees are selected for removal. This type of treatment serves as an intermediary thinning of the forest around group selections to meet forest health objectives. The forest health objectives include improving vigor of residual trees by reducing stand density and competition, maintaining forest structure, and improving species composition, as well as limiting the spread of insects and disease and reducing tree mortality. Area Thinning Units would be evaluated for follow-up treatments that would include underburning, machine or hand piling and burning, or mastication to treat residual accumulations of activity-generated or naturally occurring fuels. Clumps or individuals of the largest fire-tolerant trees would be retained to create an array of scattered openings and provide for a structure characteristic of an uneven-aged, multistory forest.

Alternative B proposes to mechanically thin approximately 4,650 acres of CWHR size class 4 and 5 stands to 50 percent canopy cover while retaining trees greater than 30 inches dbh (see table 2-5). Within the Area Thinning Units, mechanical thinning is proposed on approximately 239 acres of aspen stands (while retaining trees greater than 30 inches dbh), and hand thinning is proposed on about 88 acres of aspen stands. Biomass would be hand piled and burned. Based on post-treatment evaluations, follow-up treatments would include underburning, jackpot burning, machine piling and burning, and handpiling and burning, yarding to a landing and burning, masticating, and/or chipping activity-generated slash, pre-existing fuels, and shrubs.

Table 2-5. Alternative B – proposed treatments in the Area Thinning Units.

Proposed Treatments in the Area Thinning Units	Alternative B (number of acres)
Group selection—(Helicopter – 108 acres; cable yarding – 55 acres; tractor – 787 acres)	949
Mechanical—Thin trees up to 30 inches dbh and 50 percent canopy cover and prescribed burn	4,650
Aspen stands—Mechanically thin conifers up to 30 inches dbh and prescribed burn within aspen stands	239
Aspen stands—Hand thin conifers and prescribed burn	88
Fuel treatment—Masticate only	329
Fuel treatment—Prescribed burn only	1,763
Baker cypress fuel treatment—Mechanically thin conifer trees up to 30 inches dbh and 40 percent canopy cover and prescribed burn	57
Baker cypress fuel treatment—Mechanically thin conifer trees up to 30 inches dbh and 40 percent canopy cover and prescribed burn within the Mud Lake Research Natural Area	74
RHCAs—Mechanically thin trees up to 20 inches dbh and 50 percent canopy cover or hand thin and prescribed burn; six locations of stream channel stabilization and seven locations of fish passage improvement	671
Total Acres of Proposed Treatments in the Area Thinning Units	**8,820**

Notes: dbh = diameter at breast height.
RHCA = Riparian Habitat Conservation Area.

Fuel treatments are also proposed in the Area Thinning Units. This includes mastication proposed on approximately 329 acres and prescribed burn only on about 1,763 acres.

Baker Cypress Stands. Alternative B proposes to mechanically thin approximately 131 acres of CWHR size class 4 stands to 30 percent of the existing basal area, and CWHR size class 5 to 40 percent canopy cover while retaining trees greater than 30 inches dbh. After mechanical treatments, the stands would be evaluated for follow-up treatments that could include underburning, jackpot burning, machine piling and burning, handpiling and burning, yarding to a landing and burning, masticating, and/or chipping activity-generated slash, pre-existing fuels, and shrubs.

This fuel treatment is necessary to facilitate the reintroduction of fire to promote the growth, regeneration, and establishment of Baker cypress stands. Fire plays a crucial role in cypress regeneration by opening the cones and creating post-fire conditions, such as exposed mineral soil and direct sunlight to the ground (Vogl et al. 1977). All Baker cypress would be retained regardless of size. To promote shade-intolerant species and meet basal area guidelines, Jeffrey pine would receive secondary preference for retention. True fir species less than 30 inches in diameter would receive preference for removal.

2.2.2.4 Action 4: Implement Riparian and Watershed Improvements

The treatments proposed for RHCAs within Area Thinning Units are designed to meet the Riparian Management Objectives. Alternative B proposes to mechanically thin or hand thin approximately 671 acres (refer to table 2-5 above) of RHCAs to 50 percent canopy cover, while retaining trees greater than 20 inches dbh. Hand thinning would occur where mechanical equipment is

restricted. An equipment restriction zone would be established adjacent to stream channels. This restriction zone would be based on slope steepness and stream type (see the "Design Criteria Common to All Action Alternatives" section [2.2.6] in this chapter). For each stream type and slope class, equipment would be restricted within the prescribed distances from the channel. Prescribed burning is proposed as a follow up to mechanical or hand treatments based on post-treatment evaluations.

Six locations of headcuts and/or excessive channel and bank instability are proposed for restoration. Restoration treatments would include the use of logs, rocks, or vegetation to reduce channel erosion and restore the stream function. Additionally, fish passage improvement is proposed for seven specific locations where roads cross streams. The fish habitat treatments would include improving or replacing culverts.

2.2.2.5 Action 5: Implement Noxious Weed Treatments

Six invasive plant species are proposed for treatment using a combination of mechanical, cultural, and chemical methods (see table 2-6). Hand pulling and physical removal with a weed wrench would be used to reduce or eliminate the three known Scotch broom infestations and two known infestations of Russian thistle. A combination of hand pulling, cutting with a mechanical hand-held string trimmer (weed whacker), or flaming with a propane torch would be used to prevent seed set and further spread of the two known infestations of yellow starthistle and the six known infestations of spotted knapweed. The two known infestations of medusahead would be treated with a propane torch.

Table 2-6. Alternative B – proposed noxious weed treatments.

Species	Proposed Treatment	Number of Treatment Locations	Gross Acres[a]	Estimated Acres of Treatment[b]
Centaurea maculosa (spotted knapweed)	A combination of hand pulling, cutting with a hand-held string trimmer (weed whacker), or flaming with a propane torch.	6	0.01	0.0001
Cirsium arvense (Canada thistle)	Fall treatment with two herbicides: clopyralid and an aquatic formulation of glyphosate. Revegetation of treated sites using native seed would be considered at a site-specific level.	476	128	22
Cytisus scoparius (Scotch broom)	Mechanical methods, specifically hand pulling and removal using a weed-wrench.	3	1.8	0.35
Centaurea solstitialis (yellow starthistle)	A combination of hand pulling, cutting with a hand-held string trimmer (weed whacker), or flaming with a propane torch.	2	0.01	0.0003
Taeniatherum caputmedusae (medusahead)	Treatment with a backpack propane torch.	2	0.01	0.004
Salsola tragus (Russian thistle)	Mechanical methods, primarily hand pulling and digging.	2	0.04	0.0004

Notes:

a. Gross Acres: The total area occupied by a noxious weed occurrence.

b. Estimated Acres of Treatment: An estimate of the physical area occupied by individual plants within an occurrence. This value was obtained by multiplying the estimated percent cover of a noxious weed species within an individual occurrence and the total (gross) area of the occurrence.

Two herbicides would be used to control Canada thistle in 476 locations (approximately 128 gross acres) in the Project Area. The two herbicides are clopyralid (Transline® or an equivalent formulation) and glyphosate (Rodeo® or an equivalent formulation). Approximately 103 gross acres are proposed for treatment with clopyralid using a backpack sprayer in the dry upland areas and in lowlands where possible. Approximately 25 gross acres are proposed for treatment with the aquatic formulation of glyphosate using a wick applicator in lowland sites that are greater than 10 feet from ephemeral, intermittent, or perennial streams.

Based on the patchy distribution of individual plants within each noxious weed occurrence, the number of acres treated with herbicides may be less than the 128 gross acres presented above. The actual number of acres proposed for treatment with herbicides is estimated to be 22 acres. This value was obtained by taking the percent cover of Canada thistle within an individual occurrence (that is, 50 percent) and multiplying it by the total gross area (for example, 0.5 acre) of the occurrence to obtain an estimate of the treatment area (for example, 0.25 acre).

A vegetable oil and silicone-based surfactant (such as Syl-tac® or an equivalent formulation) and a marker dye (Hi-light® Blue or an equivalent formulation) may also be used to increase the efficiency of the treatment. Herbicide treatments would occur in late summer and early fall for two to five years based on site monitoring to identify weed persistence. If necessary, re-vegetation with native plant seed would occur at some of the treated sites. The "Design Criteria Common to All Action Alternatives" section (2.2.6) provides application rates, volumes, and concentrations proposed under this alternative.

Perennial streams with known sensitive amphibian species would have 50-foot buffers where no herbicides would be used. These streams include all or portions of the West Branch of Lights Creek, Boulder Creek, Rock Creek, and a tributary of Pierce Creek.

2.2.2.6 Action 6: Implement Transportation System Improvements

Alternative B proposes the decommissioning of approximately 9.6 miles of existing system roads (see table 2-7, Map 1, and appendix F). Decommissioning would include recontouring, removing drainage structures, subsoiling, restoring vegetative cover, and/or blocking access. This treatment is in accordance with the 1988 *Plumas National Forest Land and Resource Management Plan* (the "Forest Plan") and the on going Travel Management Process (the off-highway vehicle [OHV] route designation process). Approximately 33.2 miles of existing classified roads would be reconstructed prior to project use Reconstruction would consist of brushing, blading the road surface, improving drainage, replacing/upgrading culverts where needed, and relocating 0.5 mile of system road. The identification of hazard trees to be removed would follow guidelines in the Plumas National Forest Roadside/Facility Hazard Tree Abatement Action Plan (2003). Approximately 2 miles of new road construction is proposed—these roads would be closed with log earth barriers after use. Approximately 21.8 miles of temporary road construction is proposed: about 5.7 miles of new temporary roads and 16.1 miles that currently exist as nonsystem roads would be used as temporary roads. These roads would be decommissioned upon completion of the project. Existing harvest landings would be reconstructed, and new ones would be constructed where needed.

Table 2-7. Alternative B – summary of proposed road treatments.

Road Treatment – Alternative B (Proposed Action)	Number of Miles
Decommissioning	9.6
Reconstruction	33.2
New construction (closed after use)	2.0
Temporary construction (decommissioned after use)	21.8
Total Miles	**66.6**

2.2.3 Alternative C

Alternative C was developed to address the issue of herbicide use. Under this alternative, Canada thistle would be controlled using a combination of nonchemical treatment methods (see table 2-8). All other proposals are identical to alternative B.

Table 2-8. Alternative C – proposed noxious weed treatments.

Species	Proposed Treatment	Number of Treatment Locations	Gross Acres[a]	Estimated Acres of Treatment[b]
Centaurea maculosa (spotted knapweed)	A combination of hand pulling, cutting with a hand-held string trimmer (weed wacker), or flaming with a propane torch.	6	0.01	0.0001
Cirsium arvense (Canada thistle)	In high-priority locations (such as roads, skid trails, landings, riparian areas, aspen stands, and other areas with high potential to be impacted by proposed project activities), use a combination of hand pulling/digging, cutting with a hand-held string trimmer (weed wacker), and covering (plastic, sheeting).	213	18.5	5.2
Cytisus scoparius (scotch broom)	Mechanical methods, specifically hand pulling and removal using a weed-wrench.	3	1.8	0.35
Centaurea solstitialis (yellow starthistle)	A combination of hand pulling, cutting with a hand-held string trimmer (weed wacker), or flaming with a propane torch.	2	0.01	0.0003
Taeniatherum caputmedusae (medusahead)	Treatment with a backpack propane torch.	2	0.01	0.004
Salsola tragus (Russian thistle)	Mechanical methods, primarily hand pulling and digging.	2	0.04	0.0004

Notes:

a. Gross Acres: The total area occupied by a noxious weed occurrence.

b. Estimated Acres of Treatment: An estimate of the physical area occupied by individual plants within an occurrence. This value was obtained by multiplying the estimated percent cover of a noxious weed species within an individual occurrence and the total (gross) area of the occurrence.

The treatment of all Canada thistle locations in the Diamond Project Area was considered infeasible due to time constraints and high treatment cost (see the description of alternative G in section 2.2.7.2 below). These constraints required that treatments be concentrated on small (less than 0.5 acre) high-priority sites, such as those found along roads, skid trails, and landings and in riparian areas, aspen stands, and other areas with a high potential to be impacted by project activities. Therefore, nonherbicide treatment of Canada thistle, conducted on 213 locations, would include the following:

- **Hand pulling/digging.** This would involve digging or pulling the plant at least three times each season (regular intervals of 20 days) in June, August, and September (Zouhar 2001) for three to five years. If digging is implemented, a depth of 4 to 8 inches would be required.

- **Removal using a string trimmer** (weed whacker). This would involve monthly cutting (at 21-day intervals) for a four-year period.

- **Covering** (plastic, sheeting). This would be used only on small occurrences (less than 80 square feet).

2.2.4 Alternative D: The Preferred Alternative

Alternative D was developed to address the issue of economical feasibility of implementing the proposed action (alternative B). This alternative was developed in response to a preliminary analysis of costs associated with harvest systems and road treatments. Due to road treatment costs, alternative D was designed to drop 32 acres of group selection in the DFPZ Units. Skyline cable and helicopter logging systems were eliminated as a result of dropping the 32 acres.

To reduce cumulative watershed effects in the Indian Creek and Boulder Creek drainage networks, mitigation measures have been proposed for this alternative. The mitigation measures involve slope treatments and channel treatments. The mitigations are proposed to take place in 10 subwatersheds—5 of these subwatersheds are over the Threshold of Concern (TOC), as indicated by the Equivalent Roaded Acre model, 2 closely approach the TOC, and 3 are spatially and hydrologically connected to the 7 subwatersheds of concern. The slope treatments would occur within the 5 subwatersheds that exceed the TOC. These subwatersheds are

1. Upper Boulder – East Tributary
2. Mid Boulder – East Tributary
3. Mid Boulder – West Tributary
4. Indian above Antelope – Middle
5. Pierce

Slope Treatments

1. Drop treatments in the Cold Stream subwatershed (DFPZ Units 23, 24, 27, and 28) for a total of 415 acres of DFPZ and 17 acres of group selection. In the existing condition, this subwatershed in over the TOC. Alternative F was designed to drop these treatments.

2. Reforest 100 percent of the Group Selection Units.

3. Implement erosion-control measures to filter sediment from Group Selection Units on slopes that are greater than 20 percent. Use slash, chips, or weed-free straw to disperse concentrated flow coming from Group Selection Units into surrounding vegetated areas.

4. Increase the number of waterbars 25 percent above Forest Service Handbook (2409.15 Chapter 61.42d) direction on skid trails only within RHCAs.

5. Retain patches of biomass for a total of about 5 to 10 acres in mountain yellow-legged frog habitat in perennial and intermittent streams in RHCAs. Limit to hand thinning treatments in Area Thinning Units.

The channel treatments would occur in the 5 subwatersheds listed above that are over the TOC, as well as the following 5 subwatersheds:

1. Boulder – top
2. Upper Boulder – West Tributary
3. Lower Boulder
4. Thompson
5. Indian above Antelope – top

Channel Treatments

1. Bank and headcut stabilization

   Stabilize 1.4 miles of eroding banks in easily accessible areas – armor banks with rock and/or lay back eroding banks, install erosion cloth, and revegetate with plantings. Requires rock haul and heavy equipment.

2. Gradient control structures

   A. Boulder Creek inlet to Antelope Lake: Minimize headcut initiation and propagation, reducing potential sediment contributions to the lake. Construct step pools below the culvert where Forest Service Road 29N43 crosses Boulder Creek. Construct gradient controls above the culvert. Requires rock haul and heavy equipment. Revegetate disturbed areas. Incorporate weed control measures.

   B. Hallett Meadow, where Forest Service Road 29N43 crosses Boulder Creek: Construct gradient control structures above and below the culvert to stabilize headcutting and propagation. Requires rock haul and heavy equipment. Revegetate disturbed areas. Incorporate weed control measures.

2.2.4.1 Action 1: Implement Fuel Treatments and DFPZs

Table 2-9 describes the treatments in the DFPZ Units that are proposed under alternative D. This alternative is the same as the proposed action (alternative B) except for reducing the number of mechanical thinning acres to 3,001; reducing the number of thinning acres in RHCAs to 548; and reducing the number of group selection acres.

Table 2-9. Alternative D – proposed treatments in the DFPZ Units.

Proposed Treatments in the DFPZ Units	Number of Acres
Fuel Treatment—Mechanically thin trees up to 30 inches dbh and 35 to 45 percent canopy cover and prescribe burn	3,001
Aspen Stands—Mechanically thin conifer trees up to 30 inch dbh and prescribe burn	170
Aspen Stands—Hand thin conifers and prescribed burn	50
Plantations——Mechanically thin and/or masticate trees	293
Fuel treatment—Prescribed burn only	575
Fuel treatment—Masticate	138
RHCAs—Mechanically thin trees up to 20 inches dbh and 50 percent canopy cover or hand thin and prescribed burn	548
RHCAs—Mechanically thin trees up to 20 inches dbh and 50 percent canopy cover or hand thin or masticate	24
RHCAs—Masticate only	19
RHCAs—Prescribed burn only	140
Group Selection—All tractor logging	130
Total Acres of Proposed Treatments in the DFPZ Units	**5,088**

Notes:

a. Gross Acres: The total area occupied by a noxious weed occurrence.

b. Estimated Acres of Treatment: An estimate of the physical area occupied by individual plants within an occurrence. This value was obtained by multiplying the estimated percent cover of a noxious weed species within an individual occurrence and the total (gross) area of the occurrence.

2.2.4.2 Action 2: Implement Group Selection

Alternative D proposes approximately 932 acres of group selection. Alternative D reduces the number of group selection to 130 acres within DFPZ Units (as shown above in table 2-9) and 802 acres within the Area Thinning Units. The group selection is reduced in DFPZ Units in order to harvest only in areas proposed for mechanical thinning. This approach is intended to effectively economize logging operations. Alternative D drops group selection, as well as all other treatments in six Area Thinning Units (118, 122, 127, 128, 129, and 130) where slopes exceed 35 percent. Only tractor harvest systems would be used. Table 2-10 displays the number of acres of proposed group selection, by tractor logging system, in the Area Thinning Units.

Table 2-10. Alternative D – proposed group selection, by tractor logging system, in Area Thinning Units.

Area Thinning Unit Number	Tractor (acres)	Area Thinning Unit Number	Tractor (acres)
101	54	114	58
102	41	115	34
103	50	116	12
104	11	117	4
105	4	119	48
106	29	120	35
107	10	121	5
108	49	123	28
109	56	124	30
110	36	125	11
111	63	126	12
112	22	131	74
113	26		
Total Group Selection Acres: 802			

Similar to alternative B, the group selection proposed in alternative D would range in size from 0.5 acre to 2 acres. The group selections would primarily be located in CWHR size class 4 stands (with trees ranging from 12 to 24 inches dbh) and would also be located in CWHR size class 5 stands (with tree diameters 24 inches dbh and greater). Approximately 5.7 percent of the available and suitable land base in the Diamond Project Area would be treated by group selection harvest under this proposal. This is based on a projected 10-year reentry period and equates to a group selection harvest level of 0.57 percent of the available land base per year. All live trees greater than 30 inches dbh would be retained except as necessary for operability. Incidental healthy, undamaged, shade-intolerant trees less than 10 inches in diameter could be retained; however, most of the trees less than 30 inches in diameter would be removed.

Alternative D proposes that ground-based equipment would be used with whole-tree yarding, wherever feasible, to reduce fuel loadings. Treatment of naturally occurring and harvest-generated surface fuels (slash) would occur based on unit-by-unit post-treatment harvest evaluations. Surface fuels would be mechanically or hand treated. Surface fuel mechanical treatments would primarily involve machine piling but could include mastication or chipping and removing treated fuels. Hand treatments would include hand thinning, bucking, and piling surface and small ladder fuels.

Regeneration treatments would be identical to those proposed for alternative B (proposed action).

2.2.4.3 Action 3: Implement Area Thinning

Alternative D drops treatments in six Area Thinning Units (118, 122, 127, 128, 129, and 130). This alternative proposes to modify the Proposed Action treatment within CWHR size classes 4M and 4D to reflect the DFPZ Unit fuel treatment. Approximately 2,645 acres of CWHR size classes 4M and

4D would be mechanically thinned to 40 percent canopy cover while retaining all trees greater than 30 inches dbh (see table 2-11). For CWHR size classes 5M and 5D, alternative D proposes the same treatment as alternative B; that is, mechanical thinning on approximately 1,270 acres of CWHR size class 5 to 50 percent canopy cover while retaining all trees greater than 30 inches dbh. Mechanical thinning is also proposed on approximately 91 acres of aspen stands within in the Area Thinning Units while retaining all trees greater than 30 inches dbh. Alternative D reduces the number of acres proposed for mechanical thinning due to dropping treatments in the six Area Thinning Units. Also within the Area Thinning Units, about 88 acres of aspen stands are proposed for hand thinning. Biomass would be hand piled and burned. Follow-up treatments would include underburning, jackpot burning, machine piling and burning, handpiling and burning, yarding to a landing and burning, masticating, and/or chipping activity-generated slash, pre-existing fuels, and shrubs.

Table 2-11. Alternative D – proposed treatments in the Area Thinning Units.

Proposed Treatments in the Area Thinning Units	Alternative D (number of acres)
Group Selection—All tractor logging	802
Mechanical—Thin trees up to 30 inches dbh and 40 percent canopy cover and prescribed burn (within CWHR size class 4M and 4D stands)	2,645
Mechanical—Thin trees up to 30 inches dbh and 50 percent canopy cover and prescribe burn (within CWHR size class 5M and 5D stands)	1,270
Aspen Stands—Mechanically thin conifer trees up to 30 inches dbh and prescribe burn	91
Aspen Stands—Hand thin conifers and prescribed burn	88
Fuel Treatment—Masticate only	329
Fuel Treatment—Prescribed burn only	1,763
Baker cypress fuel treatment—Mechanically thin conifer trees up to 30 inches dbh and prescribed burn	57
Baker cypress fuel treatment—Mechanically thin conifer trees up to 30 inches dbh and prescribed burn within the Mud Lake Research Natural Area	74
RHCAs—Mechanically thin trees up to 20 inches dbh and 50 percent canopy cover or hand thin and prescribed burn	590
Total Proposed Treatment Acres in the Area Thinning Units	**7,709**

Notes: dbh = diameter at breast height.
CWHR = California Wildlife Habitat Relationship.
RHCA = Riparian Habitat Conservation Area.

Alternative D proposes the same fuel treatments in Area Thinning Units as alternative B. This includes the mastication proposed on approximately 329 acres and prescribed fire only on about 1,763 acres.

Baker Cypress Stands. Alternative D proposes the same treatment as alternative B; that is, to mechanically thin approximately 131 acres of CWHR size class 4 to 30 percent of the existing basal area and CWHR size class 5 to 40 percent canopy cover, while retaining all trees greater than 30 inches dbh. After mechanical treatments, the stands would be evaluated for follow-up treatments that could include underburning, jackpot burning, machine piling and burning, handpiling and burning, yarding to a landing and burning, masticating, and/or chipping activity-generated slash, pre-existing fuels, and shrubs.

2.2.4.4 Action 4: Implement Riparian and Watershed Improvements

Like the proposed action, the treatments proposed for RHCAs within Area Thinning Units are designed to meet the Riparian Management Objectives. Alternative D proposes to mechanically thin or hand thin approximately 590 acres of RHCAs to 50 percent canopy cover, while retaining all trees greater than 20 inches dbh. Hand thinning would occur where mechanical equipment is restricted. Prescribed burning is proposed as a follow-up to mechanical or hand treatments based on post-treatment evaluations. Alternative D reduces the number of RHCA acres proposed for mechanical or hand thinning due to dropping treatments in the six Area Thinning Units. An equipment restriction zone would be established adjacent to stream channels. This restriction zone would be based on slope steepness and stream type (see the "Design Criteria Common to All Action Alternatives" section [2.2.6] below). For each stream type and slope class, equipment would be restricted within the prescribed distances from the channel.

Six locations of headcuts and/or excessive channel and bank instability are proposed for restoration. Restoration treatments would include the use of logs, rocks, or vegetation to reduce channel erosion and restore the stream function. Additionally, fish passage improvement is proposed for seven specific locations where roads cross streams. The fish habitat treatments would include improving or replacing culverts.

2.2.4.5 Action 5: Implement Noxious Weed Treatment

Alternative D proposes the same treatments as alternative B for controlling the introduction and spread of noxious weeds (refer to table 2-6 above).

2.2.4.6 Action 6: Implement Transportation System Improvements

Alternative D proposes the same 9.6 miles of road decommissioning as alternative B (see table 2-12). Decommissioning would include recontouring, removing drainage structures, subsoiling, restoring vegetative cover, and/or blocking access. Approximately 26.7 miles of existing classified roads would be reconstructed prior to project use. Alternative D reduces the number of miles proposed for reconstruction due to dropping treatments in six Thinning Area Units. Reconstruction would consist of brushing, blading the road surface, improving drainage, and replacing/upgrading culverts, where needed, and 0.5 mile of system road would be relocated. The identification of hazard trees to be removed would follow guidelines in the Plumas National Forest Roadside/Facility Hazard Tree Abatement Action Plan (2003). Approximately 0.7 mile of new road construction is proposed—these roads would then be closed with log earth barriers upon completion of the project. Approximately 19.3 miles of temporary road construction is proposed: about 5.5 miles of new temporary roads and 13.8 miles that exist as nonsystem roads would be used as temporary roads. These roads would be decommissioned upon completion of the project. Existing harvest landings would be reconstructed, and new ones would be constructed where needed.

Table 2-12. Alternative D – summary of proposed road treatments.

Alternative D Road Treatments	Number of Miles
Decommissioning	9.6
Reconstruction	26.7
New construction (closed after use)	0.7
Temporary construction (decommissioned after use)	19.3
Total Miles	**56.3**

2.2.5 Alternative F

2.2.5.1 Action 1: Implement Fuel Treatments and DFPZs

Alternative F was developed to address the issues of economical feasibility, degradation of habitat for old-forest-dependent wildlife species, and risk of adverse effects on subwatersheds that are at or over the Threshold of Concern (as defined by the Equivalent Roaded Acre model). Alternative F drops treatments in the Cold Stream subwatershed (DFPZ Units 23, 24, 27, and 28) for a total of 415 acres of DFPZs. In the existing condition, the Cold Stream subwatershed is over the Threshold of Concern.

Alternative F proposes the same treatment as alternative B within CWHR size class 3 and 4 stands by thinning approximately 2,073 acres to 35–40 percent canopy cover while retaining all trees greater than 30 inches dbh. However, unlike alternative B, alternative F also proposes to modify treatments within CWHR size class 5M and 5D DFPZ Units; that is, mechanical thinning on approximately 976 acres of CWHR size class 5 to 50 percent canopy cover while retaining all trees greater than 20 inches dbh.

This alternative proposes to mechanically thin approximately 66 acres of aspen stands within DFPZ Units to retain trees greater than 30 inches dbh. Also within the DFPZ Units, about 22 acres of aspen stands are proposed for hand thinning. Alternative F reduces the number of aspen acres proposed for mechanical and hand thinning because treatments would not occur in subwatersheds that are over the Threshold of Concern. Within the DFPZ Units, alternative F would be similar to alternative B in that it proposes about 293 acres of tree plantations for mechanical thinning and/or mastication. Approximately 576 acres are proposed for prescribed fire only and 139 acres of mastication only.

Biomass would be mechanically thinned and removed. Treatment of naturally occurring and harvest-generated surface fuels (slash) would occur based on unit-by-unit post-treatment harvest evaluations. Follow-up treatments would include underburning, jackpot burning, machine piling and burning, handpiling and burning, yarding to a landing and burning, masticating and/or chipping activity-generated slash, pre-existing fuels, and shrubs and/or a combination thereof.

Similar to alternative B, the treatments proposed for RHCAs within DFPZ Units (see table 2-13) are designed to meet the Riparian Management Objectives and fuel reduction objectives. Alternative F proposes to mechanically thin or hand thin approximately 575 acres of RHCAs to 50 percent canopy cover, while retaining trees greater than 20 inches dbh. Hand thinning would occur where mechanical equipment is restricted. An equipment restriction zone would be established adjacent to stream channels. This restriction zone would be based on slope steepness and stream type (see the “Design Criteria Common to All Action Alternatives” section [2.2.6] below). For each stream type and slope class, equipment would be restricted within the prescribed distances from the channel. Following mechanical or hand treatments, prescribed burning is proposed on 551 acres and mastication is proposed on 24 acres. Alternative F proposes less RHCA treatment acres than alternative B due to treatments being dropped in those subwatersheds over the Threshold of Concern. However, similar to alternative B, approximately 19 acres of RHCAs are proposed to be treated with mastication only and about 140 acres of prescribed burning only.

Table 2-13. Alternative F – proposed treatments in the DFPZ Units.

Proposed Treatments in the DFPZ Units	Alternative F (number of acres)
Fuel Treatment—Mechanically thin trees up to 30 inches dbh and 35 to 45 percent canopy cover and prescribed burn	2,073
Fuel Treatment—Mechanically thin trees up to 20 inches dbh and 50 percent canopy cover and prescribed burn within CWHR size classes 5M and 5D	976
Aspen stands—Mechanically thin conifer trees up to 30 inches dbh and prescribed burn	66
Aspen stands—Hand thin conifers and prescribed burn	22
Plantations—Mechanically thin and/or masticate trees	293
Fuel treatment—Prescribed burn only	576
Fuel treatment—Masticate only	139
RHCAs—Mechanically thin trees up to 20 inches dbh and 50 percent canopy cover or hand thin and prescribed burn	551
RHCAs—Mechanically thin trees up to 20 inches dbh and 50 percent canopy cover or hand thin or masticate	24
RHCAs—Masticate only	19
RHCAs—Prescribed burn only	140
Group Selection—(No group selection in CWHR size classes 5M and 5D within HRCAs)	61
Total Acres of Proposed Treatments with DFPZ Units	**4,940**

Notes: dbh = diameter at breast height.
CWHR = California Wildlife Habitat Relationship.
RHCA = Riparian Habitat Conservation Area.

2.2.5.2 Action 2: Implement Group Selection Harvest

Alternative F proposes a total of approximately 610 acres of group selection. Alternative F reduces the number of group selection in the DFPZ Units by limiting this treatment to CWHR size class 4 and 5 stands that occur outside of Home Range Core Areas (HRCAs) for the spotted owl. This means that CWHR size classes 5M and 5D within an HRCA would not have group selection. As a result, alternative F proposes 61 acres of group selection in the DFPZ Units.

Due to watershed and economic feasibility concerns, alternative F drops group selection within 10 Area Thinning Units (104, 106, 107, 117, 118, 122, 127, 128, 129, and 130) and proposes only tractor harvest systems.

Additionally, group selection treatments within Area Thinning Units are limited to CWHR size classes 4 and 5 that occur outside of spotted owl HRCAs. This means that CWHR size class 5 stands within an HRCA would not have group selection. As a result, alternative F proposes 549 acres of group selection within the Area Thinning Units.

Table 2-14 below displays the number of acres of proposed group selection by tractor logging system within the Area Thinning Units.

Alternative F is similar to alternative B in that group selections would range in size from 0.5 acre to 2 acres. Group selection would primarily be located within CWHR size class 4 stands (trees with diameters ranging from 12 to 24 inches dbh). Unique to this alternative, group selection would also be located within CWHR size class 5 stands outside of spotted owl HRCAs.

Table 2-14. Alternative F – proposed group selection, by tractor logging system, in the Area Thinning Units.

Area Thinning Unit Number	Tractor	Area Thinning Unit Number	Tractor
101	46	115	34
102	39	116	9
103	44	119	23
105	4	120	12
108	22	121	1
109	27	123	19
110	16	124	30
111	63	125	1
112	16	126	9
113	16	131	60
114	58		
Total Group Selection Acres: 549			

Alternative F proposes to use ground-based equipment with whole-tree yarding wherever feasible to reduce fuel loadings. Treatment of naturally occurring and harvest-generated surface fuels (slash) would occur based on unit-by-unit post-treatment harvest evaluations. Surface fuels would be mechanically or hand treated. Surface fuel mechanical treatments would primarily involve machine piling, but it could include mastication or chipping and removing treated fuels. Hand treatments would include hand thinning, bucking, and piling of surface and small ladder fuels.

Regeneration treatments would be identical to those proposed for alternative B.

2.2.5.3 Action 3: Implement Area Thinning

Alternative F proposes to modify the Proposed Action treatment within CWHR size classes 4M and 4D to reflect the DFPZ Unit fuel treatment, which is similar to alternative D. Approximately 2,109 acres of CWHR size classes 4M and 4D would be mechanically thinned to 40 percent canopy cover while retaining all trees greater than 30 inches dbh (see table 2-15). For CWHR size classes 5M and 5D, alternative F modifies the proposed action and differs from alternative D because it proposes mechanical thinning on approximately 1,036 acres of CWHR size class 5 to 50 percent canopy cover while retaining all trees greater than 20 inches dbh. Mechanical thinning is also proposed on approximately 67 acres of aspen stands within the Area Thinning Units while retaining trees greater than 30 inches dbh. Hand thinning is proposed on approximately 78 acres of aspen stands. Alternative F reduces the number of aspen acres proposed for mechanical thinning due to dropping treatments in 8 of the 10 Area Thinning Units that dropped group selection (refer to section 2.2.5.2 above). Biomass would be mechanically thinned and removed or hand piled and burned. Treatment of naturally occurring and harvest-generated surface fuels (slash) would occur based on unit-by-unit post-treatment harvest evaluations. Follow-up treatments would include underburning, jackpot burning, machine piling and burning, handpiling and burning, yarding to a landing and burning, masticating and/or chipping activity-generated slash, pre-existing fuels, and shrubs and/or a combination thereof.

Table 2-15. Alternative F – proposed treatments in Area Thinning Units.

Proposed Treatments in Area Thinning Units	Alternative F (number of acres)
Group Selection—All tractor logging	549
Mechanical—Thin trees up to 30 inches dbh and 40 percent canopy cover and prescribed burn (within CWHR size classes 4M and 4D)	2,109
Mechanical—Thin trees up to 20 inches dbh and 50 percent canopy cover and prescribed burn (within CWHR size classes 5M and 5D)	1,036
Aspen Stands—Mechanically thin conifer trees up to 30 inches dbh and prescribed burn	67
Aspen Stands—Hand thin and prescribed burn	78
Fuel Treatment—Masticate only	329
Fuel Treatment—Prescribed burn only	1,763
Baker Cypress Fuel Treatment—Mechanically thin conifer trees up to 30 inches dbh and 40 percent canopy cover and prescribed burn	57
Baker Cypress Fuel Treatment—Mechanically thin conifer trees up to 30 inches dbh and 40 percent canopy cover and prescribed burn within the Mud Lake Research Natural Area	74
RHCAs—Mechanically thin trees up to 20 inches dbh and 50 percent canopy cover or hand thin and prescribed burn	232
Total Acres of Proposed Treatments in Area Thinning Units	**6,294**

Notes: dbh = diameter at breast height.
CWHR = California Wildlife Habitat Relationship.
RHCA = Riparian Habitat Conservation Area.

Alternative F proposes the same fuel treatments in Area Thinning Units as alternative B. This includes mastication on approximately 329 acres and prescribed fire only on about 1,763 acres.

Baker Cypress Stands. Alternative F proposes the same treatment as alternative B: to mechanical thin approximately 131 acres of CWHR size class 4 to 30 percent of the existing basal area, and CWHR size class 5 to 40 percent canopy cover, while retaining a trees greater than 30 inches dbh. Treatment of naturally occurring and harvest-generated surface fuels (slash) would occur based on unit-by-unit post-treatment harvest evaluations. After mechanical treatments, the stands would be evaluated for follow up treatments that could include underburning, jackpot burning, machine piling and burning, handpiling and burning, yarding to a landing and burning, masticating, and/or chipping activity-generated slash, pre-existing fuels, and shrubs.

2.2.5.4 Action 4: Implement Riparian and Watershed Improvements

Like the proposed action, the treatments proposed in alternative F for RHCAs within Area Thinning Units would be designed to meet the Riparian Management Objectives. Alternative F proposes to mechanically thin or hand thin approximately 232 acres of RHCAs to 50 percent canopy cover, while retaining trees greater than 20 inches dbh. Hand thinning would occur where mechanical equipment is restricted. Alternative F reduces the number of RHCA acres proposed for mechanical or hand thinning due to dropping treatments in eight Area Thinning Units. An equipment restriction zone would be established adjacent to stream channels. This restriction zone would be based on slope steepness and stream type (see the "Design Criteria Common to all Action Alternatives" in section [2.2.6] below). For each stream type and slope class, equipment would be restricted within the

prescribed distances from the channel. Prescribed burning is proposed as a follow up to mechanical or hand treatments based on post-treatment evaluations.

Six locations of headcuts and/or excessive channel and bank instability are proposed for restoration. Restoration treatments would include the use of logs, rocks, or vegetation to reduce channel erosion and restore the stream function. Additionally, fish passage improvement is proposed for seven specific locations where roads cross streams. The fish habitat treatments would include improving or replacing culverts.

2.2.5.5 Action 5: Implement Noxious Weed Treatments

Alternative F proposes the same treatments as alternatives B and D for controlling the introduction and spread of noxious weeds (refer to table 2-6 above).

2.2.5.6 Action 6: Implement Transportation System Improvements

Alternative F proposes the same 9.6 miles of road decommissioning as alternative B (see table 2-16). The decommissioning would include recontouring, removing drainage structures, subsoiling, restoring vegetative cover, and/or blocking access. Approximately 24.2 miles of existing classified roads would be reconstructed prior to project use. Alternative F reduces the number of miles proposed for reconstruction due to dropping treatments in the 10 Area Thinning Units. Reconstruction would consist of brushing, blading the road surface, improving drainage, and replacing/upgrading culverts where needed, and 0.5 mile of system road would be relocated. Identification of hazard trees to be removed would follow guidelines in the Plumas National Forest Roadside/Facility Hazard Tree Abatement Action Plan (2003). Approximately 0.7 mile of new road construction is proposed—these roads would be closed with log earth barriers upon completion of the project. Approximately 16.9 miles of temporary road construction is proposed: about 4 miles would be new temporary roads, and 12.9 miles that exist as nonsystem roads would be used as temporary roads. These roads would be decommissioned upon completion of the project. Existing harvest landings would be reconstructed, and new ones would be constructed where needed.

Table 2-16. Alternative F – summary of proposed road treatments.

Alternative F Road Treatments	Number of Miles
Decommissioning	9.6
Reconstruction	24.2
New construction (closed after use)	0.7
Temporary construction (decommissioned after use)	16.9
Total Miles	**51.4**

2.2.6 Design Criteria Common to All Action Alternatives

This section presents a series of tables (2-17 through 2-27) that contain the Design Criteria for the treatments proposed in all action alternatives. The Design Criteria are part of the project design and apply to the treatments. These criteria were developed as part of the project design to reduce or avoid adverse environmental effects of the proposed treatment.

Table 2-17. Design Criteria for DFPZs.

Criterion	Actions
Harvesting and yarding	Mechanical harvesting and whole-tree yarding would be used to remove commercial conifers 10 to 29.9 inches dbh and biomass (trees less than 10 inches dbh).
Diameter constraints	All trees greater than or equal to 30 inches dbh would be retained, except where removal is required to allow for operability. Impacts on trees greater than or equal to 30 inches dbh would be minimized to the extent practicable.
Residual canopy cover	In CWHR size classes 5M, 5D, and 6, retain 40–45 percent canopy cover. In CWHR size classes 4M, 4D, and all other classes, retain 35–40 percent canopy cover. Where available, retain 5 percent or more of the total treatment area in lower layers comprised of trees 6 to 24 inches dbh.
Residual basal area	In CWHR size classes 5M, 5D, and 6, retain at least 40 percent of the existing basal area. In CWHR size classes 4M, 4D, and all other classes, retain at least 30 percent of the existing basal area. Basal area retention would generally be comprised of the largest trees.
Residual species preference	Species preference would be determined by forest type.
Snag retention	Retain the number of snags per acre appropriate for each forest type unless removal is required to allow for operability. In Sierra mixed conifer types and ponderosa pine forest types, retain four of the largest snags per acre. In the red fir forest type, retain six of the largest snags per acre. Snags larger than 15 inches dbh would be used to meet this guideline.
Crown base height	Design harvests to increase the height to the canopy base in order to reduce the potential for crown fire initiation and propagation.
Plantation density	Treat plantations to a residual tree spacing of 15–30 feet.
Wildland Urban Interface	Work in conjunction with the approved *Plumas County Wildfire Mitigation Plan*. In adjacent Wildland Urban Interface, treat stands to be fairly open and dominated by larger, fire-tolerant trees. Treat surface and ladder fuels to minimize the likelihood of crown fire ignition. Create horizontal and vertical crown fuel conditions that result in very low probabilities of sustained crown fire. In extended Wildland Urban Interface, create conditions to result in modeled flame lengths of less than 4 feet, rates of spread reduced by 50 percent of pre-treatment levels, and fireline construction rates doubled from pre-treatment levels. Manage snag levels to reduce hazards to firefighters. Reduce tree density to a level consistent with the site's ability to sustain forest health during drought conditions.
Slash treatment	Underburn, jackpot burn, machine pile and burn, hand pile and burn, yard to a landing and burn, masticate, and/or chip slash, pre-existing fuels, and shrubs.
Fireline	Construct firelines using hand crews or mechanical equipment, as needed, around areas to be underburned, and around machine piles or hand piles. Incorporate existing roads, landings, skid trails, rock fields, bare areas, and other features into containment lines where logical and feasible.
Fire Behavior	In mixed conifer stands, design treatments to result in modeled flame lengths less than 4 feet under 90th percentile weather conditions. Treat plantations to result in a modeled tree mortality of less than 50 percent under 90th percentile weather conditions.
Residual surface fuels (less than 3 inches diameter)	Retain surface fuels at a level that will result in projected flame lengths of less than 4 feet under 90th percentile weather conditions. This generally corresponds to approximately 5 tons or less of surface fuels per acre, or a Fuel Model 8 or 9, depending on the forest type. Fuel Model 8 and 9 are representative of the desired condition for surface fuels for fir-dominated and pine dominated stands, respectively. Based on post-treatment evaluations, treat naturally and activity-generated surface fuels with underburning, jackpot burning, hand piling and burning, grapple piling and burning, yarding to a landing for burning, mastication, chipping, and/or other appropriate methods.
Residual brush cover	Retain less than 50 percent cover of live fuels (brush) in plantations. Treat and maintain native shrub cover to less than 30 percent in developed conifer stands.

Table 2-17. Design Criteria for DFPZs (continued).

Criterion	Actions
Residual down logs	Where they exist, retain 10 to 15 tons per acre of the largest down logs. Where needed, pile and burn extensive areas of deadfall, where feasible, in terms of equipment operability and reduced chance of excessive scorch-related mortality upon burning of these piles.
Ground cover	Maintain adequate cover of surface fuels, litter, duff, and coarse woody debris to maintain habitat values, reduce potential erosion, and meet soil standards for small diameter fuel and ground cover.
Treatment for *annosum* root rot	Apply Borax to the stumps of all harvested conifers that are 14 inches in diameter and greater within the day of harvest in order to minimize the spread of *annosum* root rot. Borax applications will follow all safety and resource protection measures listed in "Appendix C: Standard Management Requirements and Monitoring Strategy."

Note: Prior to conducting prescribed fire operations, the fuel conditions would be evaluated to determine the need for pre-treatment. Pre-treatment of fuels may include machine piling, hand piling, yarding to a landing, masticating, and/or chipping slash, pre-existing fuels, and shrubs.

Table 2-18. Design Criteria for group selection.

Criterion	Actions
Group size	0.5 acre to 2.0 acres
Group location	Locate groups outside of Riparian Habitat Conservation Areas
Harvesting and Yarding	Mechanical harvesting and whole-tree yarding would be used to remove commercial conifers 10 to 29.9 inches dbh and biomass (trees less than 10 inches dbh).
Diameter constraints	All trees greater than or equal to 30 inches dbh would be retained, except where removal is required to allow for operability. Impacts on trees greater than or equal to 30 inches dbh would be minimized to the extent practicable. Group selections would predominantly be located in CWHR size class 4 stands (average dbh of 11 to 24 inches).
Regeneration strategy	Regenerate groups with native shade-intolerant conifers, indicative of the ecological habitat type in which the group is located, using a combination of natural and planted seedlings to achieve desired stocking levels. Plantation performance would be monitored after the 1st and 3rd years, and regeneration actions would be undertaken, if needed, to ensure successful regeneration within five years after harvest. Control competing brush and grass by grubbing or mastication, if necessary, to ensure survival and growth of conifers.
Residual species preference	Retain all sugar pine tagged as resistant to white pine blister rust. Where oak is present, retain a minimum of 25 square feet of basal area per acre of oaks over 15 inches dbh.
Snag retention	Retain two of the largest snags per acre exceeding 15 inches dbh, unless removal is required to allow for operability.
Slash treatment	Underburn, jackpot burn, machine pile and burn, hand pile and burn, yard to a landing and burn, masticate, and/or chip slash, pre-existing fuels, and shrubs.
Fireline	Construct firelines using hand crews or mechanical equipment, as needed, around groups to be underburned, and around machine piles or hand piles. Incorporate existing roads, landings, skid trails, rock fields, bare areas, and other features into containment lines where logical and feasible.
Residual surface fuels (less than 3 inches diameter)	Retain surface fuels at a level that will result in projected flame lengths of less than 4 feet under 90th percentile weather conditions. This generally corresponds to approximately 5 tons of surface fuels per acre, or a Fuel Model 8 or 9, depending on the forest type. Based on post-treatment evaluations, treat naturally and activity-generated surface fuels with underburning, jackpot burning, hand piling and burning, grapple piling and burning, yarding to a landing for burning, mastication, chipping, and/or other appropriate methods.
Residual down logs	Where they exist, retain 10 to 15 tons per acre of the largest down logs having diameters greater than 12 inches.
Biomass removal	Remove biomass (trees less than 10 inches dbh) using whole-tree harvest, mastication, and/or piling and burning.
Treatment for *annosum* root rot	Apply Borax to the stumps of all harvested conifers that are 14 inches in diameter and greater within the day of harvest in order to minimize the spread of *annosum* root rot. Borax applications will follow all safety and resource protection measures listed in "Appendix C: Standard Management Requirements and Monitoring Strategy."

Table 2-19. Design Criteria for area thinning.

Criterion	Actions
Harvesting and yarding	Mechanical harvesting and whole-tree yarding would be used to remove commercial conifers 10 to 29.9 inches dbh and biomass (trees less than 10 inches dbh).
Diameter constraints	All trees greater than or equal to 30 inches dbh would be retained, except where removal is required to allow for operability. Impacts to trees greater than or equal to 30 inches dbh would be minimized to the extent practicable.
Residual canopy cover	Retain 50 percent canopy cover. Where needed to meet objectives, retain 40 percent canopy cover. Avoid reducing canopy cover by more than 30 percent. Where available, retain 5 percent of the total post-treatment canopy cover in lower layers comprised of trees between 6 and 24 inches dbh.
Residual basal area	Retain at least 40 percent of the existing basal area, generally comprised of the largest trees.
Residual species preference	Preferentially retain ponderosa pine, Jeffery pine, sugar pine, and Douglas-fir. Retain the largest, most vigorous dominant and codominant trees to create a residual stand that would be comprised of larger fire-resilient trees. Where oak is present, retain all oaks regardless of size.
Snag retention	Retain the number of snags per acre appropriate for each forest type unless removal is required to allow for operability. In Sierra mixed conifer types and ponderosa pine forest types, retain four of the largest snags per acre. In the red fir forest type, retain six of the largest snags per acre. Snags larger than 15 inches dbh would be used to meet this guideline.
Slash treatment	Based on post-treatment evaluations, underburn, jackpot burn, machine pile and burn, hand pile and burn, yard to a landing and burn, masticate, and/or chip slash, pre-existing fuels, and shrubs.
Fireline	Construct firelines using hand crews or mechanical equipment, as needed, around areas to be underburned, and around machine piles or hand piles. Incorporate existing roads, landings, skid trails, rock fields, bare areas, and other features into containment lines where logical and feasible.
Residual surface fuels (less than 3 inches diameter)	Retain surface fuels at a level that will result in projected flame lengths of less than 4 feet under 90th percentile weather conditions. This generally corresponds to approximately 5 tons of surface fuels per acre, or a Fuel Model 8 or 9, depending on the forest type. Based on post-treatment evaluations, treat naturally and activity-generated surface fuels with underburning, jackpot burning, hand piling and burning, grapple piling and burning, yarding to a landing for burning, mastication, chipping, and/or other appropriate methods.
Residual down logs	Where they exist, retain 10 to 15 tons per acre of the largest down logs having diameters greater than 12 inches.
Treat for *annosum* root rot	Apply Borax to the stumps of all harvested conifers that are 14 inches in diameter and greater within the day of harvest in order to minimize the spread of *annosum* root rot. Borax applications will follow all safety and resource protection measures listed in "Appendix C: Standard Management Requirements and Monitoring Strategy."

Table 2-20. Design Criteria for aspen stands.

Criterion	Actions
Harvesting and yarding	Mechanical harvesting and whole-tree yarding would be used to remove commercial conifers 10 to 29.9 inches dbh and biomass (trees less than 10 inches dbh).
Diameter constraints	All trees greater than or equal to 30 inches dbh would be retained, except where removal is required to allow for operability. Impacts on trees greater than or equal to 30 inches dbh would be minimized to the extent practicable.
Residual canopy cover	No restrictions. Canopy cover will be composed predominantly of aspen. No canopy restriction within RHCAs that meet Riparian Management Objectives.
Residual basal area	No restrictions. Basal area will be composed predominantly of aspen.
Residual species preference	Retain all aspen. The residual stand may contain some conifers greater than 10 inches dbh with preference given to ponderosa and/or lodgepole pine. Remove all non-merchantable conifers (1 to 10 inches dbh) by mechanical or hand treatment, and hand pile and burn the material.
Snag retention	Retain the number of snags per acre appropriate for each forest type unless removal is required to allow for operability. In Sierra mixed conifer types and ponderosa pine forest types, retain four of the largest snags per acre. In the red fir forest type, retain six of the largest snags per acre. Snags larger than 15 inches dbh would be used to meet this guideline.
Slash treatment	Underburn, jackpot burn, hand pile and burn, yard to a landing and burn, masticate, and/or chip slash, pre-existing fuels, and shrubs.
Prescribed fire treatment	Underburn within selected aspen stands to reduce excess live and dead vegetation and promote regeneration of aspen suckers.
Burn constraints	Where possible, locate burn piles away from riparian vegetation to reduce the potential for scorch.
Fireline	Construct firelines using hand crews or mechanical equipment, as needed, around areas to be underburned or hand piled. Incorporate existing roads, landings, skid trails, rock fields, bare areas, and other features into containment lines where logical and feasible.
Residual surface fuels (less than 3 inches diameter)	Retain surface fuels at a level that will result in projected flame lengths of less than 4 feet under 90th percentile weather conditions. This generally corresponds to approximately 5 tons of surface fuels per acre, or a Fuel Model 8 or 9, depending on the forest type. Based on post-treatment evaluations, treat naturally and activity-generated surface fuels with underburning, jackpot burning, hand piling and burning, grapple piling and burning, yarding to a landing for burning, mastication, chipping, and/or other appropriate methods.
Residual down logs	Where they exist, retain 10 to 15 tons per acre of the largest down logs (aspen and conifer) having diameters greater than 12 inches.
Treat for *annosum* root rot	Apply Borax to the stumps of all harvested conifers that are 14 inches in diameter and greater within the day of harvest in order to minimize the spread of *annosum* root rot. Borax applications will follow all safety and resource protection measures listed in "Appendix C: Standard Management Requirements and Monitoring Strategy."
Heritage resource sites	The Mt. Hough Ranger District archaeologist will be consulted when arborglyph sites within aspen stands are identified. Sites will be flagged and avoided, following the Standard Resource Protection Measures (R-5 PA). However, treatment may occur if aspen carving trees will not be affected by conifer removal.

Table 2-21. Design Criteria for Baker cypress stands.

Criterion	Actions
Harvesting and yarding	Mechanical harvesting and whole-tree yarding would be used to remove commercial conifers 10 to 29.9 inches dbh and biomass (trees less than 10 inches dbh).
Diameter constraints	All trees greater than or equal to 30 inches dbh would be retained, except where removal is required to allow for operability. Impacts on trees greater than or equal to 30 inches dbh would be minimized to the extent practicable.
Residual canopy cover	In CWHR size classes 5M, 5D, and 6, retain 40–45 percent canopy cover. Where available, retain 5 percent or more of the total treatment area in lower layers composed of trees 6 to 24 inches dbh
Residual basal area	In CWHR size classes 5M, 5D, and 6, retain at least 40 percent of the existing basal area. In CWHR size classes 4M, 4D, and all other classes, retain at least 30 percent of the existing basal area. Basal area retention would generally be comprised of the largest trees and Baker cypress.
Residual species preference	Retain all Baker cypress regardless of size. Preferentially retain ponderosa pine, Jeffery pine, sugar pine, and Douglas-fir. Retain the largest, most vigorous dominant and codominant trees to create a residual stand that would be comprised of larger fire-resilient trees. Retain all sugar pine tagged as resistant to white pine blister rust.
Snag retention	Retain the number of snags per acre appropriate for each forest type unless removal is required to allow for operability. In Sierra mixed conifer types and ponderosa pine forest types, retain four of the largest snags per acre. In the red fir forest type, retain six of the largest snags per acre. Snags larger than 15 inches dbh would be used to meet this guideline.
Slash treatment	After treatment, stands will be evaluated for follow up treatments: Underburn, jackpot burn, machine pile and burn, hand pile and burn, yard to a landing to burn, masticate, and/or chip activity generated slash, pre-existing fuels, and shrubs.
Burn constraints	Underburn approximately half the treated area. Underburn should be hot enough to open the serotinous cones of Baker cypress.
Fireline	Construct firelines using hand crews or mechanical equipment, as needed, around areas to be underburned, and around machine piles or hand piles. Incorporate existing roads, landings, skid trails, rock fields, bare areas, and other features into containment lines where logical and feasible.
Residual surface fuels (less than 3 inches diameter)	Retain surface fuels at a level that will result in projected flame lengths of less than 4 feet under 90th percentile weather conditions. This generally corresponds to approximately 5 tons of surface fuels per acre, or a Fuel Model 8 or 9, depending on the forest type. After post-treatment evaluations treat surface fuels with underburning, jackpot burning, hand piling and burning, grapple piling and burning, yarding to a landing for burning, mastication, chipping, and/or other appropriate methods.
Residual down logs	Where they exist, retain 10 to 15 tons per acre of the largest down logs having diameters greater than 12 inches.
Treat for *annosum* root rot	Outside of the Mud Lake Research Natural Area, apply Borax to the stumps of all harvested conifers that are 14 inches in diameter and greater within the day of harvest in order to minimize the spread of *annosum* root rot. Borax applications will follow all safety and resource protection measures listed in “Appendix C: Standard Management Requirements and Monitoring Strategy.”

Table 2-22. Design Criteria for RHCA improvements.

Criterion	Actions
Equipment constraints	No mechanical equipment operations on slopes steeper than 25 percent. Establish equipment restriction zones adjacent to stream channels according to table 2-23 below. Allow low ground pressure equipment to travel into the outer RHCA zone to retrieve harvest trees and bring them to skid trails. Locate skid trails at angles to stream channels that minimize erosion into the channel, and allow skidders to enter the outer RHCA on these skid trails. To minimize soil displacement, no equipment would be permitted to turn around while off a skid trail in RHCAs. Allow hand thinning and hand piling in areas where equipment is excluded.
Yarding	Whole-tree yarding of commercial conifers and biomass.
Diameter constraints	Within mechanical harvest areas, retain trees greater than 20 inches dbh, except where needed for operability or aspen treatment. Minimize operation impacts on trees larger than 20 inches dbh as much as practicable. In equipment restriction zones, implement an 8-inch diameter limit on hand thinning but allow conifers up to 12 inches dbh to be cut for operability.
Residual canopy cover	Retain 50 percent canopy cover within the entire RHCA.
Aspen Stands	No canopy restriction within stands that meet Riparian Management Objectives.
Residual basal area	Retain at least 40 percent of the existing basal area, generally comprised of the largest trees.
Residual species preference	Where present, retain all hardwood and riparian species.
Snag retention	In DFPZ Units, retain the number of snags per acre appropriate for each forest type unless removal is required to allow for operability. In Sierra mixed conifer types and ponderosa pine forest types, retain four of the largest snags per acre. In the red fir forest type, retain six of the largest snags per acre. Snags larger than 15 inches dbh would be used to meet this guideline. In Area Thinning Units, retain four of the largest snags per acre exceeding 15 inches dbh, unless removal is required to allow for operability.
Burn constraints	Establish pile burning restriction zones adjacent to stream channels, according to table 2-24 below. Locate burn piles away from riparian vegetation to reduce the potential for scorch where feasible. Active ignition for prescriptive underburning would be minimized within 50 feet of perennial channels and 25 feet of ephemeral and intermittent channels. Backing fires would be used to minimize scorch of riparian vegetation within these buffers.
Slash treatment	Based on post-treatment evaluations, treat naturally and activity-generated surface fuels with underburning, jackpot burning, hand piling and burning, grapple piling and burning, yarding to a landing for burning, mastication, chipping, and/or other appropriate methods.
Fireline	Construct firelines using hand crews or mechanical equipment, as needed, around areas to be underburned, and around machine piles, or hand piles. Incorporate existing roads, landings, skid trails, rock fields, bare areas, and other features into containment lines where logical and feasible.
Residual surface fuels (less than 3 inches diameter)	Retain surface fuels at a level that will result in projected flame lengths of less than 4 feet under 90th percentile weather conditions. This generally corresponds to approximately 5 tons of surface fuels per acre, or a Fuel Model 8 or 9, depending on the forest type. Treat surface fuels with underburning, jackpot burning, hand piling and burning, grapple piling and burning, yarding to a landing for burning, mastication, chipping, and/or other appropriate methods.
Residual down logs	Where they exist, retain 10 to 15 tons per acre of the largest down logs having diameters greater than 12 inches.
Treat for *annosum* root rot	Apply Borax to the stumps of all harvested conifers that are 14 inches in diameter and greater within the day of harvest in order to minimize the spread of *annosum* root rot. Borax applications will follow all safety and resource protection measures listed in "Appendix C: Standard Management Requirements and Monitoring Strategy."
Fish passage improvement	Reclaim fish passage and habitat by improving or replacing culverts at seven specific locations where roads cross streams.
Stream channel stabilization	Construct structures to control erosion and stream grade at six specific locations where headcuts and/or excessive stream channel and bank instability have been identified. Use log, rock, coir logs, and/or vegetation to reduce channel erosion and restore hydrologic function.

Table 2-23. Equipment restriction zones in RHCAs.

Stream Type	Slope Class		
	0–15% (feet)	15%–25% (feet)	Greater Than 25%
Perennial	100	150	No mechanical
Intermittent	50	100	No mechanical
Ephemeral	25	50	No mechanical

Table 2-24. Pile burning restriction zones in RHCAs.

Stream Type	Slope Class	
	0–15% (feet)	Greater Than 15% (feet)
Perennial	25	40
Intermittent	15	25
Ephemeral	15	15

Note: Where feasible, burn piles would not be placed any closer to streams than the distances shown in this table.

Table 2-25. Design Criteria for herbicide use.

Criterion	Actions
Elements common to all proposed noxious weed herbicide treatments:	
Timing	Late summer and fall (to enhance absorption and minimize chance of runoff). No application after the first storm event of the season to minimize impacts on amphibian species.
Frequency	1-2 times per season for 2-5 years
Wind speed	Application using a backpack sprayer would not occur when wind speed exceeds 5 miles per hour or when drift is visually observed.
Guidelines	All applicable pesticide laws and label restrictions would be followed to ensure human health and safety.
Prescriptions for use of the herbicide clopyralid (for example, Transline™ or an equivalent formulation):	
Where used	Upland infestations
Areas where use would be limited	Greater than 50 feet from streams (without sensitive amphibians), meadows, seeps, and springs. Greater than 150 feet from streams with sensitive amphibian species.
How herbicide would be applied	Applied selectively using a backpack sprayer.
Rate of application	0.25 acid equivalent (ae) pounds per acre (lbs/acre)
Diluent	Water
Volume of solution	20 (10–30) gallons per acre
Additive[a]	• Syl-tac™ (Wilbur-Ellis Company): A vegetable oil and silicone-based surfactant.[b] • The surfactant would be added at 1-2 quarts/100 gallons of spray mixture. • Hi-Light™ Blue (Becker-Underwood, Inc.): A water soluble colorant.[c]
Prescriptions for use of the herbicide glyphosate (for example, Rodeo™ or an equivalent formulation):	
Where used	Lowland infestations
Areas where use would be limited	Between 10 and 50 feet from streams (without sensitive amphibians). Between 50 and 150 feet from streams (with sensitive amphibian species).
How herbicide would be applied	Applied selectively using a wick applicator.
Rate of application	2.25 lbs/acre
Diluent	Water
Volume of solution	1.7 gallons per acre
Additive	• Syl-tac™ (Wilbur-Ellis Company): A vegetable oil and silicone-based surfactant. • The surfactant would be added at a rate of 10% by volume of total herbicide solution. • Hi-Light™ Blue (Becker-Underwood, Inc.): A water soluble colorant.

Notes:

a. Additives: Spray solution additives that are mixed with an herbicide solution to improve performance of the spray mixture. Examples include surfactants, wetting agents, sticker-spreaders, or penetrants.

b. Surfactants: Substances that facilitate and enhance the absorbing, emulsifying, spreading, sticking, wetting, or penetrating properties of herbicides.

c. Colorants are added to herbicide mixtures prior to application to help identify the treated area, prevent skips and overlaps, and to help reduce human exposure to recently treated vegetation.

Table 2-26. Chemicals, application rates, and application volumes proposed for Canada thistle control within the Diamond Project Area.

Chemical	Application Rate (ounces per acre)	Acid Equivalent (pounds per acre)	Application Volume (gallons per acre)	Concentration in Field Solution (milligrams per milliliter)
Clopyralid (Transline™)	4 to 10.6	0.09 to 0.25	10 to 30	1 to 3
Glyphosate (Rodeo™)	218	2.25	1.7	160
Vegetable oil-silicone surfactant (Syl-tac®)	5-15 (clopyralid) 0.85 (glyphosate)	NA	NA	1.25–3.74
Dye (Hi-light™ Blue)	5-15 (clopyralid) 0.85 (glyphosate)	NA	NA	0.004

Table 2-27. Design Criteria for transportation improvements.

Criterion	Actions
Road reconstruction	Reconstruct approximately 99 miles of system road. Treatments range from light brushing with no drainage improvements to heavy brushing and large drainage improvements. Improve four curves (to accommodate log trucks, chip vans). Apply rock to the surface of four road segments. Improve two culverts and one low water crossing.
Road relocation	Relocate approximately 1.1 miles of Forest Service Road 28N03 away from its currently unstable location.
Temporary road construction	Construct approximately 10 miles of temporary roads. Decommission these roads upon project completion.
Road decommissioning[a]	Decommission approximately 10 miles of existing system roads.
New road construction	Construct approximately 2 miles of new system roads.
Harvest landings	Reconstruct existing harvest landings, where appropriate and needed. Construct new landings where existing landings are not present or are inadequate. For existing landings supporting cull decks, identify and relocate individual hollow log structures prior to cull deck disposition. Relocate hollow logs to forest stand outside of landing disturbance area.

Notes:

a. Road treatments will be done in accordance with the *Plumas National Forest Land and Resource Management Plan* and the ongoing Travel Management Process (the OHV route designation process).

2.3 Alternatives Considered but Eliminated from Detailed Study

The *National Environmental Policy Act* (NEPA) requires federal agencies 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 of achieving the purpose and need. Some of these alternatives may have failed to adequately meet the purpose and need or were outside the scope of the proposed action, duplicative of the alternatives considered in detail, or would be infeasible to implement. Therefore, a number of alternatives were considered but dismissed from detailed considerations for the reasons summarized below.

2.3.1 Alternative E: Modification of the Proposed Action to Maintain Habitat for Sensitive Wildlife Species

Alternative E was developed to address public concerns that proposed mechanical treatments (DFPZs, group selection, area thinning, biomass removal) may threaten population viability of sensitive wildlife species through habitat degradation of forest structure, forest connectivity, and interior forest habitat characteristics.

The primary objective in developing Alternative E was to retain more acres, as well as the associated structural attributes found in forested stands (CWHR size classes 5M and 5D) considered suitable nesting habitat for the California spotted owl. Alternative E was developed to include the following design elements to address this objective: (1) DFPZ Units within CWHR size classes 5M and 5D would retain trees greater than 20 inches dbh and maintain a 50 percent canopy cover; (2) Area Thinning Units within CWHR size classes 5M and 5D would retain trees greater than 20 inches dbh and maintain a 50 percent canopy cover; and (3) implementation of group selection within spotted owl HRCAs would only occur in CWHR size class 4M and 4D acres, with no group selection in HRCAs in CWHR size classes 5M and 5D. Incorporation of these design elements would reduce direct impacts on owl nesting habitat within the spotted owl HRCAs, the Project Area, and across the entire Analysis Area, reducing risks to the spotted owl associated with habitat removal. Alternative F integrates all of the above design elements. For this reason, alternative E was eliminated from detailed study.

2.3.2 Alternative G. Modification of the Proposed Action to Treat Canada Thistle Locations with Nonherbicide Treatments

Alternative G was developed in response to a request from the public that the Forest Service consider an alternative that focuses on a nonherbicide treatment method to control Canada thistle infestations in the Diamond Project Area. The comments specifically requested that mechanical, biological, and prescribed fire treatments be considered as options for control. Physical methods, such as digging, pulling, hand-cutting, and covering, were incorporated and analyzed in detail under alternative C.

The methods considered in alternative G are further discussed below. Alternative G was eliminated from detailed study because these methods would be infeasible to implement and would not fully meet the purpose and need.

Mechanical Treatment of All Canada Thistle Occurrences in the Project Area. Alternative C proposes to treat approximately 42 percent (213 locations, 18.5 acres) of the Canada thistle locations in the Diamond Project Area with mechanical treatment methods (refer to the alternative C description presented earlier in this chapter). The treatment of all Canada thistle locations in the Diamond Project Area was not considered in detail due to both time and feasibility constraints. First, the number of repeat applications required for the proposed methods to be effective ranged from two to four treatments per site per season (Bond and Turner 2004; Nuzzo 1997; Zouhar 2001). This increased the estimated cost of mechanical treatment to over $700 per acre. Second, the proposed mechanical treatments are usually only recommended for small, newly established occurrences (Zouhar 2001). Therefore, only those occurrences that were smaller than 0.5 acre were considered feasible for mechanical treatment. These constraints required that treatments be reduced to high-priority sites, mainly those that were found along roads, skid trails, and landings and in riparian areas, aspen stands, and other areas with a high potential to be impacted by project activities.

Biological Control. Several insect species have been identified as possible biocontrol (biological control) agents for Canada thistle, but to date, none have been shown to be effective controls (Bayer 2000; Nuzzo 1997; Tu et al. 2001).

Of the biological control agents released, the fly *Orellia ruficauda* and the rust *Puccinia punctiformis* have shown some promise of control. *Orellia ruficauda* larvae are thought to reduce seed dispersal by feeding on the seeds of Canada thistle (Moore 1975 and Maw 1976 *in* Bayer, D.E. 2000); however, due to the fact that Canada thistle spreads primarily through vegetative growth, the damage inflicted by *Orellia ruficauda* is thought to provide only limited suppression of this weed species (Diamond 1993 *in* Nuzzo 1997). The rust *Puccinia punctiformis* weakens Canada thistle shoots and roots; however, recent studies (Guske, Shultz, and Boyle 2003; Kluth, Kruess, and Tscharntke 2004) have shown that this species alone is not adequate to have detrimental effects to either individual plants or populations. The stem-galling fly *Urophora cardui* and stem-galling weevil *Ceutorhynchus litura* have also been released for Canada thistle control in California; however, the effectiveness of these species at reducing or controlling Canada thistle infestations has been variable (Nuzzo 1997; McClay 2002).

In general, Canada thistle is considered to be a difficult target for biological control (McClay 2002). One reason for this is that Canada thistle is an agricultural weed in its native range (Europe), suggesting that even natural enemies of this species are not effective at limiting its growth (McClay 2002). There is also concern about nontarget damage to native thistle species by introduced biological control agents. For example, the weevil *Larinus planus*, which was introduced to the United States in the 1960s to control Canada thistle, has been shown to have major ecological effects on native thistles (Louda and O'Brien 2002). For these reasons, as well as the limited effectiveness of these species to date, biological control is not considered a viable option for treatment of Canada thistle in the Diamond Project Area.

Prescribed Fire. Canada thistle's response to prescribed fire treatment ranges from positive to negative, and appears to be dependent upon season, soil moisture, and location (Nuzzo 1997). Repeat burning in late spring has shown some reduction in established Canada thistle infestations (Hutchinson 1992); however, the overall control is generally considered less than satisfactory and early spring burns have been shown to increase sprouting and reproduction (Zouhar 2001). While fire

often kills the above-ground portion of the plant, the roots are often able to survive even high-severity fires and colonize recently burned sites (Zouhar 2001). When timed to mimic the natural fire regime of the site, prescribed fire may be effective at discouraging Canada thistle through stimulation of native plant growth (Zouhar 2001).

In the Diamond Project Area, an estimated 15 acres of Canada thistle are in DFPZ Units designated for prescribed fire treatment. In these units, prescribed fire would be used as a control method only when additional weed control methods (that is, mechanical or chemical methods) are implemented, and prescribed fire treatments are conducted in late spring when the effectiveness of control would be the greatest. Prescribed fire alone is not considered to be a viable option for Canada thistle control due to the variability in effectiveness and the infeasibility of implementing repeated burning in spring.

Flaming with a propane torch is a new approach that is being tested on the Plumas National Forest for control of other noxious weed species. This method was not considered in detail because studies have shown this method to be ineffective for Canada thistle control (Hogenbirk and Wein 2001).

Tilling, Plowing, or Disking. In agricultural settings, repeated plowing, disking, or tilling at regular intervals of 21 days has been effective at reducing Canada thistle infestations by up to 98 percent (Bayer 2000). However, this method is not often recommended in natural areas because it can exacerbate the problem by spreading root fragments to new locations and can severely damage native vegetation (Willard and Lewis 1939 *in* Nuzzo 1997).

2.3.3 Alternative H: Modification or Elimination of the Use of Borax

Alternative H was developed in response to comments suggesting that Borax application was not needed. Commenters asked the Forest Service to consider not using Borax, or to consider alternative methods of treatment, or to modify the amount, extent, and the timing of Borax use. The methods considered in alternative H are further discussed below

Alternative H was eliminated from detailed study because the following methods would be infeasible to implement and would not fully meet the purpose and need.

Borax Effectiveness. Several studies have demonstrated the efficacy (effectiveness) of using Borax as a stump treatment in California. Graham (1971) demonstrated the effectiveness of Borax on Jeffrey and ponderosa pine. Smith (1970) demonstrated that Borax prevented infection of white fir stumps. Kliejunas (1989) summarized the existing literature on Borax effectiveness in the eastside pine type.

Diameter Limit of 18 Inches. Restricting treatment to only stumps greater than 18 inches in diameter would not be consistent with current Forest Service Region 5 recommendations to reduce the spread of *Heterobasidion annosum* in the eastside pine and mixed conifer type. The following is from the Region 5 Supplement to Forest Service Handbook (FSH) 3409.11 (chapter 60) (USDA Forest Service 1994a):

> R-5 FSM 2303 requires treatment of all conifer stumps in recreation sites. The same direction shall apply to other high value areas, such as progeny test sites, seed orchards, and areas of high value trees, such as giant sequoia groves. In eastside pine or mixed conifer type stands, where surveys have indicated high levels of annosus [*annosum*] root disease, treatment of conifer stumps 12 inches or greater in diameter is highly recommended during chainsaw felling. When mechanical shearers are used, the minimum diameter should be reduced to 8 inches. These areas include the eastside pine and eastside mixed conifer types on the Modoc, Lassen, Plumas, Tahoe, Sequoia and Inyo National Forests; the Goosenest Ranger District, Klamath National Forest; and the McCloud Ranger District, Shasta-Trinity National Forests.

In 2004 Kliejunas and Woodruff, plant pathologists for the Forest Service Pacific Southwest Region, revisited the 12- and 8-inch diameter recommendations for the eastside pine and mixed conifer types (Kliejunas and Woodruff 2004). They evaluated several stands that had been harvested one to two decades previously. Based on this evaluation, they recommended modifying the direction in FSH 3409.11 to say that within the eastside pine and mixed conifer type, that all stumps 14 inches in diameter or larger be treated.

Raising the diameter limit above the 14 inches recommended by Kliejunas and Woodruff (2004) would increase the risk of infection in the Diamond Project Area and is not supported by the research conducted within California.

Timing of Cutting / Thinning. Cutting when *annosum* spores are lowest has been suggested, but there are no data or studies to support the effectiveness of such treatment in California. In James and Cobb (1984), spores are produced in the Stanislaus and San Bernardino National Forests throughout the year. In their summary, Filip and Morrison (1998) state that although many materials have been tested, only Borax is recommended and used operationally in the western United States. Based on the data in James and Cobb (1984) and Russell et al. (1973), it is likely that in the relatively mild climate of California, where spores are produced throughout the year, restricting logging to a certain season would not be effective in reducing *annosum* root disease infection.

Remove Injured Trees in High-risk Areas. Since *annosum* root disease is evident inside and outside the Diamond Project Area, and is considered a serious problem in the eastside pine and mixed conifer type stands of northern California (Kliejunas et al. 2004), the entire Project Area can be considered "at high risk." It has been demonstrated, especially in white fir, that logging damage provides points of entry for *annosum* (Schmitt et al. 2000). Aho et al. (1983, page 7) recommend logging practices that can help minimize damage to residual crop trees. Those logging practices include matching equipment to topography and size of material, spacing of crop trees, use of bumper trees, directional felling, skid trail layout, marking leave trees or the use of feller/bunchers. As a matter of standard practice, the Forest Service designs projects and includes contract provisions to minimize injury to residual trees during harvest. The removal of injured trees is a standard Forest Service contract requirement that helps minimize colonization of wounds by *annosum*. Although careful logging practices and removal of injured trees can reduce the spread of *annosum* in true fir, these practices are only part of an effective strategy. They cannot be relied on solely, as preventative

measures, since basal wounds are only one point of entry in true fir. Aho et al. (1983) also recommend stump treatment to minimize the spread of *annosum* root disease.

Use Prescribed Fire as a Pre- and Post-Treatment Technique. There is no literature supporting prescribed burning as a control of *annosum* in California ecosystems. Froelich et al. (1978, page 98) state that prescribed burning to reduce *annosum* may not have practical application outside the coastal plain of the southern United States or on soils with heavier texture than those in the Project Area (sandy). They conclude that Borax, when applied to freshly cut stumps, has proved to be the most effective treatment in preventing losses. In the southeastern United States, where the burning method was developed, conks (the fruiting body of a fungus) are formed in the duff at the base of trees and could be killed by prescribed fire. However, in the western United States, *annosum* conks are most often found inside stumps or under the bark. Prescribed burning would not be feasible as a control method for *annosum* because of the need to destroy the stumps. In 1994, a field trial was attempted in which fire would be used to destroy infected stumps (Pronos 1994). This trial was unsuccessful because the stumps were still too wet to burn, even three years after harvest.

In most of the Diamond Project Area, prescribed burning as a pre-treatment would not be a feasible strategy to reduce the spread of *annosum* root disease due to existing overly dense vegetation or heavy ground fuels. The use of prescribed fire as a pre-treatment under these circumstances would be extremely difficult to control.

Use of Bio-pesticides. The use of *Phlebiopsis gigantean* and *Streptomyces griseoloalbus* would be considered a bio-pesticide and would need the approval of both the U.S. Environmental Protection Agency (EPA) and California Department of Pesticide Registration. This method of control may be feasible in the future if their efficacy can be demonstrated in California, and if they are registered as bio-pesticides by both the EPA and state of California. Until such time as both efficacy and registration are met, these two biological agents remain untenable options.

Replanting with Resistant Species. This is already recognized as a method to reduce impacts from *annosum* root disease. The following is taken from the Forest Service Region 5 Supplement to FSH 3409.11 (chapter 60) (USDA Forest Service 1994a):

> Species Conversion. Because of host specificity of H. annosum, favor the non-infected host species. In mixed conifer stands with infected true firs, the stand may be converted to pines and incense-cedar with little risk of subsequent infection, assuming this makes sense ecologically. If pines are infected, favor true fir, again if it makes sense ecologically. (Of course, borax should be used on the stumps during this conversion process.) In recreation areas, favor existing hardwoods or the non-infected conifer species. Since hardwoods are resistant, the fungus will eventually die out over a period of 2 to 4 decades, depending on stump size. Then, take steps to regenerate the conifers.

Alternative Borax Application Rates. Pesticide use report data from the forests in Region 5 over the last five years indicate that the average application rate for Borax is 1 pound per acre. There is considerable variability in this average amount (minimum of 0.08 acid equivalent pound per acre [ae lb/acre], maximum of 6 ae lbs/acre). Ninety percent of the applications were 2.5 ae lbs/acre or less.

The Borax application rate recommended by the Wilbur Ellis Sporax® label is 1 pound per 50 square feet of stump surface. Therefore, the total application, in pounds per acre, is dependent on the number and size of stumps treated per acre. The silvicultural prescriptions determine the number and size of trees harvested in each treatment. The projected pounds of Borax application per acre are displayed by silvicultural prescriptions in chapter 4, section 4.1.4.6 (Borax Treatments), table 4-12. The projected pounds of Borax application for group selection treatments is nearly 2 ae lbs/acre. The higher application in group selection treatments is due to the greater number and size of stumps created per acre as a result of the treatment. However, due to the "thinning from below" design of the silvicultural prescriptions for the thinning treatments, the projected amount of Borax application per acre is less than 0.5 pound per acre—well below the regional average of 1 ae lb/acre.

2.3.4 Alternative I: Maintain 50 Percent Canopy Closure and 20-inch Upper Diameter Limit

More than one commenter suggested that it was not necessary to implement thinning to a canopy closure below 50 percent and upper diameter limit above 20 inches dbh to achieve the Diamond Project purpose and need, and that the wildlife habitat would be maintained at a more beneficial level by maintaining 50 percent canopy cover and a 20-inch upper diameter limit (udl).

This prescription was analyzed in both the Empire Project on the Mt. Hough Ranger District and on the Watdog Project on the Feather River Ranger District—both projects are similar in scope, scale, treatment, and purpose and need to the Diamond Project proposed action. In both analyses, it was shown that alternatives implementing only this prescription would not fully meet the purpose of these projects nor fully resolve the need for these projects. In both analyses, it was noted that this prescription would not fully implement fuel treatments to be tested under the HFQLG Pilot Project, would result in a higher probability of crown fire, and would have reduced economic contribution. Furthermore, these analyses indicated little difference in adverse environmental effects, at a landscape or Project Area level, in treating stands to 40 percent canopy with a 30-inch udl versus treating stands to 50 percent canopy cover with a 20-inch udl.

However, treatment prescriptions to maintain 50 percent canopy cover and a 20-inch udl were incorporated into alternative F and fully analyzed in detail. The fuel treatment prescription for alternative F is similar with the exception that canopy cover would be maintained at 50 percent for CWHR size class 5 with a 20-inch udl. The area thinning prescriptions in alternatives B and C maintain canopy cover above 50 percent for CWHR size classes 4 and 5 while retaining trees greater than 30 inches dbh. The area thinning prescriptions in alternatives D and F maintain canopy cover above 50 percent for CWHR size class 5 while retaining trees greater than 20 inches dbh.

Therefore, alternative I, only implementing a 50 percent canopy cover and 20-inch udl, was eliminated from detailed study because it would be duplicative of alternative F and would not meet the purpose and need for the proposed action.

2.4 Summary of Effects of All Alternatives

To summarize the effects, the measurement indicators identified in chapter 1 are used to describe how well the alternatives meet the purpose and need and address the issues identified in chapter 1 (see table 2-28).

Table 2-28. Summary of project objectives and issues identified in scoping.

Objectives	Issues
Modify fire behavior to protect communities, firefighters, and resources	Some members of the public are opposed to the use of herbicide
Modify forest structure and species composition for uneven-aged, multistoried, fire-resistant forest	Preliminary analysis of costs associated with harvest systems and road treatments
Restore aquatic and riparian habitat and improve watershed conditions	Proposed mechanical treatments may be detrimental to old forest conditions and the wildlife species dependent on these conditions.
Contribute to the stability and economic health of rural communities	Implementing ground-disturbing activities in subwatersheds that are approaching or over the Threshold of Concern increases the risk of adverse effects and cumulative watershed effects.
Control the introduction and spread of noxious weeds	
Improve the road system and provide access to treatment areas	

Table 2-29 summarizes the effects of each alternative in relation to the purpose and need. Table 2-30 summarizes how the alternatives address the issues identified in scoping.

The following narrative summarizes the effects by alternative.

2.4.1 Alternative A (No Action)

Alternative A was developed to assess the effects on the Diamond Project Area from taking no action.

The implementation of alternative A would not meet the purpose and need for modifying fire behavior to protect communities, fire fighters, and biological resources because crown fire and surface fire susceptibility on public lands in the Project Area would remain unchanged, and flames would generally remain at least 8 feet in length under 90th percentile weather conditions. The no-action alternative would not meet the purpose and need for modifying forest structure and species composition in the Diamond Project Area because high stand densities would continue to persist above the 55 percent threshold of relative stand density without implementation of area thinning, group selection, and fuels treatments. Baker cypress and aspen stands would not be enhanced without implementation of area thinning and fuels treatments.

Alternative A would not directly cause an increase in cumulative effects on watersheds, but without implementation of fuel treatments, watersheds would be vulnerable to the damaging effects of future severe wildfires. Long-term beneficial watershed effects would not be achieved without the road decommissioning proposed in the action alternatives. No headcut restoration would take place, and stream channels would continue to erode.

Table 2-29. Comparison of all alternatives in terms of meeting the purpose and need.

Objective or Issue	Alternative A (No Action)	Alternative B (Proposed Action)	Alternative C	Alternative D	Alternative F
Objective: Modify Fire Behavior	**Would not meet objective** • Flame lengths in fuel treatments would not change • Percent of public lands susceptible to crown fire would not change	**Would fully meet objective** • Flame lengths in fuel treatments would decrease • Smallest percent of public lands susceptible to crown fire	**Would fully meet objective** • Flame lengths in fuel treatments would decrease • Smallest percent of public lands susceptible to crown fire	**Would meet objective to a large degree** • Flame lengths in fuel treatments would decrease • Three percent more of public land susceptible to crown fire when compared to the proposed action	**Would meet objective to a large degree** • Flame lengths in fuel treatments would decrease • One percent more of public lands susceptible to crown fire when compared to the proposed action
Objective: Modify Forest Structure and Species Composition	**Would not meet objective** • Nearly all acres would not meet desired relative stand densities • Proportion of shade-intolerant species would not change • Percent of open canopy forest would not change	**Would meet objective to a large degree** • Treated acres would meet desired relative stand densities within 10 years; Overall, shorter duration of beneficial effect • Proportion of shade-intolerant species would increase • Percent of open canopy forest would increase 2.8%	**Would meet objective to a large degree** • Treated acres would meet desired relative stand densities within 10 years; Overall, shorter duration of beneficial effect • Proportion of shade-intolerant species would increase equal to B • Percent of open canopy forest would increase equal to alternative B	**Would fully meet objective** • Treated acres would meet desired relative stand densities within 10 years; Overall, longer duration of beneficial effect • Proportion of shade-intolerant species would increase equal to B • Percent of open canopy forest would increase less than alternative B	**Would fully meet objective** • Treated acres would meet desired relative stand densities within 10 years; Overall, longer duration of beneficial effect • Proportion of shade-intolerant species would increase equal to B • Percent of open canopy forest would increase less than alternative D
Objective: Improve Aquatic and Riparian Conditions	**Would not meet objective** • No RHCA acres treated so no benefits to watershed • No long-term benefits to watershed from decommissioning roads • No subwatersheds would be at or approach the Threshold of Concern (TOC) due to management actions	**Would meet objective to some degree** • Highest number of RHCA acres treated, along with alternative C • Long-term benefits to watershed resources from road decommissioning • Seven subwatersheds would be over the TOC and two subwatersheds would approach the TOC with large ERA increase	**Would meet objective to some degree** • Number of RHCA acres treated is equal to alternative B • Long-term benefits to watershed resources from road decommissioning • Subwatersheds that are over or approaching the TOC would be equal to alternative B	**Would meet objective to some degree** • Higher number of RHCA acres treated than alternatives A and F, but less acres than alternatives B and C • Long-term benefits to watersheds from road decommissioning • Six subwatersheds would be over the TOC and two subwatersheds would approach the TOC with large ERA increases	**Would meet objective to some degree** • Lowest number of RHCA acres treated other than alternative A • Long-term benefits to watershed resources from road decommissioning • Subwatersheds would not exceed the TOC • Five subwatersheds would approach or reach the TOC with large ERA increases

Table 2-29. Comparison of all alternatives in terms of meeting the purpose and need (continued).

Objective or Issue	Alternative A (No Action)	Alternative B (Proposed Action)	Alternative C	Alternative D	Alternative F
Objective: Provide Community Stability	**Would not meet objective** • No jobs created, no employee income, and no return to the U.S. Treasury	**Would fully meet objective** • Number of jobs created and employee income would be higher than alternatives A and F, but at the highest negative cost to the U.S. Treasury (-$2 million)	**Would fully meet objective** • Number of jobs created and employee income would be higher than alternatives A and F, and equal to B, but at the highest negative cost to the U.S. Treasury (-$2 million)	**Would fully meet objective** • Number of jobs created, employee income, and the return to U.S. Treasury would be higher than all other alternatives ($471,000 income to the U.S. Treasury)	**Would meet objective to a large degree** • Number of jobs created and employee income would be lower than alternatives B, C, and F, but the economic loss to the U.S. Treasury would not be as high as alternatives B and C (-$5,000)
Objective: Provide Access for Treatments and Improve Roads	**Would not meet objective** • No improvements to road system • OHV route designation process would not be affected	**Would fully meet objective** • Highest number of miles of road would be improved (equal to alternative C)	**Would fully meet objective** • Highest number of miles of road would be improved (equal to alternative B)	**Would fully meet objective** • A lower number of miles of roads would be improved than alternatives B and C, but a slightly higher number than F	**Would fully meet objective** • Lowest number of miles of road system would be improved (other than the no-action alternative)
Objective: Control Introduction and Spread of Noxious Weeds	**Would not meet objective** • Risk of noxious weed introduction and spread would be moderate	**Would meet objective to a large degree** • Risk of noxious weed introduction and spread would be lower than alternatives A and C	**Would not fully meet objective** • Risk of noxious weed introduction and spread would be higher than alternatives B, D, and F	**Would meet objective to a large degree** • Risk of noxious weed introduction and spread would be lower than alternatives A and C	**Would meet objective to a large degree** • Risk of noxious weed introduction and spread would be lower than alternatives A and C

Table 2-30. Summary of how the alternatives address the issues identified during scoping.

Issue Statements and Indicator Measures	Alternative A (No Action)	Alternative B (Proposed Action)	Alternative C	Alternative D	Alternative F
Issue: Some members of the public are opposed to the use of herbicides. **Indicator Measures:** • Acres and quantity of herbicide • Cost per acre of treatment • Effectiveness of treatment	Resolves this issue	Cause of the issue	Resolves this issue	Does not resolve this issue	Does not resolve this issue
Issue: Preliminary analysis of the proposed action determined logging systems and road costs are prohibitively expensive. **Indicator Measure:** • Dollars returned to treasury • Total project value	Resolves this issue	Cause of the issue	Does not resolve this issue	Resolves this issue	Resolves this issue
Issue: Proposed mechanical treatments may be detrimental to old-forest conditions and the wildlife species that depend on these conditions. **Indicator Measures:** • Acres of suitable habitat	Resolves this issue	Cause of the issue	Does not resolve this issue	Would resolve issue to a large degree	Resolves this issue
Issue: Implementing ground-disturbing activities in watersheds that are approaching or over the Threshold of Concern increases the risk of adverse effects and cumulative watershed effects. **Indicator Measure:** • Equivalent Roaded Acres Threshold of Concern derived from the Region 5 model	Resolves this issue	Cause of the issue	Does not resolve this issue	Would resolve issue to a large degree	Would resolve issue to a large degree

The number of acres of suitable spotted owl foraging habitat, suitable spotted owl nesting habitat, suitable northern goshawk nesting habitat, and suitable mesocarnivore denning habitat would be retained. Without implementing treatments under alternative A, there would be no subwatersheds at or approaching the Threshold of Concern (TOC). However, without fuel treatments, there would be an increased risk of loss or degradation of wildlife habitat due to the potential for high-severity wildfire.

Alternative A would not meet the purpose and need of contributing to the stability and economic health of rural communities because, without implementation of fuel and area thinning treatments, no jobs would be created, and no funds would be generated for the U.S. Treasury or returned to local communities.

Alternative A would not meet the purpose and need for improving the road system because no road reconstruction, construction, or road decommissioning would occur.

The no-action alternative would not meet the purpose and need of controlling the introduction and spread of noxious weeds. There would still be a moderate risk of noxious weed introduction and spread without implementation of the proposed noxious weed treatments.

2.4.2 Alternative B (Proposed Action)

Alternative B was developed as the proposed action. Alternative B would meet the purpose and need for modifying fire behavior because the susceptibility of public lands to crown fire would decrease by 10 percent. Flame lengths would be less than 4 feet in length under alternative B through implementing fuel treatments.

The implementation of alternative B would meet the purpose and need for modifying forest structure and species composition to promote the development of an uneven-aged, multistoried, fire-resilient forest by meeting desired conditions for stand density and species composition. Baker Cypress and aspen stands would also be enhanced with implementation of area thinning and fuel treatments.

The implementation of RHCA treatments under alternative B would somewhat meet the purpose and need of improving aquatic and riparian conditions and decreasing the risk of high-severity fire in the treated RHCAs, although seven subwatersheds would exceed the TOC, and two subwatersheds would approach the TOC with large Equivalent Road Acres (ERA) increases. This would be an indirect effect of the implementation of fuel treatments, area thinning, and road treatments in those watersheds. These effects would increase the risk of cumulative watershed effects.

Although implementation of area thinning and fuel treatments in the Diamond Project Area would slightly decrease suitable old-forest habitat for wildlife, fuel treatments would reduce the risk of a severe wildfire degrading large parcels of suitable wildlife habitat in the future. With implementation of alternative B, there is one subwatershed (Cold) currently over the TOC, and it would increase with project implementation; two subwatersheds would be approaching the TOC; and six would be over the TOC (see table 2-31 at the end of this chapter).

The implementation of alternative B would meet the purpose and need for contributing to the stability and economic health of rural communities; however, there would be a $2 million loss to the government through implementation of this alternative.

Road treatments proposed under alternative B would meet the purpose and need for providing access for treatments and improving roads through road reconstruction, construction, and decommissioning.

Alternative B would meet the purpose and need for controlling the spread and introduction of noxious weeds because there would be a low risk of noxious weed introduction and spread due to implementation of the proposed noxious weed treatments.

2.4.3 Alternative C

Alternative C was developed to address the issue of herbicide use. Alternatives C and B are identical except that alternative C does not propose the use of herbicides to control noxious weeds.

Alternative C would meet the purpose and need in the same manner as alternative B for all of the objectives except for controlling the spread of noxious weeds. Implementation of alternative C would not meet the purpose and need for noxious weeds because there would be a moderate risk of noxious weed introduction, establishment, and spread as a result of the ineffectiveness of the proposed methods and scope of treatment.

2.4.4 Alternative D

Alternative D was developed to address the issue of economic feasibility of implementing the proposed action. To reduce cumulative watershed effects in the Indian Creek and Boulder Creek drainage networks, mitigation measures have been proposed for this alternative.

Alternative D would meet the purpose and need for modifying fire behavior because the susceptibility of public lands to crown fire would decrease. Flame lengths within treated areas would meet desired conditions at less than 4 feet in length through implementing fuel treatments.

Implementation of alternative D would meet the purpose and need for modifying forest structure and species composition to promote the development of an uneven-aged, multistoried, fire-resilient forest by meeting desired conditions for stand density and species composition. Baker cypress and aspen stands would also be enhanced with implementation of area thinning and fuel treatments.

The implementation of RHCA treatments under alternative D would somewhat meet the purpose and need for improving aquatic and riparian conditions, but five subwatersheds would be put over the TOC, and two subwatersheds would approach the TOC with large ERA increases due to the implementation of fuel treatments, area thinning, and road treatments in those watersheds. However, implementing additional hillslope and stream channel mitigation measures in these subwatersheds and their drainage networks would mitigate the high risk of cumulative effects suggested by the ERA values. As a result, stream channel integrity would be enhanced, and subwatershed susceptibility to adverse cumulative watershed effects would be reduced. Due to these mitigation measures, the risk of adverse watershed effects would be reduced in the subwatersheds of concern.

Although implementation of area thinning and fuel treatments in alternative D would slightly decrease suitable old-forest habitat for wildlife, fuel treatments would reduce the risk of a severe wildfire degrading large parcels of suitable wildlife habitat in the future. Under alternative D, there would be five subwatersheds that may be at or over the TOC. These watershed effects, however, would be mitigated by slope and channel treatments.

The implementation of alternative D would meet the purpose and need for contributing to the stability and economic health of rural communities, as well as provide an economic return of $471,000 to the government through implementation of this alternative.

The road treatments proposed under alternative D would meet the purpose and need for providing access for treatments and improving roads through road reconstruction, construction, and decommissioning.

Alternative D would meet the purpose and need for controlling the spread and introduction of noxious weeds because there would be a low risk of noxious weed introduction and spread due to implementation of proposed noxious weed treatments.

2.4.5 Alternative F

Alternative F was developed to integrate the issues of economical feasibility, degradation of habitat for sensitive wildlife species, and watershed concerns that could occur with implementation of the proposed action.

Alternative F would meet the purpose and need for modifying fire behavior because the susceptibility of public lands to crown fire would decrease. Flame lengths in the treated areas would meet desired conditions at less than 4 feet in length through implementation of fuel treatments.

The implementation of alternative F would meet the purpose and need for modifying forest structure and species composition to promote the development of an uneven-aged, multistoried, fire-resilient forest by meeting desired conditions for stand density and species composition. Baker cypress and aspen stands would also be enhanced with implementation of area thinning and fuel treatments.

The implementation of RHCA treatments under alternative F would somewhat meet the purpose and need for improving aquatic and riparian conditions. No subwatersheds would exceed the TOC; however, five subwatersheds would approach or reach the TOC with large ERA increases because of implementation of fuel treatments, area thinning, and road treatments in those watersheds. These effects would increase the risk of cumulative watershed effects.

Although implementation of area thinning and fuel treatments under alternative F would slightly decrease suitable old-forest habitat for wildlife, fuel treatments would reduce the risk of a severe wildfire damaging large parcels of suitable wildlife habitat in the future. Under alternative F, there would be one subwatershed at the TOC.

The implementation of alternative F would largely meet the purpose and need for contributing to the stability and economic health of rural communities, but there would be a small loss to the government of $5,000 through implementation of this alternative.

Road treatments proposed under alternative F would meet the purpose and need for providing access for treatments and improving roads through road reconstruction, construction, and decommissioning.

Alternative F would meet the purpose and need for controlling the spread and introduction of noxious weeds because there would be a low risk of noxious weed introduction and spread due to implementation of the proposed noxious weed treatments.

2.5 Comparison of Alternatives

To narrow the focus of the comparison of alternatives, seven measurable elements of the ecosystem were used to emphasize the most important environmental effect and to indicate an increase or decrease in trends in ecosystem health in terms of meeting project objectives and addressing the issues:

1. Fire and Fuels
2. Forest Vegetation
3. Community Stability
4. Watershed Condition
5. Wildlife
6. Noxious Weeds
7. Transportation

Table 2-31 (at the end of this chapter) provides a comparison of the five alternatives using the measurement indicators identified in chapter 1. The measurement indicators shown in table 2-31 are used in the analysis to quantify and describe how well the alternatives meet the purpose (objectives) and need and address the issues. Table 2-31 uses the measurement indicators to show the differences between the alternatives.

The following narrative summarizes the comparison of effects according to the above-listed elements.

The implementation of alternative B or C would best meet the purpose and need for modifying fire behavior because, under both alternatives, relatively more acres of public lands would meet desired conditions for flame length and surface fire potential. Alternatives D and F would meet the purpose and need for modifying fire behavior, but a slightly fewer number of acres would meet desired conditions than under alternatives B and C. Alternative A would not meet the purpose and need for modifying fire behavior since no fuel treatments or area thinning would be implemented.

Although implementation of alternative B or C would meet density and species composition objectives to some degree, they would do so at a net loss of $2 million to the U.S. Treasury. Alternatives D and F would fully meet desired conditions for stand density and species composition, but alternative D would be the most economically feasible alternative to implement with a net return

of $471,000 to the U.S. Treasury. Alternative D would create the highest number of jobs and result in the highest employee-related income, but alternatives B and C would be only slightly less. There would only be a slight net loss of $5,000 to the U.S. Treasury from implementing alternative F, but the number of jobs created and employee income generated would be much less than alternatives B, C, and D. Since treatments would not be implemented, alternative A would not meet the purpose and need for modifying forest structure and species composition, nor would it meet the objective of contributing to the stability and economic health of rural communities.

Alternative D (the preferred alternative) would be the most economically feasible alternative to implement and would fully meet objectives for modifying fire behavior, modifying forest structure and species composition, providing access to treatments and improving the road system, and controlling noxious weed introduction and spread. As with all alternatives, the Cold subwatershed is already over the TOC, and with alternative D, it would remain at the TOC. Alternative D would place five other subwatersheds over the Threshold of Concern (TOC), and two subwatersheds would approach the TOC, with large Equivalent Roaded Acres (ERA) increases. However, mitigation measures would be implemented to reduce the risk of adverse watershed effects. Under alternatives B and C, the Cold subwatershed (which is already over the TOC) would increase slightly; additionally, two other subwatersheds would be approaching the TOC, and six other subwatersheds would be over the TOC (see table 2-31). Alternatives B and C would result in a large loss to the U.S. Treasury ($-2 million) due to implementation costs. With alternative F, one subwatershed (Indian above Antelope) would be at the TOC, four subwatersheds would be approaching the TOC, and the Cold subwatershed would still remain over the TOC. Alternative F would result in only a slight net loss to the U.S. Treasury (-$5,000).

Based on acres of suitable habitat reduction, implementation of alternatives B and C would pose the greatest level of risk to old-forest-dependent species populations in the short term and uncertainty about future activity. The level of risk to old-forest species from implementing alternative D would be less than alternatives B and C. The implementation of alternative F would result in the lowest level of risk to old-forest species compared to the other action alternatives.

Alternative F would pose the least risk to watershed values because there is only one subwatershed (Cold) that would remain over the TOC, one would be at the TOC, and four would be approaching the TOC (see table 2-31 below). Alternative A would retain the highest number of acres of suitable habitat for old-forest-dependent species, but because of the probability of stand-replacing fires, maintaining existing conditions over the long term would present a high degree of risk and uncertainty to these species.

The implementation of alternative B, D, or F would meet the objectives of controlling the introduction and spread of noxious weeds to the same degree. Without the use of herbicides, the implementation of alternative A or C would result in a moderate risk of noxious weed introduction and spread.

The implementation of alternative B, C, D, or F would meet objectives for improving the overall road system through construction, reconstruction, and decommissioning of roads, but alternatives B and C would implement the highest number of miles of road reconstruction. Alternative D would reconstruct a slightly lower number of road miles than alternatives B and C but more miles than alternative F. Alternative A would not meet objective for improving the overall road system.

Table 2-31. Summary comparison of alternatives by using the indicator measures.

Objective or Issue	Indicator Measure	Alternative A (No Action)	Alternative B (Proposed Action)	Alternative C	Alternative D (Preferred Alternative)	Alternative F
Objective: Modify Fire Behavior	Percent of public lands in Project Area susceptible to crown fire (excludes lakes, barren areas)	67	57	57	60	58
	Flame length within fuel treatments	At least 8 feet	<4 feet	<4 feet	<4 feet	<4 feet
Objective: Modify Forest Structure and Species Composition	Stand Structure: Percent of treated area with desired stand densities within 10 years and 20–30 years	10 years: 5% 20–30 years: 5%	10 years: 94% 20–30 years: 32%	10 years: 94% 20–30 years: 32%	10 years: 94% 20–30 years: 56%	10 years: 94% 20–30 years: 47%
	Species Composition: Average shade-intolerant to shade-tolerant species ratio for treated areas	1:6	1:4	1:4	1:4	1:4
	Landscape Structure: Percent open canopy forest conditions created by treatments across landscape	0%	2.8%	2.8%	2.7%	2.2%
Issue: Implementing ground-disturbing activities in subwatersheds that are approaching or over the Threshold of Concern increases the risk of adverse effects and cumulative watershed effects	East Branch Lights (% of threshold)	83	109	109	97	88
	Pierce (% of threshold)	58	115	115	115	98
	Upper Boulder – West Tributary (% of threshold)	43	98	98	98	97
	Mid-Boulder – East Tributary (% of threshold)	50	127	127	113	95
	Mid-Boulder – West Tributary (% of threshold)	42	107	107	107	89
	Indian above Antelope – Middle (% of threshold)	58	119	119	118	100
	Upper Boulder – East Tributary (% of threshold	58	111	111	112	97
	Boulder – top (% of threshold)	42	91	91	89	69
	Cold (% of threshold) (this subwatershed is already over the TOC before any actions are implemented)	133	186	186	133	133
Objective: Restore Aquatic and Riparian Conditions	Acres of RHCAs treated to meet Scientific Analysis Team guidelines and management objectives	0	1,449	1,449	1,369	966

Table 2-31. Summary comparison of alternatives by using the indicator measures (continued).

Objective or Issue	Indicator Measure	Alternative A (No Action)	Alternative B (Proposed Action)	Alternative C	Alternative D (Preferred Alternative)	Alternative F
Objective: Restore Aquatic and Riparian Conditions	Percent of thinning treatments that occur in RHCAs	0	15	15	16	14
Issue: The proposed mechanical treatments (DFPZ, group selection, area thinning, biomass removal) may be detrimental to old-forest conditions and the wildlife species that depend on these conditions	Risk of losing spotted owl Protected Activity Center (PAC) loss to wildfire	No change	Decreased	Decreased	Decreased	Decreased but greater than B
	Suitable spotted owl foraging habitat retained (acres)	54,478	51,998	51,998	52,045	52,309
	Suitable spotted owl nesting habitat retained (acres)	34,083	33,675	33,675	33.783	33,978
	Suitable northern goshawk nesting habitat retained (acres)	88,561	85,673	85,673	85,827	86,286
	Suitable mesocarnivore denning habitat retained (acres)	12,344	11,599	11,599	11,769	11,886
Objective: Contribute to Community Stability **Issue:** Preliminary analysis of the proposed action determined logging systems and road costs are prohibitively expensive.	Dollars returned to U.S. Treasury (timber sale costs or value)	$0	($2,000,000)	($2,000,000)	$471,000	($6,000)
	DFPZ Service Contract cost	$0	$356,000	$357,000	$364,000	$344,000
	All other Service Contract costs	$0	$642,000	$637,000	$645,000	$603,000
	Total project value	$0	($3,758,000)	($3,758,000)	($1,287,000)	($1,703,000)
	Total sawlog volume (million board feet)	0	28.5	28.5	30.2	20.7
	Total biomass (tons)	0	61	61	55	39
	Full-time jobs	0	453	453	457	321
	Employee-related income	$0	$19,476,000	$19,476,000	$19,669,000	$13,806,000
Objective: Control Spread and Introduction of Noxious Weeds **Issue:** Some members of the public are opposed to the use of herbicides.	Risk of weed introduction and spread	Moderate	Low	Moderate	Low	Low
	Number of acres treated	0	128	20	128	128
	Estimated cost per acre	N/A	$240	$780	$240	$240
	Effectiveness of treatment	Not applicable	High Weighted Average: 91%	Low Weighted Average: 58%	High Weighted Average: 91%	High Weighted Average: 91%
Objective: Provide Access for Treatments and Improve Roads	Roads construction (miles)	0	2.0	2.0	0.7	0.7
	Roads decommissioned (miles)	0	9.6	9.6	9.6	9.6
	Road reconstruction (miles)	0	33.2	33.2	26.7	24.2
	Temporary road construction (miles)	0	21.8	21.8	19.3	16.9