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Department of
Agriculture

Forest
Service

Environmental Assessment

ELKHORN PROJECT

Canyon Lakes Ranger District, Arapaho and Roosevelt National Forests
Larimer County, Colorado

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Elkhorn Area from West Lake Campground

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CHAPTER 1: INTRODUCTION

Background

The Canyon Lakes Ranger District (CLRD) of the Arapaho and Roosevelt National Forests is proposing a suite of projects within the Elkhorn project area for the purpose of reducing hazardous fuels adjacent to private land and communities; maintaining or improving forest health and watershed condition; enhancing bighorn sheep habitat by reducing hiding cover for predators, providing for long-term recreational opportunities in the Christmas tree area and recommending an effective transportation system for this area.

The Elkhorn project area is defined by the Cache la Poudre River and Highway 14 to the south, the Manhattan Road (CR 69) to the east, the Deadman Road to the north and a portion of Forest System Road (FSR) 517 to the west. It is adjacent to the communities of Crystal Lakes, Red Feather Lakes, Manhattan and the Upper Poudre Canyon. The Elkhorn project area is approximately 22,293 acres in total consisting of 20,800 acres of National Forest System (NFS) lands while state and private land comprise the remainder. (See Vicinity Map on page 11).

This project is being prepared under 36 CFR 218, a pre-decisional objection process for preparing NEPA. This process is intended to be collaborative and address public concerns before a decision is made. One of the many purposes of NEPA is to reduce agency paperwork and delay in analysis. Therefore, this Environmental Assessment (EA) tiers to the Environmental Impact Statement (EIS) prepared for the 1997 Revision of the Land and Resource Management Plan for the Arapaho and Roosevelt National Forests (Forest Plan). The Forest Plan defines management within Forest Lands, and reference to this document eliminates repetitive discussions of decisions that have been made previously. These documents, as well as detailed information from resource specialists in the project record, are available upon request from the Canyon Lakes Ranger District, Fort Collins, Colorado.

This EA is not a decision document. Instead, it presents evidence and analysis necessary to determine whether the consequences of the proposed action have “significant” effects on the human environment and therefore, whether an EIS is necessary. Upon completion of this determination, the Responsible Official Kevin W. Atchley, District Ranger, will make a decision to implement the proposed action or the no action alternative.

Purpose and Need for Action

The purposes of this project are to:

- Reduce hazardous fuels on National Forest System (NFS) lands that may contribute to the increase spread and intensity of wildfire;
- Maintain and improve forest health in stands affected by the current mountain pine beetle (MPB) epidemic;
- Provide economic timber products;
- Improve watershed and fisheries conditions;
- Enhance bighorn sheep habitat;
- Provide for long-term recreational opportunities in the Christmas tree sale area; and
- Manage the transportation system for the project area.

Fuels Hazard Reduction
Many of the forest stands in the lower elevations of the project area do not exhibit characteristics typical of the fire regime and condition class expected at this elevation and location. The land ownership pattern within and adjacent to the project area is intermingled Federal and private land ownership. Current fuels conditions in the project area, including dead trees killed by the mountain pine beetle (MPB) epidemic, can contribute to uncharacteristically severe wildfire behavior that could threaten improvements on private property and affect natural resources on NFS land. Action is needed to restore these stands to stocking levels and species composition that more closely resemble typical conditions.

There is a high density of homes in the communities adjacent to the Elkhorn project area and on other surrounding private parcels. In addition to community structures, values at risk include infrastructure such as utility lines, evacuation routes and water supplies. As a means of reducing the threat from wildfire created by these conditions, many property owners have completed, or are in the process of completing, defensible space around structures. To increase the effectiveness of these fuel reduction efforts and reduce the potential for destructive wildfires that may affect these communities' values at risk, the Forest Service proposes to reduce the amount of hazardous flammable fuels on NFS land within the Elkhorn Project Area.

Forest Health
Past uses in the Elkhorn project area, including heavy recreational use and timber extraction activities, and current and future predicted impacts such the MPB epidemic necessitate forest management to address forest health in order to move the area toward desired conditions. Past timber harvest patterns in some of the project area have created a patchwork mosaic of squares and strips that do not mimic natural stand sizes or appearance. Thus, there is a need to change the age and size class distribution of lodgepole pine in the project area and increase patch sizes to mimic more natural disturbances.

Timber Products
There is a need to provide timber products for beneficial uses and local economies.

Watershed Improvement
Watershed and fisheries health in the project area have been degraded by high road density, heavy recreational use including OHVs and dispersed camping, and legacy impacts from past mining and timber management. Because watersheds within the project area contribute to many downstream uses, there is a need to remediate these degraded sites.

Bighorn Sheep Habitat Enhancement
The absence of naturally-occurring wildfire in recent decades has compromised bighorn sheep habitat quality by allowing vegetation to become denser than is optimal. Bighorn sheep prefer open habitat in order to detect predators (e.g. mountain lion, coyote), and the presence of dense shrubs and trees reduce sight distances. Additionally, encroaching shrub and tree growth can concentrate sheep into smaller areas, which is thought to increase disease problems. The south-facing slopes above the Cache la Poudre River and Highway 14 in the Elkhorn area have been identified by Colorado Parks and Wildlife (CPW) specifically to maintain and improve bighorn sheep habitat.

Recreational Opportunities in the Christmas Tree Area
The Forest Service Christmas tree area located east of the Manhattan Road (CR 162) and within the FSR 171 road network is highly visited by residents of surrounding communities and the Front Range. The

demand for Christmas trees coupled with the backcountry experience of selecting one's own tree is growing. There is a need to perform forest management activities that will yield young trees suitable for Christmas trees in future years.

Transportation System Analysis
Because of escalating maintenance costs for forest roads and road network effects to forest resources, there is a need to conduct a route-by-route analysis of all National Forest System roads (NFSR) and unauthorized routes within the Elkhorn project area. This analysis recommends the transportation system needed for public access and forest management, as well as identifies unnecessary road segments. Because the project area is a popular destination for motorized recreationists, the propagation of unauthorized routes by these users contributes to resource degradation. Therefore, it is necessary to balance the desire for motorized recreational opportunities with resource protection.

Proposed Action

To address the project purpose and need, the U.S. Forest Service proposes to implement a variety of projects including fuels reduction treatments, forest product removal, watershed improvement projects, broadcast prescribed burning, and a transportation system analysis. Below is a summary of the project proposal:

- Approximately 2,770 acres are proposed for vegetation management treatments to reduce fuels, improve forest health, and provide for future Christmas trees and economic forest products. A number of treatment prescriptions are currently proposed including thinning, clearcutting, salvage and overstory removal.
- A broadcast prescribed burn over approximately 2,191 acres is proposed to increase the effectiveness of fuels reduction efforts on private land, to reduce the potential for destructive wildfires that may affect values at risk, and to improve bighorn sheep habitat.
- A number of watershed improvement projects are proposed for the purpose of addressing degraded watershed conditions within the project area.
- Modifications to the road network within the project area are proposed, including decommissioning of system roads and unauthorized routes and new road construction.

Public Involvement & Issues

The recently adopted Objection Process (36 CFR 218) is a collaborative approach to decision making which encourages meaningful public participation. Public concerns are addressed before a decision is made. As a means of informing the interested public about the proposed action and gathering specific local input, two open house-style public meetings were held (in Red Feather Lakes on May 22, 2013 and in Fort Collins on May 30, 2013). Approximately 20 people in total attended both meetings and were given an opportunity to ask questions.

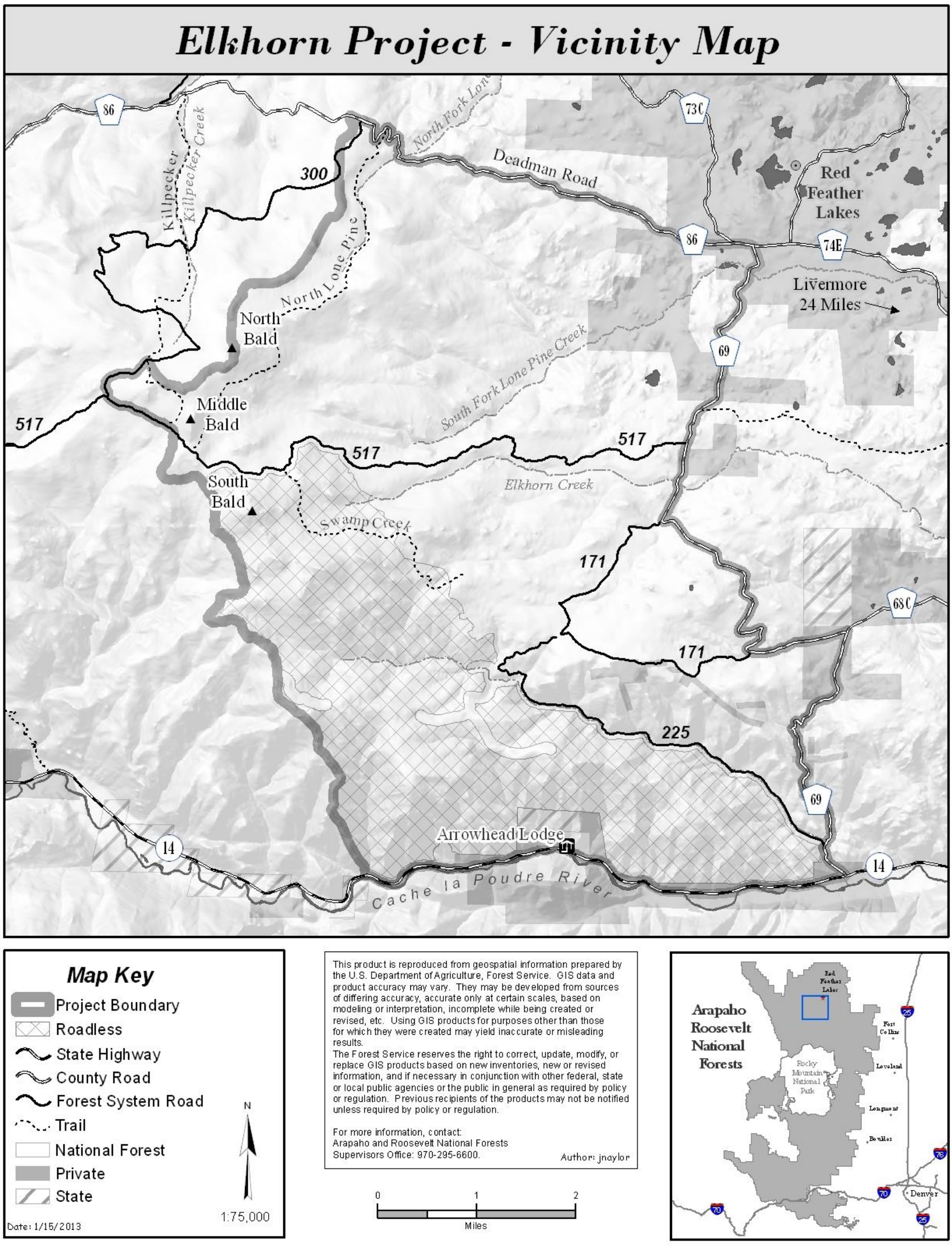
In addition to the public meetings, individual letters soliciting comments on the Elkhorn project proposal were sent to 173 recipients dated May 6, 2013. This letter was also posted on the Forest's website. Throughout the public scoping and comment period the Forest Service also circulated news releases for the project. The proposal was listed in the Forest's Schedule of Proposed Actions (SOPA) beginning in July 2011. This document is available on the National Forest website and is monitored by individuals and organizations interested in management of National Forest lands.

From these combined outreach efforts, fourteen letters of comment were received. Using comments from the public, the Forest Service developed issues to address and incorporated public input as part of project design.

The Forest Service uses an interdisciplinary process to separate issues brought forward during scoping into groups of significant and non-significant issues. Significant or relevant issues are defined as those directly or indirectly caused from implementing the proposed action and cannot be addressed through project design or mitigation. Non-significant issues are identified as those that are: (1) outside the scope of the proposed action; (2) already decided by law, regulation, Forest Plan, or other higher level decision; (3) irrelevant to the decision to be made; or, (4) conjectural and not supported by scientific or factual evidence. The Council on Environmental Quality (CEQ) NEPA regulations require this delineation in Sec. 1501.7, "…identify and eliminate from detailed study the issues which are not significant or which have been covered by prior environmental review (Sec. 1506.3)…" However, at the discretion of the Responsible Official, some non-significant issues may be considered as part of project design for the proposed action.

In general, comments received from the public related to the following: Christmas tree area, dispersed camping, fuels reduction, modifications to the transportation system, vegetation treatments and wildlife. The comments received from the public during scoping and responses to those comments can be found in Appendix 1 (page 151). The comments received during the scoping period were utilized to develop design criteria to address issues brought forward and clarify the proposed action. However, comments did not drive the Forest Service to develop any additional alternatives.

Map 1. Elkhorn Area Vicinity Map



CHAPTER 2: DESCRIPTION OF ALTERNATIVES

Alternatives Considered but Not Analyzed in Detail

An alternative to conduct mechanical fuels treatment in the Green Ridge Inventoried Roadless Area was considered by the Forest Service. Most of the Roadless area acres are infeasible to treat due to steep slopes and lack of access. The proposed broadcast prescribed burn, located in the Roadless Area, would also accomplish fuels reduction objectives.

A new road segment that would connect the FSR 171 and FSR 517 road networks for motorized recreation was considered. It would have measured 1.44 miles and included reconstruction of unauthorized routes as well as some new road construction. This new road proposal was dropped during internal scoping as it was decided that a district-wide analysis of recreation route needs would be a more appropriate venue for analysis of this road.

Inclusion of motorized trails in the Elkhorn travel analysis was considered, but not analyzed. The impetus for undertaking the Elkhorn travel analysis was to address the high density road network in the project area. Management of the few motorized trails is not being considered for change in the Elkhorn area and therefore these were not included in the travel analysis.

Alternatives Analyzed in Detail

Alternative 1 - No Action
The No Action Alternative serves as a baseline for comparing the effects of the action alternative on the environment. Under the No Action Alternative, current management actions, such as road and trail maintenance, recreation, and Christmas tree cutting, would continue within the project area. No action would be accomplished to meet the identified purpose and need of the Elkhorn project. Vegetation management activities would not be implemented for the purpose of fuels reduction, forest health and timber products. No hazardous fuel reduction treatments to complement efforts on private lands would be implemented. Mountain pine beetle-killed trees would not be removed and timber products would not be harvested. Forest management activities to yield young Christmas trees in future years would not be undertaken. Bighorn sheep habitat would not be enhanced through the use of broadcast prescribed burning in the Cache la Poudre River Canyon. Watershed restoration projects would not be implemented for the purpose of improving watershed and fisheries conditions in the project area. The Elkhorn transportation system would not be modified.

Alternative 2 – Proposed Action
The Canyon Lakes Ranger District (CLRD) of the Arapaho and Roosevelt National Forests is proposing a suite of projects within the Elkhorn project area for the purpose of reducing hazardous fuels adjacent to private land and nearby communities; maintaining or improving forest health; providing timber products; improving watershed condition; enhancing bighorn sheep habitat by reducing hiding cover for predators; providing for long-term recreational opportunities in the Christmas tree area and recommending an effective transportation system for this area.

The Elkhorn project area is approximately 22,293 acres in total consisting of 20,800 NFS acres with state and private land comprising the remainder. To address the project purpose and need, the Forest Service proposes to implement a variety of projects: vegetation treatment, broadcast prescribed burning, watershed improvement projects, and transportation system modifications.

Vegetation Management

Within the Elkhorn project area, approximately 2,770 acres are proposed for vegetation treatment designed to improve forest health, reduce hazardous fuels, provide for future Christmas trees and provide economic forest products. The implementation of Elkhorn mechanical treatments would be accomplished by private contractors and/or Forest Service employees. Generally, the option of using mechanized equipment or hand crews with chainsaws to complete the treatments would be considered. However, some areas, such as units in steep or rocky terrain, would be limited to treatment by hand crews only. Where mechanized equipment is used, forest products would most likely be removed in the form of logs, chips or firewood. Firewood could be removed from the hand treatment units.

The proposed mechanical treatment prescriptions include the following: thinning, clearcutting and patch clearcuts, group selection, overstory removal, salvage, selective harvest and two stage group shelterwood. See Appendix 2 for description of these treatments (pages 163).

The remaining cut material (referred to as slash) would primarily be piled and burned at a later date when snow cover or moisture conditions would inhibit fire spread. Where thinning is accomplished with mechanical equipment, the slash could be chipped or masticated and spread on the ground at a specified depth or piled and burned. The method of slash treatment would be determined by the amount of material cut, its proximity to private land and values at risk, and topographical features such as slope and aspect. In some areas, existing dead and down material (sound material and eight inches in diameter or less) could also be treated in a similar manner.

Proposed vegetation treatments in the Christmas tree area would be phased over multiple years in order to stagger production of young trees.

The adequacy of roads for use by logging equipment and product removal used to access treatment units has been addressed in this analysis (See Roads specialist report for specific information, in project record). Unauthorized or temporary ways or roads used by contractors for vegetation management purposes would be decommissioned by the contractor.

In addition, approximately 2,191 acres are proposed for prescribed broadcast burning designed to reduce the potential for destructive wildfires that may affect values at risk, improve bighorn sheep habitat, and enhance ecosystem health by reintroducing fire into the landscape. The primary target areas for burning would be shrub and open forest on the south-facing slopes rising from Highway 14 to the ridgeline and some open slopes in the Sevenmile Creek drainage. Burning in more dense forest areas would open up the forest canopy and help to move stands to stocking levels and species composition that more closely resemble desired conditions. Broadcast prescribed fire would reduce fuels hazard primarily by consuming excess ground fuels, understory vegetation, smaller trees and some weakened or dead overstory trees. Dense lodgepole pine or mixed conifer forest would not be actively ignited. It is estimated that approximately half of the burn area would be actively burned during implementation.

Broadcast prescribed burning would improve visual sight distances for bighorn sheep by reducing densities of conifers (ponderosa pine, Rocky Mtn juniper, and Douglas-fir) and shrubs (mountain-mahogany, sagebrush, bitterbrush); improve sheep forage habitat quality through increased grass and forb growth post-burn, and improve browse quality from regenerating shrub growth. The burn would also similarly benefit elk and mule deer habitat. The south-facing slopes above the Poudre Canyon Highway in this area have been identified by Colorado Parks and Wildlife for prescribed burning specifically to maintain and improve bighorn sheep habitat.

For safety and logistical purposes, an area surrounding the proposed primary burn area has been identified. This secondary burn area is located adjacent to the primary burn area using predefined boundaries. Within this area, fire would be actively suppressed but not deemed a wildfire.

See Table 1 for specific treatments proposed by vegetation unit and Appendix 2 for description of vegetation treatment prescriptions.

Watershed Improvement Projects

The following watershed improvement projects are proposed for the purpose of addressing degraded watershed conditions within the project area:

- As part of road decommissioning activities, recontour stream profiles where intercepted by roads. This would be accomplished using heavy equipment to reshape the stream profile and streambanks as well as the installation of rock and log habitat features that mimic naturally occurring stream habitats. Unless unavailable, on-site rock and log materials would be used at these locations and may involve felling trees. Degraded stream crossings would be identified and restored.
- For system roads reduce the number of stream crossings, where possible, and stabilize stream banks. This would be accomplished in association with removal of stream crossings, road re-contouring and drainage improvement at stream crossings (install additional cross drains, and install culverts and armor fords).
- Remove or revegetate dispersed campsites that are causing damage to riparian areas. This work would be accomplished by posting signs, constructing barriers to limit access into sensitive areas, and in some cases, replanting streambanks/wetlands. Unless unavailable, on-site rock and log materials would be used at these locations and may involve felling trees.
- Perform restoration of approximately five miles of Seven Mile Creek. Type of work could include: construction of pool habitats, installation of log jams to form complex habitats, installation of rock structures for increased holding cover, bank stabilization work, road crossing and drainage improvements. This work would be accomplished using heavy equipment within the stream corridor. Unless unavailable, on-site rock and log materials would be used at these locations and may involve felling trees. Where feasible, portions of the Sevenmile Road may be re-routed around degraded stream and wetland areas.
- Perform stream restoration work in Elkhorn and South Lone Pine Creeks, consisting of approximately one mile in each stream. Type of work would include installation of log structures and restoration of stream habitats damaged by use of unauthorized roads. Where existing roads provide access, this work would be accomplished using heavy equipment. Otherwise, work would be accomplished with hand crews, chainsaws, and pulley-type winches.
- Improve fish passage through culverts along Manhattan Road (CR162) at Elkhorn, South Lone Pine Creek, Swamp Creek and Seven Mile Creek crossings.

Transportation Management

A transportation analysis (TA) was prepared during the initial phases of this Elkhorn planning effort and documents a route-by-route analysis of all NFS roads and unauthorized routes within the Elkhorn project area. The TA recommends the transportation system necessary for public access, motorized recreation and forest management while taking into account the effects of roads on forest resources. The TA recommends modifications to the forest transportation system to meet current and future management objectives. These recommendations are based on an analysis of the physical, biological, social, and economic risks and benefits of every system road.

The following modifications to the travel network within the Elkhorn project area are proposed (see Table 2 for route-by-route recommendations):

- Multiple segments of current NFS roads, totaling 2.56 miles (4.8%) are proposed for decommissioning.
- Two segments of road, totaling 5.19 miles are proposed for conversion to maintenance level 1 (ML). These would no longer be open to the public, or used administratively in the near-term.
- Approximately 51 miles of roads in the current system provide benefit and should be regularly maintained to mitigate and prevent resource risk.
- Nearly 22 miles of unauthorized routes are proposed to be decommissioned.
- One road segment (FSR 171i), totaling approximately 0.26 miles, is proposed for new construction that would provide for an additional loop in the Christmas tree area. This new road segment would be open seasonally, during the Christmas tree sale that is approximately two weeks in duration each year.

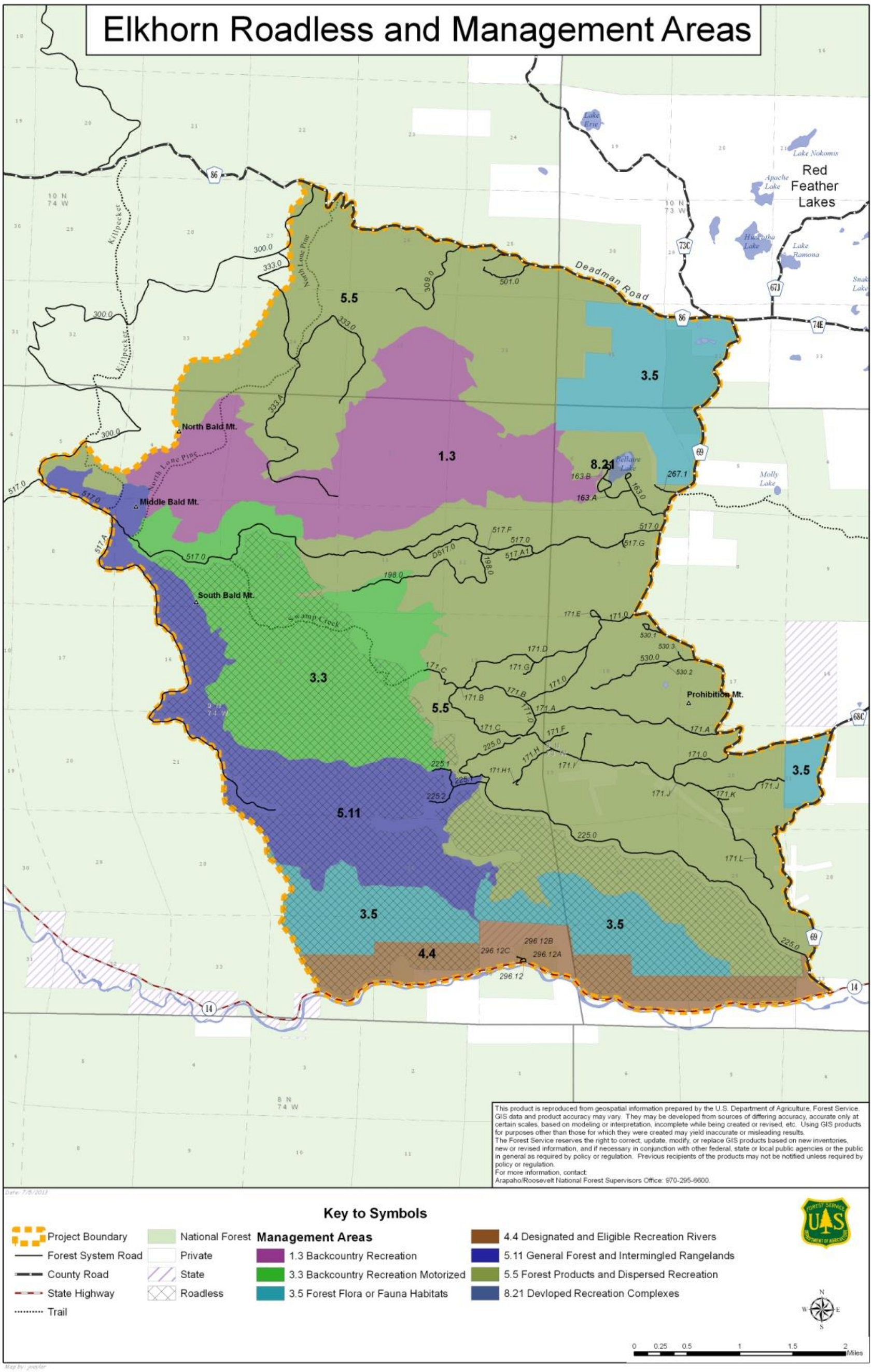
Table 1. Proposed vegetation treatment units, Elkhorn Project (*see Appendix 2 for treatment descriptions*)

Unit #	Proposed Treatment	Treatment Method	Slash Treatment	Acres
1	Broadcast Burn	Hand constructed fire-line, Ignition with drip torches and/or helicopter	A	2,191
2	Low thin - salvage	Hand/Mechanical	A	60
3	Low thin - salvage	Hand/Mechanical	A	76
4	CC with reserves	Hand/Mechanical	A	52
5	CC with reserves	Mechanical	A	27
6	CC with reserves	Mechanical	A	23
7	CC with reserves	Mechanical	A	15
8	CC with reserves	Mechanical	A	19
9	CC with reserves	Mechanical	A	15
10	CC with reserves	Mechanical	A	34
11	CC with reserves	Mechanical	A	21
12	CC with reserves	Mechanical	A	40
13	CC with reserves	Mechanical	A	79
14	CC with reserves	Mechanical	A	35
15	CC with reserves	Mechanical	A	21
16	CC with reserves	Mechanical	A	69
17	CC with reserves	Mechanical	A	15
18	Over-story Removal	Mechanical	A	15
19	CC with reserves	Mechanical	A	14
20	CC with reserves	Mechanical	A	32
21	Low thin - salvage	Hand/Mechanical	A	83
22	CC with reserves	Hand/Mechanical	A	16
23	Low thin - salvage	Hand/Mechanical	A	35
24	Low thin - salvage	Hand/Mechanical	A	103
25	Low thin - salvage	Hand/Mechanical	A	106
26	Low thin - salvage	Hand/Mechanical	A	301
27	Low thin - salvage	Hand/Mechanical	A	133
28	CC with reserves	Mechanical	A	15
29	Low thin - salvage	Hand	A	21
30	CC with reserves	Mechanical	A	26
31	CC with reserves	Mechanical	A	23
32	Selective Harvest	Mechanical	A	29
33	CC w/reserves	Mechanical	B	52
34	CC w/reserves	Mechanical	B	31
35	CC with reserves (*Contingent on OG condition at time of*	Mechanical	B	28

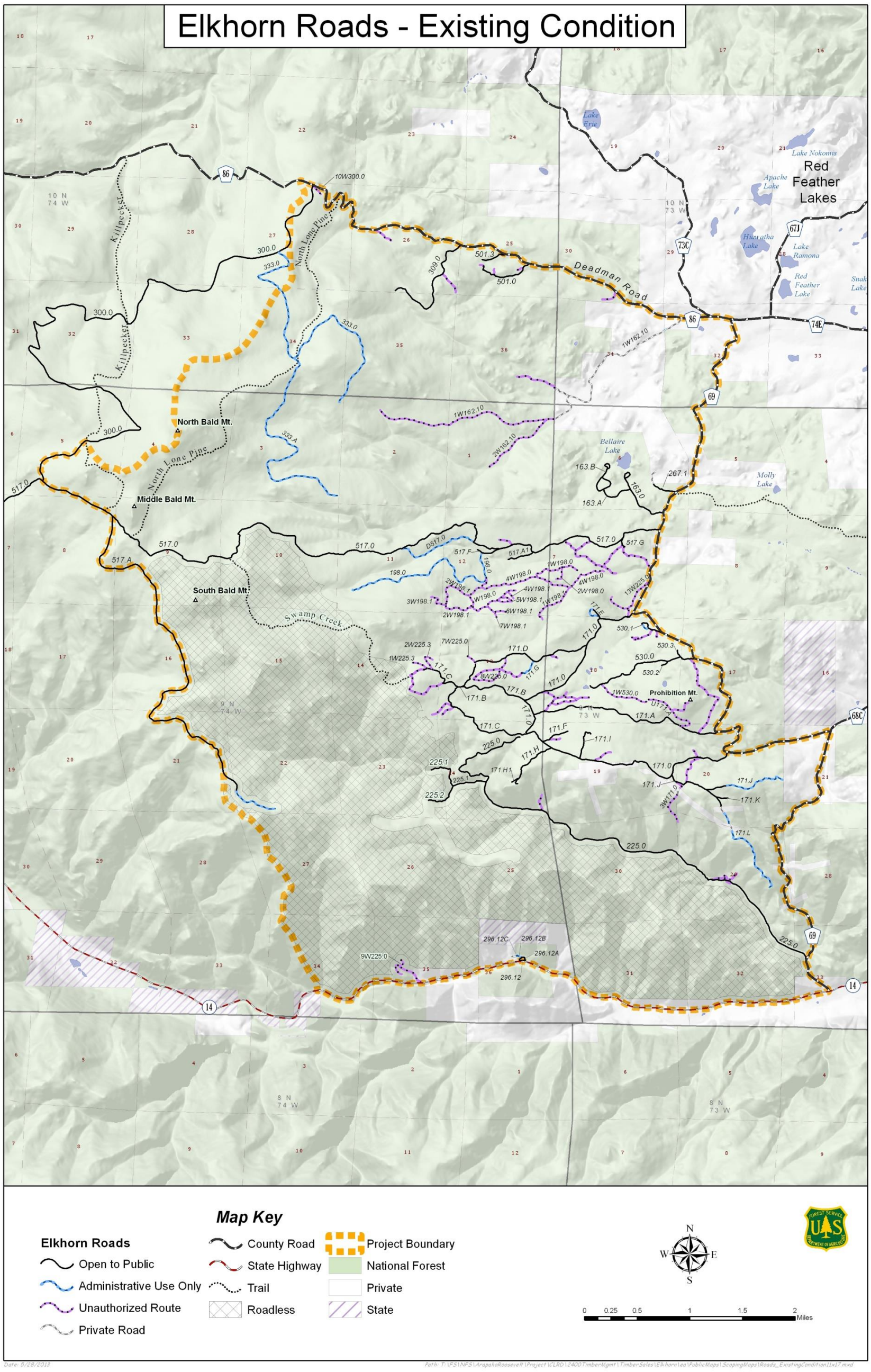
Unit #	Proposed Treatment	Treatment Method	Slash Treatment	Acres
	implementation)			
36	CC with reserves	Mechanical	B	73
37	CC with reserves	Mechanical	B	21
38	CC with reserves	Mechanical	B	34
39	CC with reserves	Mechanical	B	25
40	Selective Harvest	Mechanical	B	60
41	Selective Harvest	Mechanical	B	17
42	CC with reserves	Mechanical	B	96
43	Group Selection (*Contingent on OG condition at time of implementation*)	Mechanical	B	39
44	Two Stage Group Shelterwood	Mechanical	B	18
45	Two Stage Group Shelterwood	Mechanical	B	53
46	Group Selection	Mechanical	A	177
47	CC with reserves	Mechanical	A	23
48	CC with reserves	Mechanical	A	27
49	CC with reserves	Mechanical	A	55
50	CC with reserves	Mechanical	A	13
51	CC with reserves	Mechanical	A	18
52	CC with reserves	Mechanical	A	30
53	CC with reserves	Mechanical	A	10
54	CC with reserves	Mechanical	A	7
55	CC with reserves	Mechanical	A	7
56	CC with reserves	Mechanical	A	21
57	CC with reserves	Mechanical	A	71
58	Low thin - salvage	Mechanical	A	41
59	CC with reserves	Mechanical	A	74
60	Low thin - salvage	Hand/Mechanical	A	10
61	Low thin - salvage	Hand/Mechanical	A	16
62	Low thin - salvage	Hand/Mechanical	A	4
63	Selective Harvest	Mechanical	B	11
64	Selective Harvest	Mechanical	B	16
65	Selective Harvest	Mechanical	B	10
66	Selective Harvest	Mechanical	B	15
67	Group Selection	Mechanical	B	14
Total Acres Proposed for Treatment				**4,961**

Slash Treatments: Slash Treatment A: Whole tree logging required and/or piling within the unit or landing allowed, Slash Treatment B: Whole tree logging allowed or lop and scatter

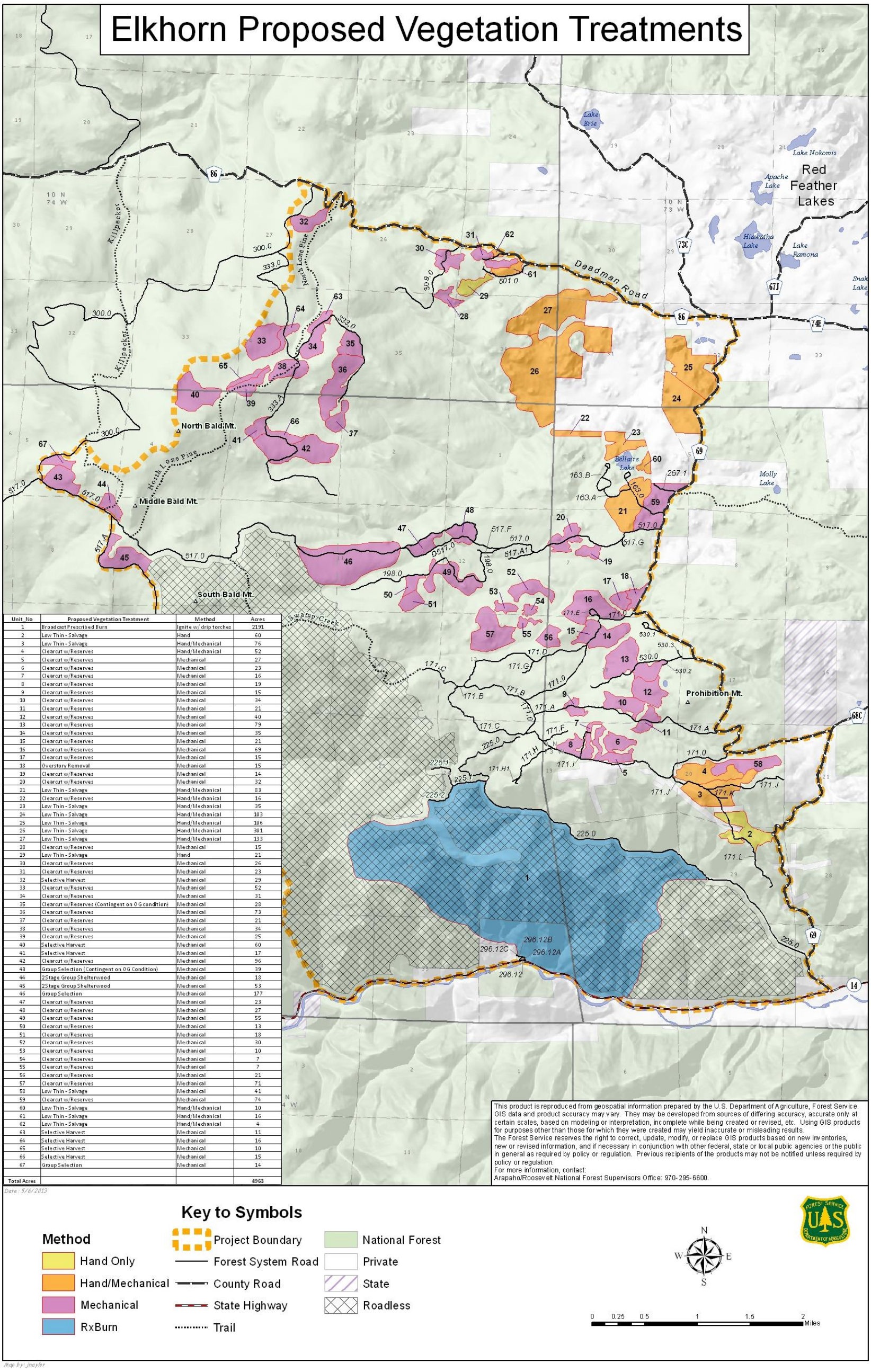
Map 2. Forest Plan Management Areas and Designated Roadless Areas, Elkhorn Project Area



Map 3. Existing Transportation System, Elkhorn Project Area



Map 4. Alternative 2 – Elkhorn Proposed Vegetation Treatments



Unit_No	Proposed Vegetation Treatment	Method	Acres
1	Broadcast Prescribed Burn	Ignite w/ drip torches	2191
2	Low Thin - Salvage	Hand	60
3	Low Thin - Salvage	Hand/Mechanical	76
4	Clearcut w/Reserves	Hand/Mechanical	52
5	Clearcut w/Reserves	Mechanical	27
6	Clearcut w/Reserves	Mechanical	23
7	Clearcut w/Reserves	Mechanical	16
8	Clearcut w/Reserves	Mechanical	19
9	Clearcut w/Reserves	Mechanical	15
10	Clearcut w/Reserves	Mechanical	34
11	Clearcut w/Reserves	Mechanical	21
12	Clearcut w/Reserves	Mechanical	40
13	Clearcut w/Reserves	Mechanical	79
14	Clearcut w/Reserves	Mechanical	35
15	Clearcut w/Reserves	Mechanical	21
16	Clearcut w/Reserves	Mechanical	69
17	Clearcut w/Reserves	Mechanical	15
18	Overstory Removal	Mechanical	15
19	Clearcut w/Reserves	Mechanical	14
20	Clearcut w/Reserves	Mechanical	32
21	Low Thin - Salvage	Hand/Mechanical	83
22	Clearcut w/Reserves	Hand/Mechanical	16
23	Low Thin - Salvage	Hand/Mechanical	35
24	Low Thin - Salvage	Hand/Mechanical	103
25	Low Thin - Salvage	Hand/Mechanical	106
26	Low Thin - Salvage	Hand/Mechanical	301
27	Low Thin - Salvage	Hand/Mechanical	133
28	Clearcut w/Reserves	Mechanical	15
29	Low Thin - Salvage	Hand	21
30	Clearcut w/Reserves	Mechanical	26
31	Clearcut w/Reserves	Mechanical	23
32	Selective Harvest	Mechanical	29
33	Clearcut w/Reserves	Mechanical	52
34	Clearcut w/Reserves	Mechanical	31
35	Clearcut w/Reserves (Contingent on OG condition)	Mechanical	28
36	Clearcut w/Reserves	Mechanical	73
37	Clearcut w/Reserves	Mechanical	21
38	Clearcut w/Reserves	Mechanical	34
39	Clearcut w/Reserves	Mechanical	25
40	Selective Harvest	Mechanical	60
41	Selective Harvest	Mechanical	17
42	Clearcut w/Reserves	Mechanical	96
43	Group Selection (Contingent on OG Condition)	Mechanical	39
44	2Stage Group Shelterwood	Mechanical	18
45	2Stage Group Shelterwood	Mechanical	53
46	Group Selection	Mechanical	177
47	Clearcut w/Reserves	Mechanical	23
48	Clearcut w/Reserves	Mechanical	27
49	Clearcut w/Reserves	Mechanical	55
50	Clearcut w/Reserves	Mechanical	13
51	Clearcut w/Reserves	Mechanical	18
52	Clearcut w/Reserves	Mechanical	30
53	Clearcut w/Reserves	Mechanical	10
54	Clearcut w/Reserves	Mechanical	7
55	Clearcut w/Reserves	Mechanical	7
56	Clearcut w/Reserves	Mechanical	21
57	Clearcut w/Reserves	Mechanical	71
58	Low Thin - Salvage	Mechanical	41
59	Clearcut w/Reserves	Mechanical	74
60	Low Thin - Salvage	Hand/Mechanical	10
61	Low Thin - Salvage	Hand/Mechanical	16
62	Low Thin - Salvage	Hand/Mechanical	4
63	Selective Harvest	Mechanical	11
64	Selective Harvest	Mechanical	16
65	Selective Harvest	Mechanical	10
66	Selective Harvest	Mechanical	15
67	Group Selection	Mechanical	14
Total Acres			4963

Map 5. Alternative 2 – Elkhorn Proposed Transportation System

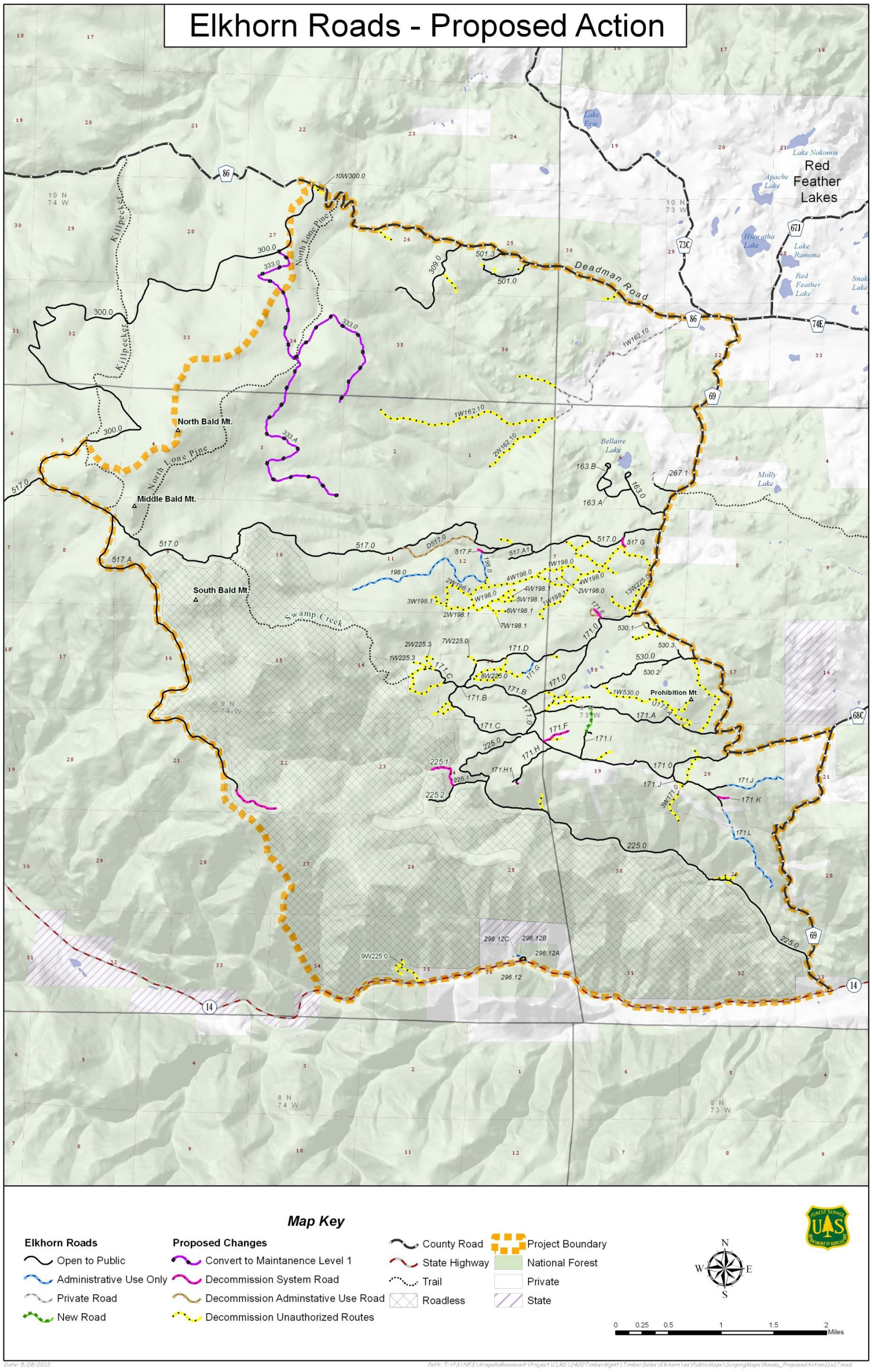


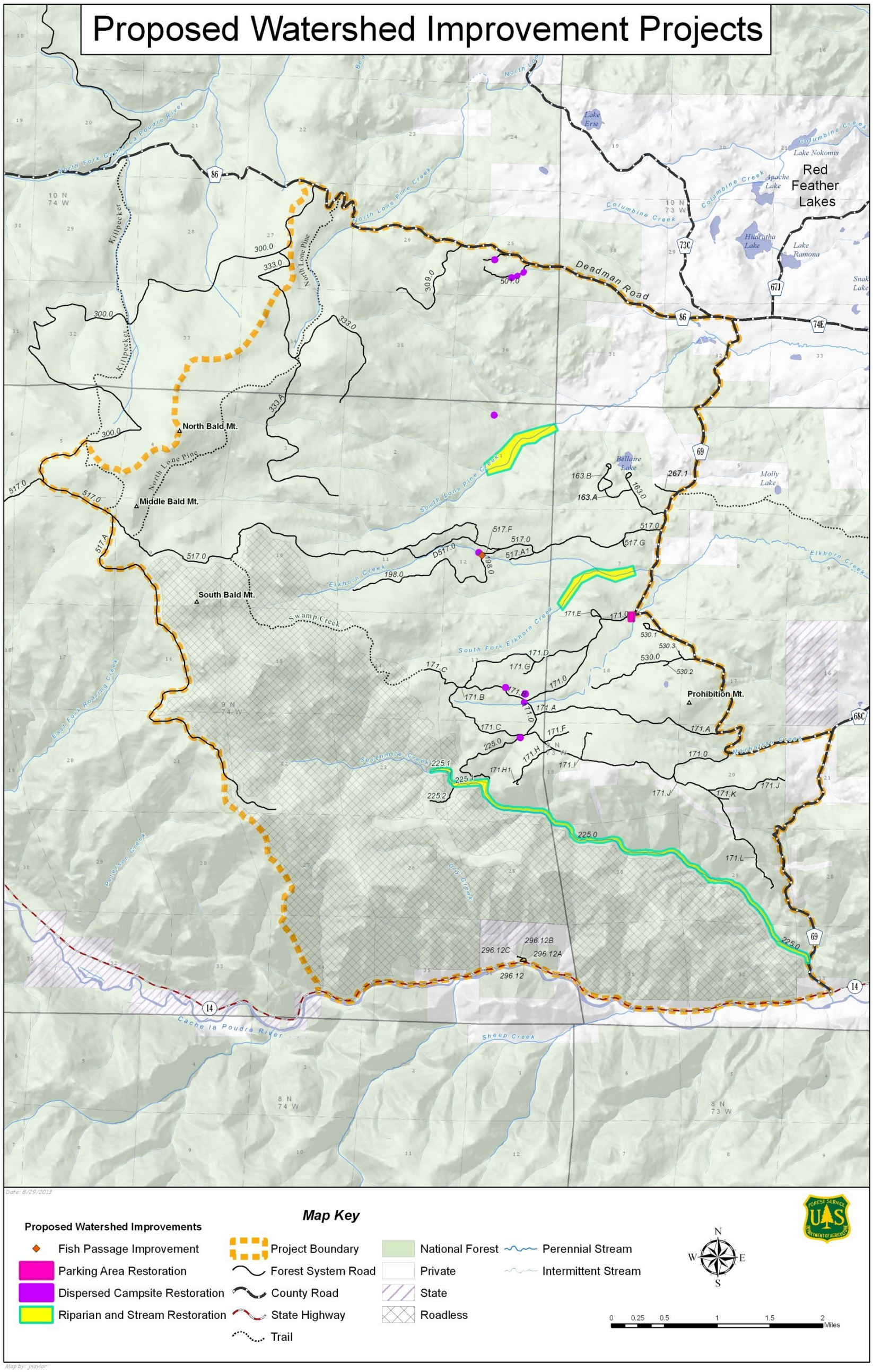
Table 2. Summary of Elkhorn road system and proposed changes *(Several road lengths in the below table are slightly different from that presented in the Proposed Action during the public scoping period. The table used below is from the TAP, which we believe to be correct.)*

Road Number	Road Name	Road Length	Recommendation	Length of Road to be Decommissioned	Length of Road to be Converted
Existing NFSR's					
163.0	BELLAIRE LAKE DAYUSE	0.72	Maintain		
163A	BELLAIRE CG LOOP A	0.72	Maintain		
163B	BELLAIRE CG LOOP B	0.24	Maintain		
171.0	MANHATTAN	4.14	Mitigate/Maintain		
171.A	PROHIBITION MOUNTAIN	1.90	Mitigate/Maintain		
171.B		0.75	Maintain		
171.C		1.55	Maintain		
171.D		1.46	Maintain		
171.E		0.28	Decommission	0.28	
171.F		0.27	Decommission	0.27	
171.G		0.18	Maintain		
171.H		0.55	Decommission last segment past dispersed site	0.01	
171.H1		0.07	Maintain		
171.I		0.32	Maintain		
171.J		1.22	Maintain (admin road)		
171.K		0.11	Decommission	0.11	
171.L		1.26	Maintain (public/admin road)		
198.0	ELKHORN	1.88	Maintain		
225.0		5.06	Mitigate/Maintain		
225.1		0.71	Decommission north segment past intersection with 225.2	0.37	
225.2		0.33	Mitigate/Maintain		
267.1		0.39	Maintain		
296.12	ARROWHEAD VISITOR CENTER	0.08	Maintain		

Road Number	Road Name	Road Length	Recommendation	Length of Road to be Decommissioned	Length of Road to be Converted
296.12A-C	ARROWHEAD CABIN LOOP	0.21	Maintain		
300.0	KILLPECKER	1.24	Maintain		
309.0	AMETHYST	1.22	Maintain		
333.0	NORTH BALD MOUNTAIN	2.74	Convert to ML1		2.74
333.A		2.45	Convert to ML1		2.45
501.0		0.55	Maintain/Mitigate		
501.3		0.23	Maintain/Mitigate		
517.0	ELKHORN - BALDY	13.38	Maintain		
517.A		4.44	Decommission past gate	0.46	
517.A1	ROARING ROAD	0.26	Maintain		
517.F		0.23	Maintain except decommission segment west of junction with FSR 198	0.05	
517.G		0.09	Decommission past 300' dispersed site	0.09	
530.0		1.13	Maintain		
530.1		0.33	Maintain first segment and decommission portion of loop to west that does not lead to designated site	0.12	
530.2		0.07	Maintain		
530.3		0.08	Maintain		
D517.0		0.80	Decommission	0.80	
TOTAL MILES (FS & PVT Jurisdiction)		**53.64**		**2.56**	**5.19**

Road Number	Road Name	Road Length	Recommendation	Length of Road to be Decommissioned	Length of Road to be Converted
Unauthorized Routes					
TOTAL		**21.88**	Decommission all	**21.88**	
Proposed New Routes					
171.i connector	Christmas Tree Loop	0.26	Construct new segment		
TOTAL		**0.26**			

Map 6. Alternative 2 – Proposed Watershed Improvement Projects



Project Design

In response to public comments and collaboration on the proposed action and from analysis by the Forest Service, project design features were developed to minimize the potential impacts to resources the action alternative may cause. Experience has shown project design features similar to those listed below to be effective reducing effects in other projects. If an action alternative is selected, the following measures would be included in project design and implementation.

AIR

- Obtain a smoke permit from the State of Colorado Air Pollution Control Division prior to implementing any prescribed burning.
- Implement prescribed burning when smoke dispersion is favorable as required by the smoke permit.
- Notify stakeholders, media, and smoke sensitive individuals prior to prescribed burning, by signs and/or phone calls/emails as required by the smoke permit.

BOTANY

- Prior to project implementation, areas will be surveyed that contain any habitat for TE plant species as well as medium- to high-quality habitat for Sensitive plant species. If found, TE plants will be avoided such that there would be no adverse impacts to plants. Sensitive plants would be avoided or actions mitigated to ensure that adverse impacts would not lead toward a trend in federal listing or decreased viability across the planning unit.
- If yellow lady's-slipper is discovered prior to or during implementation, it will be protected from project impacts. A Forest Service botanist or botanical representative will define excluded areas and/or other measures needed to protect occurrences, if any are discovered.
- Any Forest Service Sensitive species other than yellow lady's-slipper, or other local plant species of concern identified in the botany specialist report, found within treatment units prior to or during implementation, may be flagged and excluded from treatment to remove or reduce adverse impacts to occurrences. A Forest Service botanist or botanical representative will define this excluded area prior to or during project implementation.
- In the following areas, conduct botany surveys prior to implementation:
    - All suitable habitat, associated with perennial streams, for the federally threatened Colorado butterfly plant (up to 7,200 feet elevation) and Ute ladies-tresses orchid (up to 7,800 feet elevation)
    - Units 1 – 8, 10 – 13, 15 – 17, 26 – 31, 35 – 41, 52, 53, 56, and 58, survey entire unit, not surveyed in 2012
- Consult a Forest Service botanist for site rehabilitation plantings and seed mixes to maximize use of native plants and minimize the risk of nonnative species invasion. Site rehabilitation may include revegetation and/or mulching, depending on site conditions.
- Restore ground cover (the first fall following the cessation of ground disturbing activities on any area where effective ground cover is removed or obliterated e.g. skid trails and landings) using native certified weed free seed and mulch to meet revegetation objectives and to reduce chances for weed introduction and establishment.
    - Seed mix shall be derived in consultation with USFS Botanist or botany representative.
    - Seeding shall conform to the Forest Revegetation Policy.

- Seed shall not contain presence of downy brome (*Bromus tectorum*), its annual weedy allies (*B. japonicus, B. commutatus*, etc.) or smooth brome *(B. inermis*). Proof of seed weed content via an "All States Exam" and including testing for downy brome, its allies, and smooth brome shall be submitted to USFS.

FUELS

Design features must be achieved immediately following completion and acceptance of units unless otherwise stated:

- Minimum pile size, hand or machine created, shall be no less than 6 feet high by 6 feet wide.
- Consult Fuels Specialist during contract preparation for current maximum pile size and pile separation requirements as regulated by the Colorado Air Pollution Control Division.
- Piles shall be constructed in a manner to minimize large air spaces and dirt within the piles. Piles shall not have material extending more than 4 feet in any direction beyond the pile perimeter and a minimum of 4 feet of separation from pile perimeter to surrounding down woody material to reduce unwanted fire spread.
- Construct a minimum 6 foot wide control line, down to bare mineral soil, around each machine pile to create separation between piled material and surrounding slash mat. If piles are grouped, a single control line may be placed around the entire group rather than around individual piles. The scraped material must be moved outward to avoid a berm adjacent to the piles' edge.
- Any bole wood 6 inches or greater dbh, created by treatment, and left in the unit must be scattered, be fully in contact with the ground, and not jackstrawed.
- Locate machine piles a minimum of 150 feet and hand piles a minimum of 50 feet from any infrastructure or private property boundary.
- In hand units, pile all sound existing and/or created slash material, 1 to 6 inches in diameter. Alternatively, any slash that must be moved more than 50 feet to meet minimum required pile size may be lopped and scattered to a maximum depth of 18 inches.
- The following apply to Units 2-32 and 46-62 when treated mechanically:
    - Whole tree logging is required and/or piling within the unit or landing is allowed
    - Slash take back is only allowed in areas adversely impacted or designated by the Soil Scientist/Hydrologist, for soil stabilization, and to a maximum depth of 18 inches.
    - All activity slash material (slash created during treatment), 1 to 6 inches in diameter, must be reasonably gathered and placed into piles. If more than 50% of a treatment unit has continuous slash depth greater than 6 inches after initial treatment, additional piling is required.
- In Units 33-45 and 63-67, residual slash material must not exceed 24 inches in depth.

HERITAGE

- A Class II (sample) Cultural Resource Inventory will be completed in consultation with the Colorado State Historic Preservation Office (SHPO) prior to project implementation. Implementation will not begin until the SHPO has concurred with a determination of *no historic properties affected* or *no historic properties adversely affected*.
- If specialized tree cutting machinery (not including chainsaws) is used to implement vegetation treatments, then all NRHP eligible or unevaluated sites within the units proposed for such treatments would be flagged on the ground for avoidance during implementation. No thinning or slash treatments would occur within these flagged areas, unless determined to be appropriate by the Project Archaeologist.

- All NRHP eligible or unevaluated sites located within prescribed burn units would be marked on the ground by the Project Archaeologist. The Project Archaeologist and fire staff would design protection measures to remove the sites from the burn's Area of Potential Effects. These protection measures would take into consideration the site type, environmental setting, and anticipated burn conditions. These protections may include, but are not limited to: fuel breaks, no treatment buffers, wrapping, foaming, wetting, black line, fire line (machine or hand dug), and/or raking.
- All potentially ground-disturbing fire lines will be intensively surveyed for cultural resources prior to project implementation; any NRHP-eligible cultural resources would be avoided by project design.
- All road improvement, construction, deconstruction, decommissioning, or designated ATV or vehicle routes/ways to be used by crews, would be surveyed for cultural resources prior to implementation and receive consultation with the SHPO.
- Previously undiscovered sites encountered during the course of project activities would be avoided until they can be evaluated by an archaeologist. If affected properties are discovered after project activities are completed, the Forest would document any damage and consult with SHPO and Council pursuant to 800.13(b).

LANDS/MINERALS

- Contact Poudre Valley REA prior to any project implementation and/or provide for notification in any contracts in close proximity to power lines.
- Prior to implementation for projects adjacent to the Bellaire Ditch contact the operator.
- Prior to implementation of projects in the area of the Elkhorn #1 mining operation, notify the operator.
- Prior to implementation of projects where access is required across non-Federal land, contact the landowner in advance to negotiate the proper authorization and timeframe. If access is acquired (either temporary or long-term) road conditions should be assessed and documented with the landowner prior to and after implementation.
- Prior to implementation of projects in the area of the FSR 198 mining operation, notify the operator.

NOXIOUS WEEDS

- Comply with Forest Service Rocky Mountain Region Order No. R2-2005-01 requiring use of certified weed-free hay, straw, or mulch in all Forest Service activities.
- Prior to entering the project area, equipment would be cleaned to minimize risk of noxious weed introduction and spread. This applies to all equipment used off road for this project (not including service trucks or other vehicles that remain on roadways). Equipment would be free of mud, dirt, plant parts, seeds, or other debris that could contain or hold seeds. Equipment would be considered free of soil and other debris when a visual inspection does not disclose such material. Equipment would be re-cleaned prior to transfer to a unit where noxious weeds are known to be present into a unit where noxious weeds are not known present. Disassembly of equipment components or specialized tools is not required.
- For the Elkhorn prescribed burn: (1) Consult with district weed specialist prior to finalizing burn plan for current cheatgrass BMPs and (2) Clean off-road equipment prior to entry *and* exit into Unit 1 to prevent the spread of cheatgrass

- For mechanized treatments, known noxious weed populations may be flagged on the ground for avoidance during layout. No thinning or slash treatments would occur within these flagged areas, unless determined to be appropriate by the District weed coordinator.

Monitoring

- Surveys would be done to identify new noxious weed infestations in hazardous fuels reduction project areas at highest risk (i.e., landing and staging areas, burned pile areas, other areas of heavy activity or where mineral soil is exposed) for weed infestation and/or spread and then prioritized for treatment. In most cases, surveys and/or treatment would be done during the first three growing seasons after ground-disturbing operations.

RANGE

- Delineate all improvement locations on treatment area maps and protect them from damage from tree cutting and prescribed fire operations. If damaged, repair or replace. Specifically, protect the fence on the east side of Unit 2 in the Seven Mile Allotment, and the fence around Bellaire Lake.
- Coordinate operations with grazing permittee before the grazing season to make necessary modifications to allotment use.
- As determined by the District Range Staff, fence extensions may be needed in areas where dense trees that currently limit livestock movement are removed by treatment.

RECREATION

- Recreation infrastructure components (gates, signs, etc.) shall be protected from damage from all treatment activities.
- If unauthorized roads are used for implementation of the fuel reduction project, they will be decommissioned after project activities are completed.
- Implementation schedules for prescribed burning and thinning activities will be provided to the District Recreation Program Manager for coordination with Visitor Information Services and outfitter and guide permittees.
- To prevent off-road vehicular use, treatment units that have Forest Service road access for motorized public use could include one or more of the following (or other methods) barriers to off-road travel unless natural topography provides a sufficient barrier. Consult with recreation specialist to determine specific areas where this treatment should be carried out in units 3 - 5, 7 - 11, 13 - 16, 18 - 21, 24, 25, 28 - 32, 43 - 48, 56, 59, 61, 62, and 67.
    - A buffer zone between the road and the treatment area that prohibits motor vehicle travel; or
    - A fence constructed along the road, and a minimum sufficient quantity of down woody material left to assist in prohibiting off-road vehicular use into the treatment unit; or
    - A sufficient quantity and size of scattered down woody material (minimum size of 6 inch diameter material, and minimal small diameter slash) left to prohibit off-road vehicular use into the treatment unit. Material shall be left variably arranged on the ground for an agreed upon width and distance with the Recreation Specialist from the road.
- Obliterate all unauthorized Forest Service roads, trails and access routes within project area that are more than 300 feet from a Forest Service road.
- No operations on the weekends from 5 pm Friday to 6 am Monday from Memorial Day weekend to Labor Day weekend unless waived by the recreation specialist. This applies to units: 3 -5, 7 - 21, 28 - 32, 43 - 48, 56, 59 - 62, and 67.

- As identified by recreation staff, dispersed campsites located in vegetation treatment units shall be protected.
- All temporary roads built from FSR 171, 171a, 171b, 171c, 171d, and 171f will require temporary gates for the duration of the contract.
- Log decks shall be located in a safe location that will not impede recreational traffic, consult with recreation staff.
- No operations shall occur between the Monday after Thanksgiving and mid-December within the Christmas Tree Sale Area. Consult with recreation specialist to determine where machinery can be left in the Christmas Tree Sale Area during the above dates. This applies to units 5 -16 and 56.

ROADS

- Road decommissioning should reclaim the disturbed areas and include stabilizing the drainages, obliteration of the road prism, full removal of any stream crossings, restoration of stream channels, revegetation with local native plants (as determined by a Forest Service botanist), and effective closures. This work should be done immediately after use but not to exceed one year after use ends. Temporary roads shall be subject to obliteration along its entire length and System roads shall be subject to at a minimum obliteration within visible site distance from its intersection with the connecting road (beginning terminus). Refer to Appendix B in the Elkhorn Project Road Specialist Report regarding information on road recontouring.
- On all Forest Service roads and county, state, and federal highways, all temporary and permanent warning signs and traffic control shall be in accordance with the latest edition of the "Manual of Uniform Traffic Control Devices."
- Prior to operations, all aboveground and underground utilities will be located and protected.
- When operating on or along the road prism, impacts to road surfaces and drainage ditches will be limited. When damage is unavoidable as a result of project implementation, reconstruction and/or replacement of road surfacing and/or drainage ditches will be completed as necessary. The Forest Service will determine post-operation/haul road maintenance, repair, reconditioning, or resurfacing needs on an individual basis.
- Install closure gates as needed for travel management needs on Admin or Maintenance Level 1 roads.
- Any reconstruction of existing roads or construction of temporary roads shall subscribe to the following criteria:
    - Roads shall not go down the fall line or be located in swale bottoms.
    - Roads shall cross drainages at right angles.
    - FSH 7709.56, Chapter 40 recommends road grades will typically not exceed 15 percent in the favorable (downhill) direction and 11 percent in the adverse (uphill) direction for empty trucks and light vehicles and will typically not exceed 8 percent in the downhill direction and 3 percent in the uphill direction for loaded trucks. Additional grade reductions may be needed on horizontal curves and switchbacks. If short intervals of steep grades are necessary, other factors shall be considered such as reduced overall road costs and a higher-quality surfacing to provide the necessary traction and to resist erosion. Maximum grades guidelines should be as follows:
        - Passenger car traffic: 12 percent grade.
        - Motor homes or vehicles pulling trailers: 12 percent grade for pitches up to 300 feet.

        - High clearance and four-wheel drive vehicles: 18 percent grade or as required by State safety regulations.
        - Road cuts and fills shall be minimized with slopes typically of no more than 1.5:1 fill slope and 1:1 cut slope, or as soil conditions warrant. If material conditions warrant (competent rock) steeper cut slopes may be allowed.
- Do not use chain, cable, rope, or wire as a traffic control device.

SILVICULTURE

- Locate burn piles away from green live trees a minimum of 30 feet distance for machine piles and 10 feet minimum distance for hand piles.
- Applicable for Treatment Units 5-18 and 56:
    - Retain when possible, existing advanced regeneration (seedling, sapling and pole size trees) that are healthy, possess crowns > 40% and are capable of responding from the removal of the overstory or adjacent mature trees.
    - Stagger the treatment of these units over the course of at least ten years to provide a sustainable source of Christmas trees within the public Christmas tree harvest area.

SOIL/WATER/FISH

Overall Project

- Do not open temporary roads within the stream buffer (100') for use by mechanical equipment or consult with hydrologist or soil scientist.
- Prior to entering treatment areas, mud must be removed entirely from all off-road equipment (including both FS and contract equipment) and equipment decontaminated with extremely hot water, a disinfectant, or bleach (See 2011 technical guidelines for preventing spread of aquatic organisms in project file).
- Stream insect densities and composition will be monitored by the Forest Service before, during, and after project activities in Sevenmile Creek and any other project area affected streams with occurrences of the Arapahoe Snowfly. If monitoring shows a 20% decrease in sediment-tolerant species from pre-treatment monitoring, project mitigation to reduce sediment, as determined by the District Hydrologist, will be implemented.

All Vegetation Treatment Units

- Roads, trails, and disturbed sites would be stabilized and maintained during and after project implementation to control erosion.
- During winter operations, maintain roads as needed to keep the road surface drained during thaws and break-ups. Perform snow removal in such a manner that protects the road and other adjacent resources. Do not use riparian areas, wetlands or streams for snow storage or disposal. Remove snow berms where they result in accumulation or concentration of snowmelt runoff on the road or erodible fill slopes. Install snow berms where such placement will preclude concentration of snowmelt runoff and will serve to rapidly dissipate melt water.
- Locate vehicle service and fuel areas, chemical storage and use areas, and waste dumps and areas on gentle upland sites, away from surface water.
- Install contour berms and trenches around vehicle service and refueling areas, chemical storage and use areas, and waste dumps to fully contain spills.
- Where applicable, remove all temporary stream crossings and restore stream banks to natural contours following project completion. Reestablish natural drainage patterns with permanent

rolling dips. As recommended by a Forest Service Soil Scientist, decompact temporary road surfaces by ripping or subsoiling the entire length of disturbed areas.

Mechanical Treatment Units

- A no treatment buffer of 100 feet, or to the edge of riparian vegetation, whichever is greater, would be established around perennial and intermittent streams.
- Where chipping operations are planned, depth of chips should not exceed 3 inches and should not exceed 40% ground cover of an area for any given acre.
- Where mastication operations are planned, chunks of masticated material should not exceed 6 inches maximum depth.
- For ephemeral streams, equipment would be excluded from the stream channel, except to cross at designated points.
- Wetlands, fens, and wet meadows may occur within or adjacent to treatment units. These features may not be mapped and may only be discovered during unit layout. A no treatment buffer of 100 feet shall be established around the wetland, fen or wet meadow.
- No mechanical treatment on slopes greater than 40%. Some of the proposed mechanical acres may include 35 to 40% slopes, if soil texture, infiltration, and physical properties classify the area as severe erosion potential additional mitigations should be follow such as higher ground cover percent, reduce equipment traffic cycles, etc. Consult soil scientist for further information (sections within units: 1 -3, 13, 14, 16, 19, 20 - 24, 29 - 31, 33, 36, 38, 40, 45, 47, 56, 57, 59, 60, 62, 65, 66 (also refer to Figures 2 & 3 in Soil/Water/Fish Specialist Report).
- Retain effective ground cover according to the amount of disturbance; in larger cutting area retain an average of 40 % ground cover. In more disturbed areas (i.e. skid trails, landings, temporary roads, and all areas with heavy equipment traffic) retain an average ground cover (slash) of 50 to 60 percent, higher percent in areas of more than 35% slope and even size material distribution (fine and woody debris or upon soil scientist consultation). Slash left on disturbed areas should have a minimum 12 inch depth up to 18 inches deep.
- Operate heavy equipment off of road surfaces or landings only when soil moisture is below the plastic limit, or protected by at least one foot of packed snow or two inches of frozen soil. Soil moisture exceeds the plastic limit if the soil can be rolled into three millimeter threads without breaking or crumbling. In general, avoid all soil-disturbing actions, including travel, during periods of heavy rain or wet soils.
- Do not locate landings, staging areas or storage areas for any heavy equipment on wet or fine textured soils found in riparian areas, meadows, aspen stands, and wetlands (hydric soils). A soils map, provided by the soil scientist, will designate these locations. The units with potential for hydric or wet soils are 1, 13, 14, 16, 19, 20 - 24, 30, 31, 45, 47, 56, 57, 59, 60, 62, 65 and 66.
- Skid trails and landings would be designated prior to treatment.
- If detrimentally compacted, puddled or displaced land exceeds 15% of any land unit, mitigation would include rehabilitating the main arterial skid roads and landings. This treatment would be followed by seeding using native species or by covering with slash.
- Temporary roads would be obliterated within 1 year of completion of use. Decompact surfaces by ripping or subsoiling the entire length of temporary roads. Obliteration activities could include waterbars, seeding, covering with slash, and providing sufficient barriers to prevent trespass. Where applicable, remove all temporary stream crossings and restore stream banks to natural contours following project completion. Reestablish natural drainage patterns with permanent rolling dips.

Hand Treatment Units

- Tree cutting can occur to the edge of the stream bank for perennial, intermittent and ephemeral streams. For shading and bank stability, retain at least 50% of forested vegetation along the banks of perennial and intermittent streams. No riparian vegetation will be cut.
- Wetlands, fens, and wet meadows may occur within or adjacent to treatment units. These features may not be mapped and may only be discovered during unit layout. No tree cutting would occur within wetlands, fens or wet meadows.
- Burn piles would be located at least 50 feet from perennial streams, wetlands, fens, and wet meadows. Ditches and canals are considered perennial streams if they carry water outside of runoff season or storm events and/or they support riparian vegetation.
- Burn piles would be located 50 feet or outside the inner gorge, whichever is less, for intermittent and ephemeral streams.
- Lopped and scattered slash would be removed from the stream channel of perennial, intermittent and ephemeral streams.
- During winter operations, maintain roads as needed to keep the road surface drained during thaws and break-ups. Perform snow removal in such a manner that protects the road and other adjacent resources. Do not use riparian areas, wetlands or streams for snow storage or disposal. Remove snow berms where they result in accumulation or concentration of snowmelt runoff on the road or erodible fill slopes. Install snow berms where such placement will preclude concentration of snowmelt runoff and will serve to rapidly dissipate melt water.
- Retain effective ground cover to prevent accelerated on-site soil loss and sediment delivery to streams according to the appropriate slope gradient ranges in a unit as follows:

Slope Gradient Range	% Ground Cover to Retain
0-25%	30
25-40%	40
40-75%	50
>75%	70

Broadcast Prescribed Burning and Pile Burning

- Rehabilitate constructed fire lines by installing water bars, raking topsoil back over the line, covering with slash or other mulch materials, or seeding, if recommended by the botanist, to help prevent weed/non-native invasion.
- Conduct broadcast prescribed burning and pile burning to minimize the residence time on the soil while meeting the burn objectives. This is usually done when the soil and duff are moist (not wet).
- Schedule broadcast burning when the soil moisture conditions will minimize heat conductivity into the soils.
- Where pile burning of slash is planned, burn under conditions where complete consumption of organic materials is not expected.

VISUAL RESOURCES

- Unit boundary and tree marking: When located within two chains (132 feet) of the viewers within the 'view corridor', boundary leave trees should be painted on the side facing away from the potential viewer within the constraints of the contract. Boundary trees could also be repainted by the Landscape Architect with a color sympathetic to the tree bole when the contract is complete. View corridor is defined as Larimer County roads 69 & 86 (the Manhattan and Deadman Roads), CSH 14 (The Cache La Poudre-North Park Scenic Byway) or the Bellaire Lake Recreation Area or along FSR 163 and 163A to that recreation area.

- Burn piles should be limited to 20 per acre within a zone of two chains (132 feet) within the 'view corridor' listed above and within the constraints of the contract.
- Harvest areas should achieve a natural appearing shape in consultation with the Landscape Architect. Units should mimic the scale of natural openings where feasible. Units should strive to prevent the appearance of uniform tree spacing. Harvest area boundaries should be natural or natural-appearing edges whenever possible to avoid any straight line unit boundaries. Straight line boundaries shall be treated by 'feathering' and 'scalloping'.
    - To 'feather' would be to go from a clearcut or maximum thinned density to existing stand density in 50 to 200 feet in a gradual progression.
    - To 'scallop' would be to cut curvilinear edges of varying wavelength and amplitude for example, a short one followed by two long ones, and then a medium one, etc.
- Treatment areas within the 'view corridor' as defined above will be reviewed by a Forest Landscape Architect prior to final unit layout.
- If barrier rocks are used to close roads they should be of various sizes and grouped in 'natural' arrangements and 1/3-1/2 buried.
- Preburn treatments (lining, yarding, piling etc.) should avoid the appearance of straight lines in the landscape (eg. fire lines, roads, 'pull-back' length of materials from the edge of the burn area etc. should all be *non-uniform* whenever possible).
- In consultation with the Landscape Architect, retain a 400 foot wide band along the Bellaire Lake Recreation Area Road (Units 21 and 59) where there are leave islands of various size that may contain rock piles, meadows, aspen, live or dead trees in order to provide vegetative screening.
- In units along private land boundaries retain clumps of live trees to avoid the appearance of straight lines in the landscape.

WILDLIFE

- Retain an average of 3 snags per acre within all treatment units. Snags may be retained in a mix of both clumps and individuals. Criteria for snag selection will be specified in the silvicultural prescription with emphasis on retaining the largest diameter snags present. If the minimum number of snags is not available, then live, green replacement trees will be selected for future snags and should be representative of the largest trees available.
- Old-growth SNO polygons (Units 35 and 43) that are within lodgepole pine and spruce-fir forest types would be treated if considered non-functional at time of implementation. This determination of functionality is to be made for the polygon as a whole within the treatment unit. For a site to be considered as providing functional old growth habitat, key old-growth characteristics include large live trees (some of which are old and declining); either snags or fallen trees; and greater than 20 percent overhead canopy closure. The specific lodgepole old-growth forest criteria include primarily (must be present):
    - Presence of 15 or more large live trees (10 inches or greater dbh) per acre and
    - Overhead canopy closure greater than 20% (from live trees at time of evaluation). Secondarily (may or may not be present):
        - Presence of 2 or more large snags (10 inches or greater dbh) per acre.
        - Presence of 3 or more large fallen trees (10 inches or greater dbh) per acre.
        - Presence of large, old, declining live trees.
- The portion of treatment unit 3 overlapped by SNO can be treated, but treatment would be designed to retain old-growth/large tree structure (unit primarily is ponderosa pine and mixed conifer type).

- For units 10 acres and larger where clearcut (CC) or overstory removal (OSR) removal treatments are prescribed, retain at least 5-15% of the average or greater diameter trees in patches and as individuals.
- By adjusting lighting patterns in prescribed burn unit 1, minimize loss of existing larger snags (e.g. 12 inches and greater DBH).
- In treatment units where slash is piled by hand, leave 2 piles per acre for wildlife habitat.
- Existing down material that does not meet utilization standards should not be removed and should be left in place.
- Retain a minimum of 50 linear feet per acre of downed woody material, distributed randomly across an acre at a minimum diameter of 5 inches or greater. If 5 inch material is not available, leave the largest diameter possible. Length of the material should be 8 feet or greater.
- Within treatment units, in order to maintain meadow areas and aspen stands greater than ¼ acre in size, remove smaller diameter conifers from both types of habitat (e.g. ponderosa pine, lodgepole pine, Douglas fir, and Rocky Mountain juniper) per the following: conifer trees up to 14 inches dbh may be felled, except for Engelmann and blue spruce for which trees up to 10 inches may be cut.
- For timber harvest units located within elk production areas (as identified by CPW), restrict timber unit treatment activities during May 15 through June 15. This does not apply to the following units that are outside of the identified elk production area: 1 through 8, 11, 27 through 32, 58, 61, and 62. If necessary, exceptions to this criterion may occur after consultation with the District Wildlife Biologist.
- During June 15 through August 15, timber unit treatment activities may occur in only one of the following groups of units at any one time (i.e. work cannot occur in both groups simultaneously) in order to reduce potential disturbance within an elk summer concentration area, as identified by CPW. If treatment activities are completed within a group during this time period, work may then proceed in the other group. Timber units not included below can have work done without this timing restriction.
    - Group 1 – Units 43, 44, 45, 67
    - Group 2 – Units 33 through 42, 63 through 66
- For the portion of the broadcast burn unit above the Poudre River, confine burn activities to the upper third of the slope to the ridgeline during the bighorn lambing and summer concentration area periods (from May 1 through August 15). If necessary, exceptions to this criterion may occur after consultation with the District Wildlife Biologist. Activities within the Sevenmile Creek drainage within the burn area have no activity timing restrictions.
- For the area within broadcast burn unit 1 that overlaps with the Redfeather lynx analysis unit, conduct burning operations to minimize tree mortality, as practicable.
- For proposed watershed improvement projects, a seasonal restriction on watershed project activities (i.e. noise disturbance and human encroachment) from March 1 through August 31 will be implemented within one-quarter mile of known raptor nest sites. The District Wildlife Biologist will be consulted for implementation of this design feature.
- A seasonal restriction on project activities (i.e. noise disturbance and human encroachment) from March 1 through August 31 will be implemented within one-quarter mile of a sharp-shinned hawk nest site in proximity to units 29, 61, and 28. The activity restriction applies to all of unit 29, and approximately the west half of Unit 61 and east half of unit 28. If necessary, exceptions to this criterion may occur after consultation with the District Wildlife Biologist.
- If raptor nesting activity (e.g. nesting behavior, nest sites, or fledglings) is detected within treatment units or areas potentially impacted by proposed project activities prior to or during

implementation, a Forest Service wildlife biologist would be contacted as soon as possible to ensure Forest Plan guidelines for raptor protection are met.

- If a federally listed or Forest Service sensitive wildlife species is identified within treatment units or areas potentially impacted by proposed project activities prior to or during implementation, a Forest Service wildlife biologist will be contacted as soon as possible to ensure Forest Plan guidelines are met.
- In units with multi-story mature or late-successional conifer forest habitat (i.e. the units proposed for uneven-aged treatment), incidental removal or damage of understory vegetation should be limited to 15-20%. Skid trails, temporary roads, landings, hazard tree removal, trees damaged/killed from felling other trees are all considered 'incidental' impact or removal. These units are: 32, 40, 41, 43, 46, 63 - 67.
- For units 32, 40, 41, 43, 46, 63 – 67 noted above where uneven-aged management (single tree and small group selection) practices are employed, small group selections would consist of small forest openings (approximately 1-2 acres in size individually) not to exceed 20% of the unit acres. Uneven-aged treatment should focus the location of the patches or small groups in those areas of each stand that have less than 35% horizontal cover. Individual tree selection can occur throughout the unit or between the groups. Units 43, 46, and 67 are proposed for group selection; units 32, 40, 41, 63, 64, 65, and 66 are proposed for selective harvest.

CHAPTER 3: ENVIRONMENTAL CONSEQUENCES

This section discloses the physical, biological, and social environments of the affected project area and the potential changes to those environments as a result of implementation of either alternative. In-depth analysis of this project was prepared for each resource area is included in specialist reports in the project record. This chapter is a summary of the effects to resources.

Project Area Overview

The Elkhorn project area is located entirely within Larimer County, CO (see Vicinity Map on page 11). It is defined by the Cache la Poudre River and Highway 14 to the south, the Manhattan Road (CR 69) to the east, the Deadman Road to the north and a portion of FSR 517 to the west. It is adjacent to the communities of Crystal Lakes, Red Feather Lakes, Manhattan and the Upper Poudre Canyon. The proposed project area boundary encompasses approximately 22,293 acres of which approximately 20,800 are NFS ownership and the remainder is private and State land. The project is within the Deadman and Elkhorn Geographic Areas (GA) of the ARNFPNG 1997 Revised Forest Plan.

The Elkhorn Project Area is characterized by elevations that range from 7,200 feet to 11,003 feet. At the lower elevations where conditions are the warmest and driest, the vegetation is dominated by shrubs and gradually transitions into open ponderosa pine forest. The ponderosa pine forest typically becomes mixed with Douglas fir and aspen at higher elevations. At about 8,000 feet, ponderosa pine, Douglas fir and aspen are joined by lodgepole pine and limber pine. This species mix forms a transitional mixed conifer forest in the higher elevations of the project area. Where there is usually a persistent winter snowpack, ponderosa pine and Douglas fir are replaced by lodgepole pine, patches of aspen and limber pine, subalpine fir and Engelmann spruce.

Mortality of lodgepole and ponderosa pine trees from mountain pine beetle is an important factor influencing forest habitat, snag and down wood material, and fuel loadings within the project area now and over the next few years. Old growth stands within the project area have also been affected by MPB mortality, however the extent of this impact is not currently known. Additionally, much of the mature Englemann spruce trees at higher elevations have been killed by spruce beetle and mountain pine beetle. Forest Health aerial detection surveys are conducted annually. Survey information collected from 1996 to 2012 has indicated that 20,737 acres within the project area have light to heavy MPB infestations. This represents 93% of the project area. Large populations of MPB in the western, higher elevation and lodgepole pine dominated portion of the county thought to have dispersed following wind patterns into the lower elevation ponderosa pine area. MPB-caused tree mortality data was measured at 24% of basal area for all forest types combined in 2011 using common stand exam measurement protocols. Two additional MPB flights have occurred since these data were collected, so this percentage is likely higher. Field observations in the project area estimate variable levels depending upon species and location. Overstory tree mortality in lodgepole pine stands is estimated as little as 10% up to about 40-60% mortality. In spruce-fir and mixed lodgepole/spruce-fir stands, mortality generally was lower (from less than 20% up to 35%). In the ponderosa pine type, there generally was low to moderate levels of beetle mortality (generally 10 to 30%).

Past, present and future activities relevant to the Elkhorn project proposal include:

- The High Park Fire, adjacent to the Elkhorn project area, burned 87,200 acres in June and July of 2012. Approximately 50% of the acres burned are NFS lands on the CLRD.
- Past, present and future fuels reduction projects adjacent to the project area on Forest System lands have been implemented or are planned, including the Red Feather, Crystal Lakes, Sheep Creek, Pingree Hill and Magic Sky projects.
- There is a current proposal by Larimer County for construction of a communication sites near Middle Bald Mountain which is within the Elkhorn project area.
- Past and future timber harvest activities have occurred within project area including the Seven Mile project. Past, current and future timber harvest activities adjacent to the Elkhorn project area include the Deadman 1 project.
- Past, present, and future recreation activities within and adjacent to the project area including OHV use, public Christmas tree harvest, backcountry recreation, and designated dispersed camping.
- Recent designation of the Roadless Area per the Colorado Roadless Rule which includes approximately 6,777 acres within the Green Ridge Roadless Area.
- Past and future wildlife enhancement projects in the form of broadcast prescribed burning adjacent to the Elkhorn project area in the following areas: Dadd Bennett, Pingree Hill, Jack's Gulch, Red Feather and Magic Sky.
- Rural residential developments and associated infrastructure including roads and power lines have occurred on private lands adjacent to the project area. Residential development continues to expand as vacant lots are built on and general visitation to the area increases.
- Continued expansion of noxious weeds within the project area and adjacent areas, exacerbated by recent wildfires.
- The recent mountain pine beetle epidemic affecting millions of acres in the Rocky Mountain region.
- Livestock grazing on NFS lands in the project area within the Elkhorn Grazing Allotment, as well as surrounding public and private lands.
- Currently, two minerals-related operations exist within the project area: one unpatented mining claim and one 'pick and shovel' operation.

PHYSICAL RESOURCES

Soils, Hydrology and Fisheries

Affected Environment

Watersheds: The Elkhorn project area falls in six watersheds; and between 62 and 100% of these watersheds are on Forest Service lands (Figure 1). Forest Service portions of these watersheds have been rated with the National Watershed Condition Class (WCC) rating system (Table 3). Road density on FS lands in the project area watersheds ranges from 0.25-4.82 mile per square mile (mi/mi$^{2)}$.

The streams in the project area should be capable of sustaining a wide variety of cold-water biota, including sensitive biota; are suitable for direct contact recreational activities; are suitable for direct agricultural irrigation; and are suitable for potable water supplies following standard treatment. The

North Fork Cache la Poudre River and tributaries below Halligan Reservoir are listed on the State Monitoring and Evaluation list for impairment from *E.coli*. All other segments are currently meeting State standards.

Figure 1. Map of the watersheds draining the Elkhorn project area.

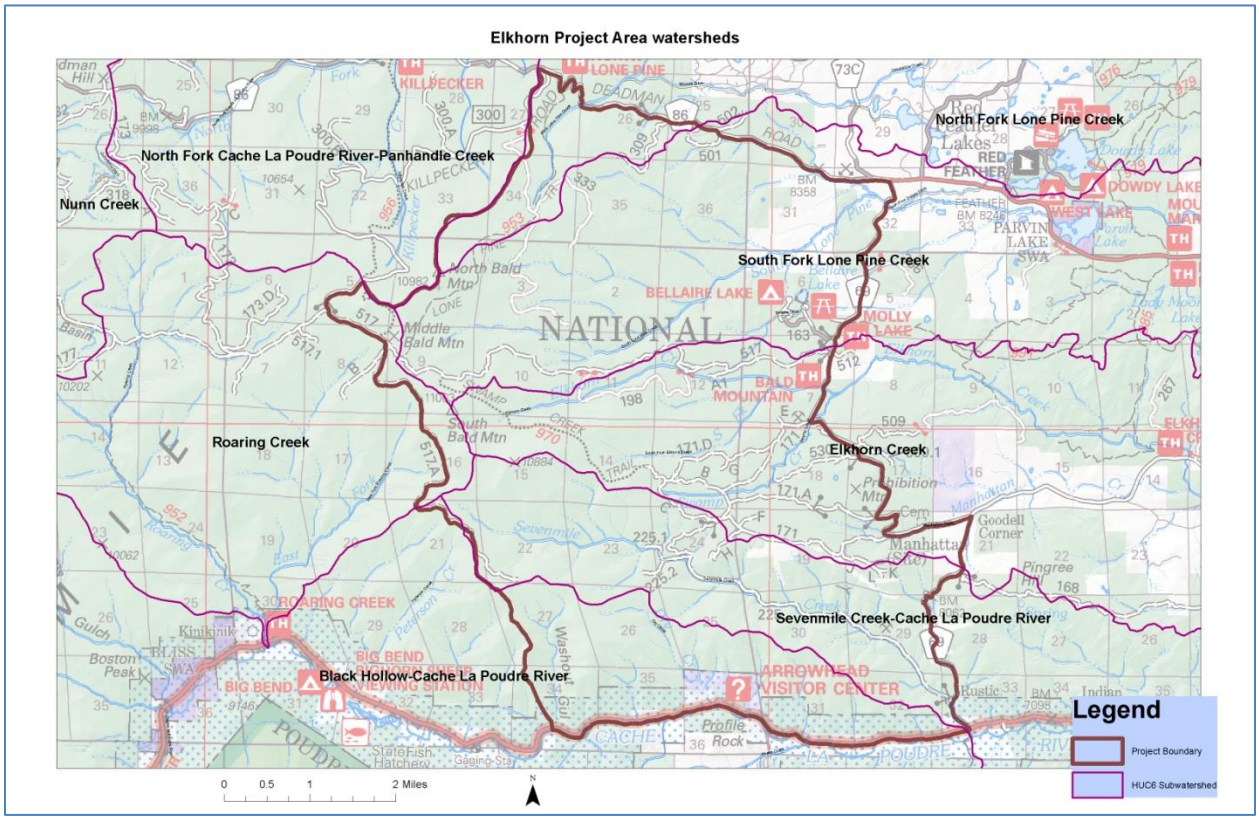


Table 3. Watershed and watershed condition class within the Elkhorn project area.

Watershed (WS) Name	WS HUC6 #*	WS Acres	Percent Forest Service	Watershed Condition Class**	Road Density, FS lands in project area only (mi/mi^2)
Roaring Creek	101900070207	9,938	100	1	1.23
Black Hollow-Cache La Poudre River	101900070208	37,738	93	2	0.25
Sevenmile Creek-Cache La Poudre River	101900070210	18,654	95	2	1.94
Elkhorn Creek	101900070301	22,276	64	2	4.82
South Fork Lone Pine Creek	101900070601	16,378	68	2	1.43
North Fork Lone Pine Creek	101900070602	25,288	62	2	2.34

*HUC6 number is the watersheds Hydrologic Unit Code, 6th level. The HUC system is used nationally to code watersheds from largest to smallest. **Based on WCC ratings of FS lands only, (USDA-FS, 2011). WCC1 = Functioning properly; WCC2 = Functioning at Risk.

Stream flow patterns in the project area are typical of those found in snow-dominated watersheds along the Front Range of Colorado. The annual average precipitation in the Elkhorn area is approximately 15 inches. Rainfall is fairly evenly distributed throughout the year. The wettest month of the year in the area is July. Stream flow rises in April or May as snow begins to melt and peak flows typically occur in May or June at the higher elevation ranges in the project area. Flow declines through the summer and fall. Low, stable base flow occurs through late fall and winter, until snow begins to melt again the following spring. Throughout the project area stream channels are predominantly pool-riffle with some low gradient, meandering, depositional channels in wetlands and meadows. Riparian wetlands and isolated forested wetlands were also identified throughout the project area.

The most persistent impact to Forest Service lands from management is from road drainage and sediment accumulation at stream crossings. Moderate amounts of past vegetation management have occurred in different portions of the project area watersheds.

Soils: Soils within the Elkhorn proposed treatment areas are dominated by sandy loam soil texture, slow decomposition rates, slopes generally below 40%, and moderate soil rutting hazard potential. Wet soils occur as a minor component in floodplains, terraces, swales, fans and floodplains steps for a total of approximately 20 acres within the project area. Runoff and erosion in severely erosive soils will occur if adequate ground cover is not maintained and/or certain activities take place on steep slopes (≥40%). Heavy precipitation in areas with a high to very high surface runoff potential, bare soils on steep slopes, and low surface water retention could result in high amounts of erosion and sediment transport. Equipment traffic, especially on wet soils, can increase compaction and sediment movement to riparian zones.

The average percentage of organic ground cover within the proposed vegetation treatment areas (live plant, fine woody, coarse woody, fine material (duff, litter, needles) is high (greater than 80%). This is a common feature of areas with high tree density and little disturbance. However, the ground cover is mostly shallow (less than 2 inches) within the proposed treatment areas. The forest organic matter layers in the project area contain 40 to 90% fine material (duff, litter, needles). Duff, litter and needles decompose slowly and are beneficial for soil infiltration, nutrient cycling and reducing surface soil movement.

Currently, highly disturbed sites within the Elkhorn project area are largely limited to roads (system and unauthorized), clear areas at road intersections, bare ground parking sections and recreational dispersed campsites. These areas can generate sediment movement to adjacent riparian zones due to deep gullies, surface erosion down to bedrock, steep slopes, high surface cementation, high bare ground cover, compaction (in areas close to riparian zones) and highly rutted zones.

Aquatic Ecosystems: The three primary aquatic ecosystems within the upper montane setting of the Elkhorn project area are small forested wetlands, headwater streams, and beaver-impounded wetlands along streams. Aquatic habitats in this montane landscape rely on snowmelt generated from mid-elevation watersheds (mean elevation < 9,000 ft.), which fills streams and wetlands through runoff and localized groundwater input. Due to low stream origin elevations (<10,000 ft.), these streams do not

generate dramatic peak flows annually and recede to very low baseflow conditions (< 2 cfs). Underlying geology of the Elkhorn Project Area is a combination of granitic and metamorphic rock that weathers down to produce streams with moderately sandy beds in low slope channels to coarser streambed particles (i.e., more cobbles and boulders) as stream slopes increase; however, sand remains at moderate levels, even in undisturbed reaches of stream. Vegetation surrounding aquatic habitats ranges from mixed conifer forest to sedge mats and maintains key structural components of each of the aquatic habitat types found in the project area.

Small forested wetlands are scattered throughout the project area and may occur in some proposed vegetation treatment units (e.g., Units 11 and 13), particularly in areas with gentle slopes. Groundwater seeps provide small areas of surface water and saturated soils. These small wetland habitats support common wetland plants and handful of aquatic macroinvertebrates, such as dragonfly larvae.

Figure 2. Tiger salamander collected from beaver ponds on Swamp Creek.

Beaver impounded wetlands have been created within the upper reaches of Elkhorn Creek and Swamp Creek. Due to the low stream power in the headwaters of these particular streams, beaver dams and habitat modifications can persist for many years beyond when beaver colonies have actively occurred in the area. These habitats provided habitat for tiger salamanders (Figure 2), as well as foraging and over-wintering habitat for resident brook trout and a host of aquatic macroinvertebrates. The margins of these areas contain riparian vegetation (e.g., willows and aspen) and saturated soils, which provide the food needed to support periodic colonization by beavers and, in turn, the maintenance of these unique wetlands.

In forested streams of the Colorado Front Range, wood plays an important role in helping to form and maintain the pool habitats vital to resident fish species. Wood loads are generally highest in small streams which lack the flood flows to transport and redistribute wood downstream on a regular basis; however, wood loads are strongly influenced by the time since the last disturbance. Fires and forest disease outbreaks typically generate additional wood loads to streams, whereas timber harvest and road construction reduce wood loads through time. The streams draining the Elkhorn Project area should have relatively high wood loads given their poor ability to move wood downstream; however, past management in the area has produced low wood loads commensurate with other disturbed streams in the Colorado Front Range (e.g., 0.6-6.6 m^3/100 m). Only the upper Elkhorn Creek site has a high wood load and this site is surrounded by mature mixed conifer forest.

While several water diversions occur on the Sevenmile, Elkhorn, and South Lone Pine streams, most diversions occur downstream of the project area. The Bellaire Ditch is the single water diversion in the project area and it occurs on Elkhorn Creek. This diversion reduces streamflow by roughly 65% during peakflow and reduces the amount of available aquatic habitat during the peak runoff season. Reduced

peak runoff also leads to a reduced capacity of Elkhorn Creek to move stream sediments, resulting in longer retention times for fine sediment delivered to this particular stream.

The stream habitats within the project area support low to moderate productivity resident trout populations as well as aquatic macroinvertebrates. Fish sampling showed that many streams support resident brook trout and South Lone Pine Creek also supported brown trout. Based on previous surveys, North Lone Pine Creek is occupied by resident brook and brown trout and Roaring Creek is occupied by greenback cutthroat trout. The upper reaches of some streams, South Fork Elkhorn and Swamp Creek, did not support fish indicating that these reaches may be intermittent during normal and dry years.

FSR 225 and the associated spur road network travel alongside and within Sevenmile Creek. This backcountry jeep road has not been well maintained, has several actively eroding road surfaces, and at least thirteen forded stream crossings, all of which contribute to streambed sedimentation particularly during thunderstorm events. Habitat quality and fish densities are reduced in reaches of Sevenmile Creek affected by sediment delivery and vehicle traffic when compared to upstream reaches not affected by the road. Total weight and numbers of trout were lower in reaches affected by the road as well. Stream sections affected by the road were wider, shallower, contained fewer pools, lower wood loads, exhibited less bank stability, and had smaller streambed stones when compared to upstream reaches unaffected by the road.

Stream habitats in the project area are also fragmented to by the road network. There are seven known culverted stream crossings in the project area. Each crossing fragments the headwater aquatic habitats of these drainages, making it difficult for fish to move upstream. Some of these crossings are worse than others and impede fish passage nearly year-round, while others may have suitable flow conditions for fish to move upstream during spring runoff.

Road Network: Approximately 12 miles of roads were surveyed as part of the Elkhorn watershed road inventory program, most of which were unauthorized roads. More than 40 percent of the roads surveyed exhibit a direct impact to watershed resources. These roads are located at less than 100 feet to a riparian zone and/or wetlands and include some amount of stream crossings. The erosion and disturbance level of the 12 miles surveyed was mostly classified as moderate to high. Gullies, rutting and compaction were the dominant erosion and disturbance features. The observed negative effects from the surveyed roads to watershed resources was mainly due to the prevailing moderate to heavy motorized use and recreational use activities. The recurrent disturbance from these activities on the current highly disturbed and erosive roads results in higher sediment movement and detrimental effects to watershed resources.

The desired watershed condition for the project area following management activities includes having stable soils capable of supporting vegetative growth, streams with stable channels, a healthy riparian community, appropriate assemblages of aquatic fauna in each aquatic habitat, and the ability for the watersheds to transmit the expected range of water and sediment. Streams should provide the physical habitat necessary to support populations of native and desirable non-native fish and macro-invertebrates. Where floodplains are present, they should be connected to the stream channels. Pathways that connect upslope disturbed areas to the stream channels should be minimized. The desired vegetative pattern following treatment is to be patchy, mosaic, and discontinuous.

Alternative 1 (No Action)

Direct Effects to Soil and Water Resources

Under the no action alternative, no proposed management activities in the Elkhorn project area would occur, which would result in no additional impacts to soil, water, or fisheries resources. Because no new ground disturbing activities would be implemented (including creation of new roads, skid trails and landings), no additional direct effects such as compaction (rutting), removal of ground cover (decrease in surface organic matter content), decrease in nutrient levels, increase in erosion and runoff potential would occur. Recovery in previously and currently impacted areas would continue at a natural rate. Organic material would continue to accumulate and decompose at natural rates. However, excessive sedimentation from existing roads (system and non-system) would continue to impact streams and aquatic habitats. Without removal of vehicle traffic or reductions in road densities, reduction in road erosion and stream sedimentation through natural recovery is unlikely to occur. Watershed improvement projects, including decommissioning of FSR 225.1 relocating the Swamp Creek ATV parking area, improving fish passage, and improving fish habitat with log structures, would not occur and would have to be pursued through other project planning efforts. Future reclamation projects could be planned for the area to eliminate erosion from existing impacted areas. Of the project area roads surveyed, 59% have a moderate to high potential to impact watershed resources. The direct impacts of roads to watershed resources include soil degradation, high levels of erosion, and direct sediment transport to streams.

Indirect Effects to Soil and Water Resources

Selection of the No Action alternative would result in no indirect effects to watershed and fisheries resources from slash disposal activities such as piling and burning, chipping, mastication and lop and scattering. Over time, this would lead to an increase in fuel accumulations within the project area. Increased fuel accumulation may at some point lead to higher severity fire should a wildfire occur and would potentially reduce the opportunity for fire crews to engage the fire for suppression. This could also potentially increase fire behavior and fire intensity during a wildfire, which would increase the soil burn severity effects, including water repellency and soil loss potential. However, not all post-wildfire effects are negative. Wildfire burning through riparian areas of project area streams, while destructive in the short-term, would likely increase potential wood loads and potentially improve stream productivity in the decades following a fire.

Because sources of stream sedimentation would remain unchanged under the No Action alternative, the long-term indirect benefits to habitat structure (i.e., less fine sediment deposition in pools and spawning areas) and improvements to fish passage through culverted road crossings would not occur. Stream habitat improvements in Elkhorn Creek, Sevenmile Creek, and South Lone Pine Creek also would not occur. The potential indirect benefits (i.e., improved productivity, improved condition) to the resident trout (brook and brown trout) populations in these streams would not occur and current population conditions are expected to continue.

Cumulative Effects to Soil and Water Resources

Cumulative effects to hydrology and soil resources initiated by management activities in the project area, including grazing, recreational use, and travel on existing roads and trails would continue. Streams within the project area would continue to receive sediment loading of fine material from erosion generated by these activities. For the following reasons, cumulative impacts to hydrology and soil resources are expected to be less than Alternative 2 for project activities associated with the proposed

action except for road decommissioning. Prescribed burning and vegetation management, as part of the proposed action, are expected to cumulatively increase soil and water impacts. Road decommissioning, on the other hand, is expected to reduce erosion and decrease negative watershed impacts.

Except for existing roads, the project area watersheds have largely recovered from past management activities. Tree mortality resulting from the ongoing bark beetle infestation is expected to increase in the project area within the immediate and foreseeable future (1-15 years), and may temporarily increase the probability for more intense fire behavior. In the event of a severe wildfire, resident trout may be extirpated from project area streams and current habitat fragmentation will likely slow the rate of fish population recovery following such an event.

Alternative 2 (Proposed Action)
The potential effects to hydrology, soil, and aquatic resources from proposed management activities are discussed below by management type. These effects include the potential for sediment eroding into streams and lakes (thus disrupting aquatic ecosystems), and compaction of wet soils with subsequent impacts possible to the hydrologic flow regime. Resulting changes to aquatic habitat, fish populations, hydrology and soils resulting from mechanical and other vegetation treatments would be mitigated through the use of design criteria for watershed protection (see pages 31-33). These measures have been shown to reduce sedimentation and other impacts from affecting soil, water, and fish resources. In addition, watershed improvement projects, road decommissioning, and fish habitat improvement projects that are part of the proposed action will offset some of these possible changes.

Direct and Indirect Effects to Soil and Water Resources
Vegetation Management: The proposed treatments include hand thinning, pile burning, mechanical treatment and prescribed fire. The main access to the proposed units would be from existing roads and trails, with approximately 13.5 miles of temporary road needed. Vegetation management has the potential to impact streams and aquatic habitats and potential adverse impacts include increases in erosion and sedimentation, compaction, and vegetation loss in wetlands and riparian areas. Typically it is not tree cutting that directly produces adverse impacts, but rather burn piles necessary to treat the slash as well as roads and mechanized equipment used for treatment. The effects of the different proposed treatments are discussed below.

With the exception of burn pile effects, there are generally few effects (minimal ground disturbance) to soil and water resources associated with hand fuel reduction treatments, provided an adequate amount of fine slash, litter and duff (organic matter and ground cover) is retained and maintained in the activity area. Hand treatment units are proposed primarily in areas with slope gradients less than 40% but some areas with gradients from 40-60% could also be treated.

Mechanical vegetation management can increase soil compaction and ground disturbance, and increase the risk of erosion and sedimentation. Impacts to soils are more likely to occur in upland areas rather than riparian area because most units are located on upland sites away from stream channels. Forests generally have very low erosion rates unless they are disturbed. Contributions by mechanical harvesting operations on erosion could last up to two years post-treatment. If precipitation during this time is above average, significant erosion could result.

Direct and indirect effects to soil resources related to proposed mechanical activities are described below:

- Clearcutting: Erosion potential (and runoff values) could increase especially in areas susceptible to landslides (steep slopes with sandy coarse material) if the resultant area is mostly bare soil. Clearcutting can also result in sudden loss of soil nutrients due to lack of organic material. Clearcutting activities could diminish or eliminate the soil ground cover layer. Erosion and runoff potential would increase promptly during and after clearcutting activities. These negative effects would be mitigated by maintaining existing ground cover in less disturbed areas and adding more ground cover material to highly disturbed areas as recommended in the design criteria.

- Heavy equipment operation: The use of mechanical equipment could generate an increase in compaction levels and increased erosion. Erosion and runoff may occur during snowmelt or high storm events. Slopes greater than 40% are not appropriate for mechanical equipment

  Long term nutrient cycling in the project area depends on a recurrent supply of slash and downed wood material for decomposition. Decomposition rates are slow during the winter season, but increase during the rainy season when there is higher soil moisture content.

- Slash disposal (pile and burning, chipping and mastication): Pile burning is proposed to treat heavy accumulations of slash. Established piles are generally burned in the winter after slash has lost most of its moisture content. Burning can remove ground cover and create bare soil patches if all organics are reduced to ash. However, burn piles typically result in a mosaic, which acts as a buffer, with burned patches separated from unburned patches making it unlikely that erosion from burn piles would reach stream channels. Pile burning could result in loss of litter and soil organic matter in the immediate burn pile area, possible hydrophobicity (water repellency), short term nutrient deficiency, and reduced pH levels (higher acidity). The use of machinery to construct burn piles would likely cause ground disturbance, compaction, and removal or mixing of surface layers depending on the amount of passes and turns near the piles.

  Chipping and mastication provide a protective ground cover. In the early stages of decomposition soil nutrient availability is reduced, but increases when the material is mostly decomposed. There could also be an increase in soil compaction due to the use of heavy equipment for chipping and mastication.

  With implementation of the recommended design criteria, operation of mechanized equipment would not be expected to have a measurable effect on streams, wetlands, or riparian areas in the treatment units. There are no perennial streams within the mechanized treatments units. Monitoring would be used to ensure the appropriate implementation and effectiveness of conservation measures.

- Temporary roads and skid trails: Approximately, 13.5 miles of temporary roads and additional skid trails will likely be needed in the mechanical treatment units. Temporary roads and skid trails will be identified during layout in a manner that will help minimize hillslope erosion and the number of stream crossings. Temporary roads would be placed away from streams when practicable; however, there is one perennial and three intermittent stream crossings on

temporary roads identified for treatment unit access. While temporary roads will be obliterated at the end of the project, they could remain open for approximately 5-10 years during project duration. During this time, temporary roads are expected to contribute small amounts of sediment into stream channels because of limited crossings and selection of road locations in less steep areas away from streams.

Sediment delivery from skid trails are proportional to the percentage of ground cover left on site and are not limited by the skid trail length. Access to the remaining units in the project area would be from existing roads and trails. No increased soil and water impacts are expected from this use.

Prescribed Broadcast Burning: Where prescribed broadcast burning is proposed (Unit 1), vegetative recovery is expected to be rapid, with erosion rates typically dropping to pre-fire levels within one to two years. Hydrologic recovery after prescribed burning also tends to be more rapid than after wildfire or where high severity fires occur because a smaller proportion of the forest canopy would be removed. Areas with high fuel loadings within the unit could experience higher soil burn severity, which could increase the potential for erosion and runoff movement following the burn. Due to coarse textured soils, rock outcrops, rubble content and steep slopes there is a moderate risk of sediment yield to the Cache la Poudre River since the proposed burn is located just upslope from the river. This potential erosion could yield a small to moderate amount of sediment. Erosion rates are expected to return to baseline levels within one growing season following the fire.

Road Decommissioning and Watershed Improvement Projects: Watershed and fisheries health in the project area have been degraded by the high density of roads, heavy recreational use including OHVs and dispersed camping, and legacy impacts from past mining and timber management. Road decommissioning as well as watershed improvement projects are proposed for the purpose of addressing degraded watershed conditions within the project area, and the effects of these proposals are summarized below.

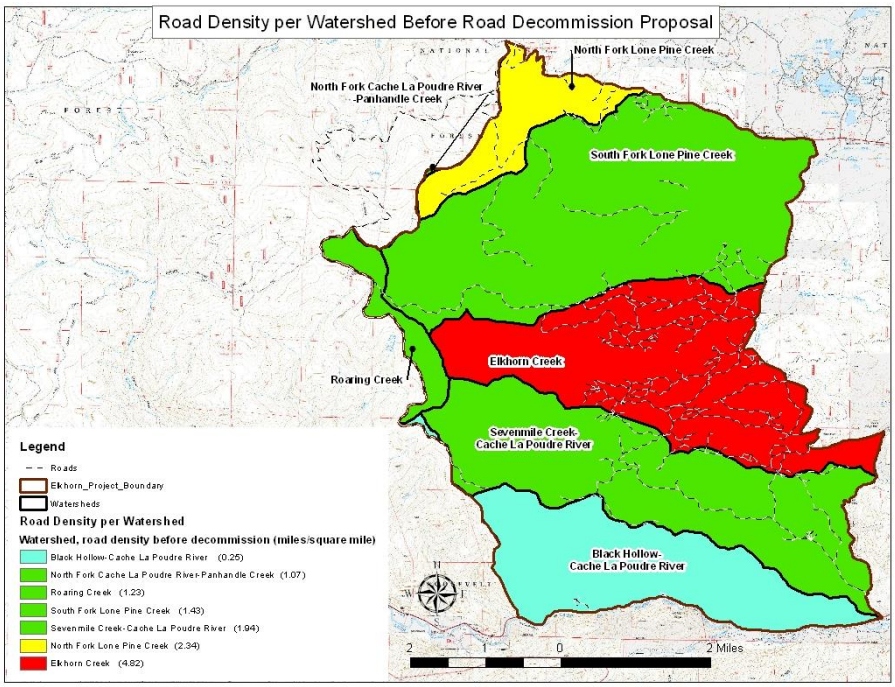
- Reducing the number of stream crossings on authorized/system roads and stabilizing stream banks in association with removal of stream crossings, improving drainage at system road stream crossings (install additional cross drains, and install culverts and armor fords) would improve stream water quality and habitat potential.

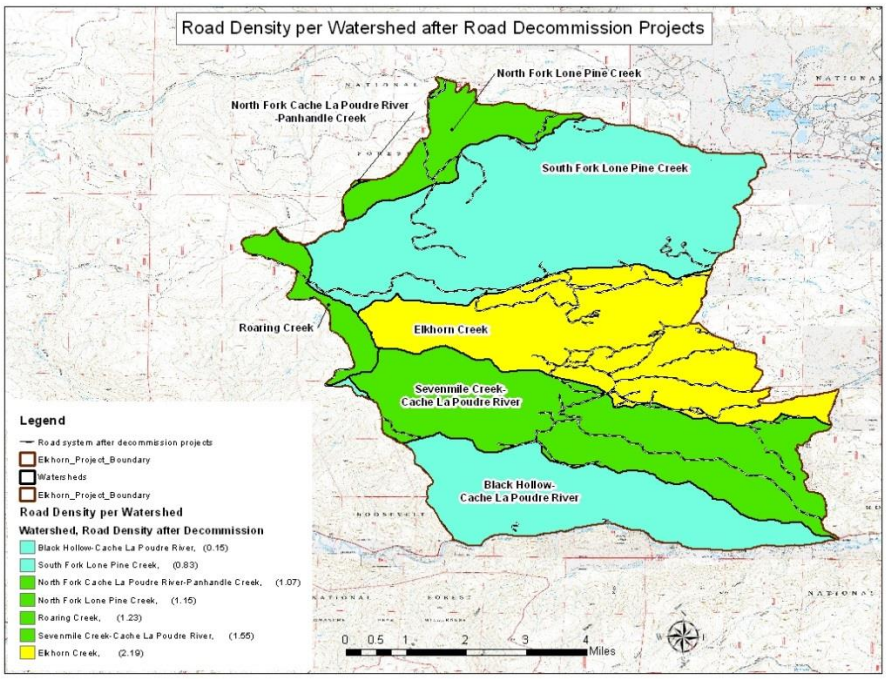
- Decommissioning of system and unauthorized roads may cause short term increases in erosion and sedimentation, as has been observed on other projects but long-term benefits of reduced erodible road surfaces and fewer road interception points along a stream would be much greater than the short-term increase from road decommissioning because the closed road surfaces will no longer erode and deliver sediment into the stream in the future. This would result in improved soil conservation, water quality, and aquatic habitat. Road decommissioning would appreciably reduce the road density within the high road density areas of Elkhorn, Swamp, and Sevenmile Creek watersheds (see Figures 3 and 4 below).

- The relocation of the parking area just off of Manhattan road on north end of FSR171 to the other side of the road away from Swamp Creek would greatly reduce sedimentation to Swamp Creek.

- The removal or restoration of dispersed campsites that are causing damage to riparian areas is not expected to directly affect streams; however, restoring riparian areas will indirectly improve stream habitat through improved bank stability and improved forest cover.

Figure 3: Existing (top map) and expected following proposed action (bottom map) road density in Elkhorn project area





- Restoration work in Seven Mile, Elkhorn and South Lone Pine Creeks is expected to reduce sedimentation and improve fisheries habitat. Physical disturbance in stream channels would likely cause short-term increases in suspended sediment, which will displace resident fish within one mile of each disturbance during the restoration activities. These short-term effects will not persist for a long timeframe and beneficial effects to stream habitats (e.g., removal of road crossings, more pools, deeper pools, reduced sediment) and resident fish (e.g., improved numbers and biomass) should occur within two years following restoration.
- Improvement of fish passage through culverts is proposed along Manhattan Road (CR162) at Elkhorn, South Lone Pine Creek, Swamp Creek and Seven Mile Creek crossings would improve the resilience of resident fish populations following disturbances as well as the numbers and ages of fish occurring in the upper most reaches, particularly in Elkhorn, South Fork Elkhorn, and Swamp Creek. Physical disturbance in stream channels will likely cause short-term increases in suspended sediment, which is expected to displace resident fish within one mile of each disturbance during the restoration activities. These short-term effects will not persist in the long-term and improved access to stream habitats for resident fish should occur immediately following restoration.
- Recontouring of stream profile as part of road decommissioning activities would help to return the stream to undisturbed condition. Degraded stream crossings would be identified and restored.

Cumulative Effects to Soil and Water Resources
Cumulative watershed effects include past and present vegetation management (timber harvest, fuels treatment, and prescribed fire), and concern for erosion from roads resulting from increased travel as a result of proposed treatments.

The effects from the past timber sales dating back to the 1960s up through 2000 are largely undetectable from a watershed perspective. Ground cover percentages are similar to native levels, and the largest remaining impact is from roads. Unauthorized roads exist from these past activities. Approximately 950 acres of recent timber activities since 2000 have also occurred. Adding these acreages to the proposed treatment acres cumulatively affects 1-9% of the area watersheds. These low percentages are not expected to cause a significant change to overall watershed health. Implementation or planned road decommissioning and watershed improvements within these watersheds along with the timber management are expected to improve the overall watershed conditions in the long term.

Direct, Indirect, and Cumulative Effects to Aquatic Habitat and Species for Both Alternatives
Aquatic habitats and aquatic life could be affected by the additional sediment yield generated as a result of the proposed action. Sediment yields would be most affected by road reconstruction, skidding, and road decommissioning activities. These impacts would occur in Elkhorn, South Fork Elkhorn, Swamp, Manhattan, and Sevenmile Creeks and ultimately alter sediment loads to Elkhorn Creek and the Poudre River. However, these overall quantities of sediment as a result of the project are low in comparison to natural and ongoing sedimentation rates. Risk of sediment-related impacts is negligible for Roaring and North Lone Pine Creek due to the absence of project-used roads crossing the stream, proximity of units to this stream (>500 feet), and absence of restoration activities. Additional sediment deposited into those streams, would likely not be transported very far downstream (< 1 mile) and local stream habitats might experience shallower depths and wider channels as fine sediments accumulate. While temporary

road construction, timber harvest, and some restoration actions will generate sediment and may cause stream sedimentation, the long-term (>10 years) benefits of riparian road removals, reconstruction of the Swamp Creek Parking Area, and other watershed restoration work should result in either a neutral or slightly reduced sediment load into the affected streams. Effects of the broadcast burn to sediment delivery in the Cache la Poudre River would be very minimal if any and within the range of natural variability.

Stream sedimentation, as described above, is not expected elsewhere in the project area. Additional sedimentation would potentially reduce habitat diversity and productivity for potential fish and macroinvertebrates by filling pools, filling of interstitial spaces, and reducing streambed diversity. However, increased sediment loads in streams are expected to be short-term (<5 years) and within the local vicinity of the project. While habitat changes in these streams could lead to a short-term loss of stream insect diversity, loss of benthic macroinvertebrate abundance, and loss of stream productivity, long-term sediment loads in streams should fall below current levels as restoration activities remove sources of sediment and temporary roads for timber harvest are closed.

A back-hoe or small excavators (i.e., heavy equipment) would be used within the stream channel, next to the stream, and within the immediate riparian area to complete much of the stream restoration and some road decommissioning work. Operating heavy equipment in the stream and on the streambanks will undoubtedly generate suspended sediment in the stream channel; however, the work will occur during the baseflow period when conditions are driest in order to minimize these effects. Short-term pulses of suspended sediment into potentially affected streams will most likely occur when heavy equipment use and blasting occurs in the stream. Design criteria and best management practices will be employed to reduce inputs of sediment (see pages 31-33).

Greenback Cutthroat Trout
Greenback cutthroat trout are Threatened species. Conservation populations are present in Roaring Creek.

Alternative 1 (No Action): Effects to greenback cutthroat trout are expected to be negligible as a result of the No Action Alternative
Alternative 2 (Proposed Action): Proposed project activities are not expect to affect any stream habitat in the Roaring Creek watershed. Therefore, no direct, indirect or cumulative effects to greenback cutthroat trout are expected as a result of this alternative.

Brook Trout/Brown Trout
Both brook trout and brown trout are Aquatic Management Indicator Species for montane aquatic habitats and members of the Montane Aquatic Management Indicator Community. Brown trout and brook trout are currently in a stable to increasing trend across the Forest and stable in Elkhorn, Sevenmile and Lone Pine Creek watersheds.

Alternative 1 (No Action): Effects to brown trout and brook trout are expected to be negligible and population trends are expected to remain unchanged under the No Action alternative.
Alternative 2 (Proposed Action): While brook trout populations in the western United States are relatively hardy and can tolerate some localized stream degradation, the low numbers and lower

productivity of these sites suggest that additional stream degradation (i.e., streambed sedimentation, removal of large wood, etc.) would potentially cause even further reductions in trout numbers, trout biomass, and possibly complete loss of fish from headwater reaches. On the other hand, resident trout number/biomass would likely respond positively to measurable improvements in stream habitat (i.e., less fine sediment, increase pool habitat) following watershed improvement projects.

As a result of past, present and reasonably foreseeable future actions, there could be short term cumulative effects to brook trout but long-term beneficial effects are expected overall. No loss of viability to this species would occur.

No loss of viability to brown trout is expected as a result of cumulative effects.

Arapahoe Snowfly
The lower most portions of Elkhorn Creek (i.e., near the confluence with the Poudre River) and Sevenmile Creek are occupied by the Arapahoe snowfly, a rare winter stonefly. In 2012, the U.S. Fish and Wildlife Service (USFWS) found this species to be warranted for protection under the Endangered Species Act, but precluded due to higher priority listings on the basis of (1) modification of habitat due to climate change, (2) the outbreak of mountain pine beetle, (3) the threatened increase likelihood of wildfire, and (4) the small population size. New localities have been identified for the species within the last year, one being Sevenmile Creek above the Manhattan Road. These new findings provide reason that the species may occur within the project area and in sections of streams that could be affected by changes in sediment loads as a result of proposed Forest Service actions.

Alternative 1 (No Action): The No Action alternative would have no impact on the Arapahoe Snowfly in Elkhorn Creek.
Alternative 2 (Proposed Action): Activities associated with the proposed action in Sevenmile Creek could affect the Arapahoe snowfly. Potentially the prescribed burn as well as any work occurring in the stream channel (road construction, rerouting portions of trail, enhancing stream habitat, etc.) could alter sediment yields and deliver sediment to the creek include. Due to the current lack of information about this species, it is difficult to actually assess how the species would be affected by those actions. Sedimentation from roads or other activities, while recognized as an impact to stream insects, is not currently considered a threat to the species by the USFWS. However, modification of stream habitats and alteration of current sediment loads from the habitats occupied and the potentially suitable habitats elsewhere in the project area poses unknown potential risks to individuals of the species. Individual snowfly in Sevenmile Creek are at greatest risk due to proximity of sedimentation effects, whereas individuals in lower Elkhorn Creek (a stronghold for the species) are at very little risk due to 14 miles of separation between project activities and occupied habitat. The level of impact is expected to remain at an individual level and should not rise to the level of reduced viability for the species on the unit.

Past, present and foreseeable future actions in the watershed where the snowfly occurs, may cumulatively impact individuals, but is not likely to result in a loss of viability in the planning area not cause a trend toward federal listing.

Air Resources

Affected Environment

The Elkhorn project area lies within the Medicine Bow Airshed. This airshed has existing negative air quality impacts and a high potential for more due to air pollutants such as sulfur dioxide, oxides of nitrogen, and particulates. Particulate matter, or PM, is the term used for particles found in the air, including dust, dirt, soot, smoke, and liquid droplets. Particles can be suspended in the air for long periods of time. Some particles are large or dark enough to be seen as soot or smoke while others are so small that individually they can only be detected with an electron microscope. Particulate matter is classified by size of the particles into two categories, PM10 and PM 2.5. PM10, particles less than 10 microns in diameter, pose a health concern because they can be inhaled into and accumulate in the respiratory system. PM2.5, particles less than 2.5 microns in diameter, is referred to as 'fine' particles and is believed to pose the greatest health risks. Because of their small size, approximately 1/30th the average width of a human hair, fine particles can lodge deeply into the lungs. Individuals that may be particularly sensitive to fine particle exposure include people with heart or lung disease, older adults, and children.

There are five air quality related values (AQRVs) identified within the Medicine Bow Airshed as having the potential to be impacted by human-caused air pollution. These five AQRVs are soil, water quality, flora, fauna, and visibility; water quality and visibility are most at risk. Impacts to air quality mostly come from sources outside of the Forest boundary, however some activities on the Forest also have the potential to impact air quality within this airshed including prescribed fires, wildfires, oil and gas development, domestic livestock grazing, mining, developed recreation (campfires, summer homes, etc.), and travelway use (paved and non-paved roads and trails).

Part of Larimer County is in nonattainment for eight hour ozone per the Colorado Ambient Air Quality Standards (AAQS). Nonattainment is any area that does not meet (or that contributes to ambient air quality in a nearby area that does not meet) the national primary or secondary ambient air quality standard for the pollutant. The Elkhorn Project is approximately 4.7 miles west of and the proposed broadcast burn unit (Unit 1) is approximately 5.7 miles west of this nonattainment boundary. The Colorado AAQS allowance for eight hour ozone is measured by the amount of nitrogen oxides (NOx) and volatile organic compounds (VOCs) in the air. The allowance for NOx is 122.9 tons/day and 109.2 tons/day for VOCs.

There are several subdivisions, towns, associations, and other private property surrounding the Elkhorn Project that may be smoke receptors or have citizens with smoke concerns. These include Glen Echo, Rustic, Red Feather Lakes, Beaver Meadows, Crystal Lakes, Glacier View Meadows, the Shambhala Center and Ben Delatour Boy Scouts Ranch.

Direct and Indirect Effects (No Action)

There would be no direct or indirect effects to air resources expected if the No Action alternative is selected. Dust created from the existing roads in the area, planned pile burns, and planned broadcast burns would continue to affect the amount of pollution in the air.

Cumulative Effects
There are several projects planned, such as pile burns and broadcast burns, surrounding the project area that will contribute to increasing particulate matter within the Medicine Bow Airshed. Planned Forest Service broadcast burning and anticipated pile burning projects in Larimer County, and within the airshed over the next five years, may contribute up to an estimated 549 tons of PM10. However, on average the Forest Service may add up to an estimated 110 tons of PM10 in any given year, or about 1.28% of the County's annual total. There will also continue to be vehicles traveling along the paved and unpaved roadways which will continue to contribute to the particulate matter.

Direct and Indirect Effects (Proposed Action)
The proposed watershed and transportation system modification projects would be expected produce a relatively small amount of particulate matter over the life of these projects. These effects would last only as long as heavy equipment was in use.

If the proposed action vegetation management projects are implemented, it is likely that particulates would increase over the duration of the project. There would be more dust created from an increase in traffic from logging trucks and other vehicles associated with these projects.

The broadcast burn would increase particulate matter during implementation as would burning any piles created during implementation. Before pile or broadcast burning, the Forest Service is required to obtain a smoke permit from the State of Colorado which requires that burning be conducted in a manner that will minimize emissions and smoke impacts on visibility and public health. The smoke permit outlines conditions under which any given prescribed burn may occur, including the number of piles or acres per day and wind and weather conditions, to meet the Regional Haze Rule. Generally for pile burning, more piles can be burned if they are smaller in size (e.g. hand-created piles). The allowable number of acres per day to be broadcast burned depends on distance from occupied homes and potential smoke risk. The proposed burn is expected to add approximately 194 tons of PM10 per year to the Medicine Bow Airshed in any given year over the life of the burn project.

Cumulative Effects
Cumulatively, the particulate matter produced during the proposed activities for this project coupled with other Forest Service broadcast burning projects within the Medicine Bow Airshed would contribute approximately 884 tons of PM10 over the life of all projects combined. Because broadcast burns are phased over multiple years, we anticipate it will take a minimum of eight years to complete all proposed broadcast burns within the Medicine Bow Airshed. The Forest Service may add an average of 110.5 tons of PM10 per year over eight years, or about 1.29% of the County's annual total. Additionally, each year an estimated 13 tons of PM10 would be produced from pile burning throughout these projects. Pile burning each year could add approximately 0.15% to Larimer County's annual PM10 total. Motor vehicle travel along paved and unpaved roads would continue, also contributing to the particulate matter totals.

Fire and Fuels

Affected Environment
Fuels in the project area are primarily characterized by fuel loading, vegetation type, weather patterns and the current MPB epidemic. Much of the lodgepole pine forests within the project boundary have been affected by the current mountain pine beetle epidemic. Most trees that have been hit are

currently in the red stage (needles of the trees have turned from green to red) which is expected to last another year or two before needles fall to the ground. Lower foliar moisture content and responsiveness to changing weather conditions are characteristics of the red stage which increases the opportunity for surface fires to become active crown fires with lower windspeeds and surface fire intensity. Typically, very windy conditions coupled with intense surface fire are required for a healthy pure lodgepole pine stand to display active crown fire behavior. Stand replacing crown fires are typical in green lodgepole pine stands, but occur infrequently (every 100+ years) and under very dry and windy conditions.

Historical fire return intervals in the project area are dependent on elevation and vegetation. Generally, as elevation increases the frequency of fires decrease because the climate is usually wetter and cooler. Colorado Front Range ponderosa pine and Douglas-fir fire return intervals have varied considerably over the past 700 years, and were typified by a mixed severity fire regime. Fires in these forests ranged from relatively frequently (16.8 year interval) to longer intervals (more than 50 years). Fire in lodgepole pine forest types historically occurred every 20 to 100 years or more.

Recorded fire history in the project area indicates that 406 fires have occurred since 1951 and most have occurred in June through September. However, only 25 of these wildfires were over 10 acres in size. Of these, 10 were caused by lightning and the other 15 were human caused. Several are still identifiable on the landscape, including North Bald, North Fork, and Killpecker. The Killpecker fire was the largest recently recorded wildfire within the project boundary at 1,200 acres in size. Active human fire suppression helps explain why most fires in the Elkhorn area have been limited to one acre or less in size. Human-caused fires account for about 57% of the total number of fires that have occurred. The high incidence of human fire starts is probably explained by high recreational use in the Elkhorn area.

Current fuel loading across the project area is, on average, approximately 15.5 tons per acre of down woody debris (range = 0-95 tons/acre). Fuel hazard is defined by the percent canopy cover, tree/shrub/forb/grass species, the presence of ladder fuels and can be classified as low, moderate, high, or very high. The majority of Forest Service lands within the Elkhorn project area are currently classified as high fuel hazard. The table below summarizes fuel hazard by class. It can further be broken down by vegetation and habitat structure stage. High and very high fuel hazard occurs principally in spruce/fir, lodgepole, and ponderosa stands within the project area.

Table 4. Fuel hazard by class for Elkhorn project area (FS lands only) in acres

Low	Moderate	High	Very High	Total
2,045	4,509	13,310	933	20,797 acres

Low fuel hazard: 0 – 10% canopy closure and absence of ladder fuels; moderate fuel hazard: 11 – 39% canopy closure with some ladder fuels; high fuel hazard: 40 - 69% canopy closure and more ladder fuels than in moderate fuel hazard; very high fuel hazard: 70+% canopy closure and ladder fuels throughout the entire stand

Values at risk within and adjacent to the planning area include the town of Red Feather Lakes, and the Beaver Meadows, Crystal Lakes, and Glacier View Meadows communities. There are also private inholdings, trailheads, Bellaire Campground, and Arrowhead Visitor Center within the boundary. The Shambhala Center and Ben Delatour Boy Scout Ranch are adjacent to the project area. Additionally forest resources including timber and threatened and endangered species habitat are threatened by potential large wildfires. Because prevailing winds are from the west, ignitions that occur in the beetle

killed stands within the project area during intense or extreme fire weather are most apt to threaten the private property surrounding the project area to the east.

The desired condition for the project area with respect to fuels management is to create a condition on the landscape where fire behavior is modified to reduce the threat of a crown fire in the direction of the values at risk. The fire behavior should be modified to achieve flame lengths less than four feet and fireline intensities less than 100 BTU/ft/sec to allow for direct attack control tactics. This desired condition could be achieved by reducing the surface fuel loading, increasing the spacing between tree crowns, and decreasing the canopy closure from 70% or greater to a more manageable 10 to 69%.

Implementing fuels reduction treatments on National Forest lands helps to reduce the fire hazard, restore ecosystems that are no longer in balance due to suppression actions, and to compliment fuel treatments on adjacent private property. Fuel treatments are meant to slow, not stop, the spread of a wildfire and to allow for suppression actions near values at risk under 90th percentile weather conditions. Fuels reduction unit locations on Forest Service lands are mainly chosen based on proximity to private property within the Wildland Urban Interface (WUI) zone. Other factors that contribute to fuels reduction unit locations include machine operable ground, access to treatment areas (by both machine and hand thinning crews), and presence of MPB-killed trees.
Cohen makes the case for treating only within the 'home ignition zone' for survivability of a structure during a wildfire. The home ignition zone occurs strictly on private property lands for which the Forest Service does not have authority to treat. Private property owners should assume responsibility for the construction of their structures to decrease the flammability, along with removing fuels from within the home ignition zone. If areas leading to private property are overgrown, firefighters may not be able to gain access in the case of a wildfire.

In 2011 the Wallow Fire, outside of Alpine, AZ threatened to destroy the entire community. Fire conditions during the Wallow Fire were well above the 90th percentile weather for which fuels reduction treatments are typically planned. Fuel treatments had been implemented prior to the Wallow Fire, over several years, outside of the home ignition zone and successfully decreased fire behavior enough for firefighters to perform suppression tactics to save all but one private residence. Even though they experienced ember showers and low-intensity surface fires, many of the other Alpine structures that survived the Wallow Fire did so because of these prior fuel treatments, as well as 'Firewise' construction and landscaping completed by the landowners.

A combination of treatment on National Forest lands, treatment within the home ignition zone on private property, as well as construction material used for structures provides the best chance of decreasing the loss of private property. The Forest Service is currently implementing or planning to implement fuels reduction activities near the Elkhorn project area in the Lady Moon, Red Feather and Pingree Hill areas, which are expected to decrease potential fire behavior in those areas once completed.

Alternative 1 (No Action)
Direct and Indirect Effects
To determine the potential fire behavior in the project area if the No Action alternative is chosen, existing conditions were modeled since no vegetation treatments would occur under this scenario.

Minimal effects on fuels are expected if no watershed improvement projects are undertaken nor modifications to the road system.

Representative fuel models are used in fire behavior prediction models and describe the predominant type of surface fuel that would carry fire across an area. Each fuel type has different fuel bed characteristics (i.e. fuel loading, surface-area-to-volume, heat content, depth, and dead fuel moisture of extinction) which describe the surface fuels that contribute to fire behavior. The following table summarizes the fuel types represented across the project area. Some of the project area is best described by using a combination of a timber litter with a grass-shrub fuel type.

Table 5. Fuel model by percent of Elkhorn project area

Fuel Model	Percent of Project Area
TL3	67%
TU5/TL7	7%
TL3/GS1	<1%
TU5	1%
TL7	1%
TL8	<1%
GS2	13%
GR2	<1%
TL3/GR1	<1%
TL8/TL3	11%
TU5/TL5	<1%

- GR1 (short, sparse dry climate grass – models more open lodgepole pine stands where grass tufts occur along with conifer litter)
- GR2 (low load, dry climate grass – models open forested areas where the predominant carrier of fire is grass mixed with forest litter)
- GS1 (low load, dry climate grass-shrub – models open brushy areas)
- GS2 (moderate load, dry climate grass-shrub – models open brushy areas)
- TL3 (moderate load conifer litter – models lodgepole pine and mixed conifer stands with a heavier litter load than the closed canopy stands)
- TL5 (high load conifer litter – models timbered areas similar to TL3 but with some large diameter woody material in the understory along with the litter component)
- TL7 (large downed logs – models areas with a concentration of large down woody material in the understory)
- TL8 (long-needle litter – models ponderosa pine and some mixed conifer stands)
- TU5 (very high load, dry climate timber-shrub – models timbered areas with a ladder fuel component such as younger suppressed trees).

When characterizing wildland fire behavior it is useful to describe fire behavior that occurs during three weather situations: 1) ‘typical’ - high fuel moistures and higher relative humidity 2) ‘intense’ - large fuels less than 13% fuel moisture, and 3) ‘extreme’ - low fuel moistures, low relative humidity, and high winds. Typically, regardless of the vegetation in which an ignition occurs, under average weather a fire can readily be suppressed. Under an extreme situation, all stands are susceptible to fire spread. Extreme weather conditions can create fire behavior that can breach most fuels reduction treatments.

Percentile weather is often used to help gauge what prescriptions or alterations to the landscape may be needed to help reduce fire behavior in critical areas. Percentile levels give an indication of the current situation compared to previous years in the weather database. Ninetieth percentile weather conditions are good parameters to use for modeling fire behavior and are defined as 10 percent of the days in the historical weather database having lower fuel moisture and higher wind speeds compared to the rest of the days and are measured in many different ways such as Energy Release Component, Burning Index, and 1000-hr fuel moistures. Rare but large and destructive fires can occur under 90th percentile weather conditions.

The types of fire that could be represented within the existing stands under 90th percentile weather conditions are surface, passive, and active crown fires. Surface fires are defined as fires that remain on the ground only. Passive crown fires, also called torching fires, occur when individual or small groups of trees torch out, but solid flame is not consistently maintained in the canopy. Active crown fires, also called a running or continuous crown fire, occur when the entire surface/canopy fuel complex becomes involved, but the crowning phase remains dependent on heat from the surface fuels for continued spread. They can be characterized by a solid wall of flame extending from the fuel bed surface through the top of the canopy.

Fire behavior prediction programs BehavePlus 5.0 and NEXUS 2.0 were used to calculate predicted surface and crown fire behavior for all fuel models represented within the project area (Table 6). However, there are limitations to these fire behavior prediction models (see fuels specialist report for more information about model methodology and assumptions). Percent slope and crown base heights are important factors used in predicting fire behavior and are inputs in the fire behavior prediction models. As slopes increase or crown base height decrease, the amount of space between the surface fuel bed and the canopy of the trees decreases. As the distance decreases between surface and canopy fuels, lower flame lengths are required for a surface fire to transition to a crown fire. Average slope across the project area is 25% and crown base height ranges from zero to two feet.

Current MPB-caused mortality in the project area is a key element in potential fire behavior. Current model limitations do allow for consideration of low foliar moistures typical of beetle-killed stands and therefore the predicted fire behavior for the existing stands could be more severe than is presented in this analysis. Over the following several decades, the grey MPB-killed trees will fall to the forest floor increasing the amount of large down woody debris. During this time the forest will begin to regenerate while the increase in down woody debris and regeneration will significantly increase the surface fire intensity. The regeneration in these stands will act as ladder fuels or an extension of the down woody fuels and be a very intense fire. Therefore, without treatment in these mountain pine beetle infested lodgepole pine stands, over time the existing stands will pose a serious fire risk.

Fire behavior models predict at what windspeed a surface fire will transition into a passive fire, , or a crown fire. At windspeeds less than the torching index a surface fire is expected. If the windspeed is greater than the torching index, but less than the crowning index, a passive crown fire (torching) is expected. When windspeeds are greater than the crowning index an active crown fire can be expected.

Table 6. Predicted fire behavior results for the existing conditions and No Action Alternative under 90th percentile weather.

Fuel Model	Fire Type*		Rate of Spread (ch/hr)		Fireline Intensity (BTU/ft/sec)		Flame Length (ft)		Torching Index (mi/hr)	Crowning Index (mi/hr)
	20-ft WS	*Gust WS*	*20-ft WS*	*Gust WS*	*20-ft WS*	*Gust WS*	*20-ft WS*	*Gust WS*	*20-ft WS*	*20-ft WS*
TL3	S	C	2.1	143.3	10	4403	1.3	53.7	18.3	17.2
TU5	C	C	51.5	143.3	6002	16698	66.1	130.7	0	8.4
TL7	C	C	51.5	143.3	3590	9987	46.9	92.8	0	8.4
TL8	P	C	49.9	143.3	2068	6071	31.8	66.6	0	12.4
GS2	S	S	43.8	129.5	482	1424	7.7	12.7	n/a	n/a
GR2	S	S	79.2	234.9	423	1255	7.3	12.0	n/a	n/a
TU5/TL7	P	C	9.1	35.1	348	2419	6.6	16.2	0	26.7
TL3/GS1	P	P	21.9	60.4	150	422	4.5	7.3	0	211.9
TL3/GR1	P	P	23.9	39.8	45	77	2.6	3.3	0	178.9
TU5/TL5	P	C	9.2	35.1	286	2322	6.1	15.9	0	26.7

*S = surface fire; P = passive fire (torching); C = crown fire

Under the No Action alternative and under 90th percentile conditions, a wildfire within most existing stands in the project area would exhibit unwanted, intense fire behavior and pose a problem for suppression crews. Eighty percent of the stands within the project area are currently in a state where fire behavior would be too much for ground suppression crews to use direct suppression tactics under 90th percentile 20-ft wind speeds. As wind speeds increase, virtually all the existing stands would be susceptible to crown fire and become a threat to the firefighters, infrastructure, and nearby communities. In the past, periodic landscape wildfires spread for many miles when weather remained dry and windy in summers with little rain, such as associated with drought conditions similar to what the area is currently experiencing. With strong winds, topography normally has little influence on fire spread. Even with current suppression capabilities, major crown fires on the Arapaho/Roosevelt can cover five or more miles in one operational period, such as the High Park fire in 2012 which is the largest recorded wildfire on the Forest. Under the existing conditions, a wildfire would need air support, a change in weather conditions, or change in fuel type to help contain it.

Cumulative Effects

If no action is taken to reduce fuels in the project area surface fuel loads and ladder fuels will continue to increase leading to a potentially large wildfire under the right weather conditions. It is predicted that the mountain pine beetle infestation will continue to infest areas east of the Continental Divide including within the project area over the next 3-5 years. Cumulatively, increasing numbers of dead pine stands, within the project area and surrounding sites, the opportunity for a large catastrophic wildfire under much lower percentile weather conditions is increased.

Alternative 2 (Proposed Action)
Direct and Indirect Effects
The proposed watershed and transportation management projects are not expected to affect forest fuels. Decommissioning unauthorized routes and system roads is not likely to decrease recreational activity in the project area substantially.

If the proposed action is chosen, overall the proposed vegetation treatments would modify the fire behavior in treated areas and reduce the threat of a catastrophic wildfire.

As stated earlier, the majority of project area is currently classified as high or moderate fuels hazard. The proposed vegetation treatments would reduce the high fuel hazard by approximately 13% across the project area and 64% within the treatment units. The very high fuel hazard risk would be reduced by approximately 29% across the project area and 61% within the treatment units. Those acres treated would change from high and very high fuel hazards and be redistributed to low and moderate fuel hazards (see table below).

Table 7. Change in fuel hazard acres before and after proposed vegetation treatments (tx), within project area and within proposed treatment units, in acres.

Fuel Hazard	Within Project Area		Within Proposed Treatment Units	
	Before tx (ac)	***After tx(ac)***	***Before tx (ac)***	***After tx (ac)***
Low	2,045	3,490	398	1,843
Moderate	4,509	5,106	1,345	1,942
High	13,310	11,540	2,776	1,006
Very High	933	661	444	172

The same combinations of fuel models used to predict potential fire behavior across the entire project area were also used to predict fire behavior within the treatment units.

BehavePlus 5.0 and NEXUS 2.0 modeling software were used to calculate predicted surface and crown fire behavior for all fuel models represented within the treatment units post treatment (see table below). The types of fire that could be represented after implementation within the treatment units under 90th percentile weather conditions are surface, passive, and active crown fires.

The predicted fire behavior across the treatment units is expected to drop to either a passive or surface fire. The only fuel models that would exhibit crowning would be TL7 and TL8, but only with wind gusts of 27 mph or higher. Clearcutting the infested lodgepole pine trees will help to decrease the threat of crown fires across the treatment unit for several years. However, depending on how the slash is dealt with, fire behavior could increase substantially for some years post-implementation depending on treatment.

Table 8. Predicted fire behavior results for all treatment units post-implementation under 90th percentile weather (derived from Behave 5.0 and Nexus 2.0 models)

Fuel Model	Fire Type*		Rate of Spread (ch/hr)		Fireline Intensity (BTU/ft/sec)		Flame Length (ft)		Torching Index (mi/hr)	Crowning Index (mi/hr)
	20-ft WS	***Gust WS***	***20-ft WS***	***Gust WS***	***20-ft WS***	***Gust WS***	***20-ft WS***	***Gust WS***	***20-ft WS***	***20-ft WS***
SB1[2]	S	S	9.3	25.8	123	343	4.1	6.6	n/a	n/a
SB3[3]	S	S	75.8	237.7	2700	8462	17	28.8	n/a	n/a
TL3[1]	S	P	2.6	48	12	418	1.4	8.5	20.9	35.9
TU5[2]	P	P	26.6	126.7	1724	9503	19.3	82.4	0	30.4
TL7[1]	P	C	41.5	139.8	1611	6098	25.4	66.8	0	14.1
TL8[2]	P	C	35.8	139.8	1062	5012	17.8	58.6	0	16.2
GS2[2]	S	S	41.1	126.8	452	1394	7.5	12.6	n/a	n/a
GR2[2]	S	S	74.3	230	397	1229	7.1	11.9	n/a	n/a
TL3/SB1[2]	P	P	9.2	25.5	123	341	4.1	6.6	0	716.9
TL3/SB2[4]	P	P	22.9	68.8	552	1663	8.2	13.6	0	716.9
TU5/TL5[3]	P	P	6.6	18.2	64	229	3.1	5.5	0	175.6
TU5/TL7[1]	P	P	6.6	23.8	168	1063	4.7	11.1	0	43.9
TL3/GS1[2]	P	P	29.5	89.7	201	617	5.2	8.6	0	309.5
TL3/GR1[2]	P	P	32.9	38.4	60	70	3	3.2	0	368.4

*S = surface fire; P = passive fire (torching); C = crown fire
[1]Fuel models occur in Units 2-67
[2]Fuel models occur only in Units 2-32 and 46-62
[3]Fuel models occur only in Units 33-45 and 63-67
[4]Fuel model for Units 33-45 and 63-67 three or more years post treatment

The vegetation management treatments included as part of the proposed action will necessitate slash disposal. There are several slash disposal methods that could be employed and include chipping, pile and burning, and lopping and scattering the material. Proposed treatment units 2-32 and 46-62, within the Wildland Urban Interface (WUI), would employ whole tree logging or piling to reduce slash build up. Proposed vegetation treatment units 33-45 and 63-67 are outside WUI and slash could be lopped and scattered.

Whole tree skidding consists of removing the entire tree from the stand and processing it at a landing, in turn leaving less slash in the unit. With whole tree skidding or piling of the slash within Units 2-32 and 46-62, fire behavior would decrease to a more manageable rate of spread. Even with whole tree skidding operations, some slash would be left in the units due to breakage while felling and skidding the material. Once these sites regenerate, torching could be expected in these treated stands under 90th percentile weather conditions because of remaining slash.

In Units 33-45 and 63-67, if lop and scatter slash treatment is employed, fire behavior under 90th percentile weather conditions in these units is expected to become so intense that ground resources would not be able to take direct suppression efforts for several years.

Prescribed burning is an essential tool in reducing fire behavior across the landscape as well as reintroducing fire back into the ecosystem. Historically, dry ponderosa pine and Douglas-fir-dominated forests were frequently (4 to 25 years) burned by low intensity surface fire, with ignitions caused by both lightning and humans. These fires helped to keep shrubs and ladder fuels from becoming a fire hazard to the overstory.

In the proposed broadcast burn (Unit 1), timbered areas would be pre-treated by thinning and piling and burning the slash prior to implementation of the broadcast burn to reduce fire behavior in those areas. The broadcast burn would be conducted under weather conditions conducive to achieve management objectives and control fire behavior. Lighting patterns will also be used to control fire behavior. If during the broadcast burn, fire behavior observed is not meeting objectives, the burn boss will change lighting patterns to best achieve objectives. A mosaic type pattern of consumed and unconsumed material is expected post-burn.

Following implementation of the broadcast prescribed burn, fire behavior is predicted to decrease due to consumption of needle cast, shrubs and grass (see table below). Canopy base height will also be increased which creates a separation between the surface fuels and the canopy of the overstory trees. The shrub component may take 10 – 15 years to regenerate post burning, but the grasses would be replenished the following growing season with adequate moisture. For this reason fire behavior would increase when grasses and shrubs re-occupy sites within the prescribed burn.

Therefore, this site should be re-evaluated for maintenance burning after 15 to 25 years. This would be to help maintain the fire-adapted ecosystem and to keep shrubs and ladder fuels at a minimum. "Although low-intensity prescribed burns reduce fine fuels in the short-term, they also contribute to subsequent dead fuels by killing understory trees, which can result in fuel levels that exceed pre-burn levels within a decade. Therefore, repeated or staged prescribed fire or mechanical thinning treatments are essential for maintaining lower forest densities; otherwise, a one-time thinning may facilitate a dense tree establishment" (Romme et al, 2006).

Table 9. Predicted fire behavior results for Unit 1 before and after treatment under 90th percentile weather.

Fuel Model	Fire Type*		Rate of Spread (ch/hr)		Fireline Intensity (BTU/ft/sec)		Flame Length (ft)		Torching Index (mi/hr)	Crowning Index (mi/hr)
	20-ft WS	Gust WS	20-ft WS	Gust WS	20-ft WS	Gust WS	20-ft WS	Gust WS	20-ft WS	20-ft WS
Before broadcast prescribed burn										
TL3	S	C	2.6	152.5	12	6676	1.4	70.9	15.6	19
TL8	C	C	60.8	152.5	2574	6463	37.6	69.4	0	10.6
GS2	S	S	51.1	136.8	562	1504	8.3	13	n/a	n/a
After broadcast prescribed burn										
TL3	S	S	4.1	7.2	19	33	1.7	2.3	74.5	28.6
TL1	S	S	2.1	2.2	5	5	1	1	175.4	28.6
GS1	S	S	37	99.4	249	670	5.7	9	n/a	n/a

*S = surface fire; C = crown fire

Cumulative Effects
The proposed action vegetation treatments along with other fuels reduction projects in the area (e.g., Red Feather and Magic Sky Fuels Reduction Projects as well as other smaller timber sale areas adjacent to the project area) would cumulatively help disrupt fire behavior in the event of a large wildfire in the area. The vegetation treatment units scattered across the landscape act as a barrier to large fire growth as evidenced by fuels reduction projects tested by wildfires across the western United States. Fire intensities would decrease due to these cumulative treatments not only on federal lands but also on private lands, allowing firefighters to suppress wildfires more readily.

BIOLOGICAL RESOURCES

Botany

Affected Environment
The slope, aspect, and topographic position have a major influence on the composition of forest vegetation. Most of the project area is located in the montane ecological zone, with the rest occupying the sub-alpine zone. At lower elevations in the project area conditions are warmest and driest, the vegetation is dominated by shrubs and grasses, and gradually transitions into vegetation dominated by open ponderosa pine and mixed ponderosa and Douglas-fir forest with some dry grassland and meadows, and also by grass and shrub lands on dry south-facing slopes in the Poudre Canyon. Douglas-fir, lodgepole pine, and quaking aspen co-occur on north-facing slopes. Riparian vegetation occurs along several perennial streams and intermittent drainages distributed throughout the project area.

Because a variety of vegetation types occur in the project area, there is suitable habitat present for numerous threatened and endangered species, Region 2 sensitive species and other species of local concern. The table below lists the threatened and sensitive plant species that were considered in this analysis and the determination of effects as a result of the No Action and Proposed Action alternatives. The species of local concern considered in this analysis are listed in Table 11 which follows.

Table 10. Summary of determinations for Threatened (T) and Sensitive plants

Common Name	Species	Determinations of Effects[1]	
		No Action	Proposed Action
Ute ladies'-tresses orchid (T)	*Spiranthes diluvialis*	NLAA[2]	NE[4]
Colorado butterfly plant (T)	*Gaura neomexicana* ssp. *coloradensis*	NLAA	NE
Park milkvetch (S)	*Astragalus leptaleus*	MAII[3]	MAII
Slender moonwort (S)	*Botrychium lineare*	MAII	MAII
Lesser-panicled sedge (S)	*Carex diandra*	MAII	MAII
Yellow lady's-slipper (S)	*Cypripedium calceolus* ssp. *parviflorum*	MAII	MAII
Slender cottongrass (S)	*Eriophorum gracile*	MAII	MAII
Colorado tansyaster (S)	*Machaeranthera coloradoensis*	MAII	MAII
White adder's-mouth (S)	*Malaxis brachypoda*	MAII	MAII
Budding monkeyflower (S)	*Mimulus gemmiparus*	MAII	MAII
Rock cinquefoil (S)	*Potentilla rupincola*	MAII	MAII
Dwarf raspberry (S)	*Rubus arcticus* ssp. *acaulis*	MAII	MAII
Autumn willow (S)	*Salix serissima*	MAII	MAII
Sphagnum (S)	*Sphagnum angustifolium*	MAII	MAII
Lesser bladderwort (S)	*Utricularia minor*	MAII	MAII
Selkirk's violet (S)	*Viola selkirkii*	MAII	MAII

[1]This summary includes only the overall determinations. In several cases, long-term effects to the species may include beneficial impacts. See species discussions for long-term effects.
[2]NLAA: Not likely to adversely affect; [3]MAII: May adversely impact individuals, but not likely to result in a loss of viability on the planning area, nor cause a trend to federal listing; [4] NE: No effect.

Table 11. Species of Local Concern included in project analysis

Other Species of Local Concern *	
Aletes humilis (formerly Sensitive)	*Listera convallarioides & Listera borealis*
All *Botrychium* species	*Lycopodium annotinum*
Cornus canadense	*Petasites sagittatus*
Cypripedium fasciculatum (formerly Sensitive)	*Pyrola picta*
Goodyera repens	Fern species, including *Cysopteris montana, Pellaea atropurpurea,*
Lilium philadelphicum	

* Other Species of Local Concern are included for analysis based on presence and/or suitable habitat in the project area, as described under Survey Findings and Suitable Habitat in Section II above.

Alternative 1 (No Action)
Direct and Indirect Effects
Under the No Action Alternative, current management plans would continue to guide management of the project area. No vegetation management activities would be implemented, forest health and watershed condition would be not be improved, bighorn sheep habitat would not be enhanced, long-term recreational opportunities in the Christmas tree area would not be ensured, and transportation system modification would not take place for this area. Because the project area is adjacent to private land, fire suppression on even low severity fires would continue and fuel hazard condition would likely continue to increase. The effect of the No Action alternative on botanical species is described on a species by species basis in the text that follows.

Alternative 2 (Proposed Action)
Direct and Indirect Effects
Analysis of effects to threatened and endangered species (TES), rare plant species and communities in this report is based on the proposed action, including implementation of design criteria for watershed protection, botany, and invasive plants/noxious weeds. A description of each species status, distribution, life history, habitat requirements and environmental baseline can be found in the botany specialist report in the project record.

Federally listed or proposed species
Ute Ladies'-tresses Orchid (*Spiranthes diluvialis)* - Status: Threatened
Ute ladies'-tresses is a perennial, terrestrial orchid with stems 8 to 20 inches tall, arising from tuberous, thickened roots. It is currently designated as Threatened over its entire range. Threats to the continued existence of the Ute ladies'-tresses orchid include several forms of water development projects, intense domestic livestock grazing, haying, exotic species invasions, habitat fragmentation, recreation use, and urbanization. The species may also be vulnerable in parts of its range due to the loss of pollinators. The plant occurs at altitudes below 6,800 feet in seasonally moist soils and wet meadows near springs, lakes, or perennial streams and their associated floodplains in certain areas along the Front Range in Colorado.

Effects of the No Action Alternative
No occurrences of Ute ladies'-tresses orchid are known in the project area, and occurrence in the project area is unlikely due to limited areas that could contain suitable habitat. Implementation of the

No Action alternative would result in no direct or indirect impacts from project activities because activities would not occur. Selection of the No Action Alternative could result in continued accumulation of hazardous fuels within the project area, increasing the potential for high-intensity, high-severity wildfire. If present in adjacent areas, Ute ladies'-tresses individuals could be injured or destroyed through burning of plants, falling trees crushing plants, and loss or degradation of habitat through change in hydrological regimes associated with removal of vegetation. Indirect effects of a wildfire on this species, if present, could include reduced water quality due to sediment loading and ash deposition into watercourses and riparian areas, and increased susceptibility to noxious weed invasion.
In the absence of wildfire, none of the above-described potential effects would occur.
Although the no-action alternative could increase the potential for a high-intensity, high-severity wildfire, the reality of a wildfire occurring is uncertain and unpredictable. Based on this and the low likelihood of the species occurring in the project area, effects under this alternative to Ute ladies'-tresses orchid are extremely unlikely to occur and therefore considered discountable. Based on the above discussion, it is determined that the No Action Alternative *may affect, but is not likely to adversely affect* Ute ladies'-tresses orchid.

Effects of the Proposed Action Alternative
Potential habitat for this species in the project area is limited by elevation and relative scarcity of perennial water and suitable wet meadows in proposed treatment units. Design criteria to protect wet areas would be employed during implementation of project activities. Surveys would be conducted in all potential habitat prior to project implementation, and if any plants of this species are found, they would be avoided. Based on the above discussion, it is determined that the proposed Action Alternative will have *no effect* to Ute ladies'-tresses orchid**.**

Cumulative Effects
Reasonably foreseeable future activities occurring on non-federal lands in the vicinity of the project area include residential development, motorized and non-motorized recreation, cattle grazing, road building and maintenance, utility infrastructure development, mineral prospecting, insect activity, increases in invasive plants, and fuel reduction. Because effects for Alternative 1 are considered to be discountable based on the above analysis, this project is not expected to make a measurable contribution to positive or negative cumulative effects under NEPA or ESA. Because Alternative 2 will not affect Ute ladies'-tresses or its habitat, the Proposed Action is not expected to contribute to cumulative effects for this species.

Colorado Butterfly Plant (*Guara neomexicana ssp. coloradensis)* - Status: Threatened
Colorado butterfly plant is a short-lived perennial herb. Of the known populations of *Gaura neomexicana* ssp. *coloradensis*, the vast majority occur on private lands managed primarily for agriculture and livestock. Haying and mowing at certain times of the year, water development, land conversion for cultivation, competition with exotic plants, nonselective use of herbicides, and loss of habitat to urban development are the main threats to these populations. Because of the small, isolated nature of populations and few numbers present in many of them, the subspecies is much more susceptible to random events such as fires, insect or disease outbreaks, or other unpredictable events that could easily eliminate local populations. This species typically occurs on sub-irrigated soils on level or slightly sloping floodplains and drainage bottoms at elevations of 5000-6400 feet; however, the

Forest Service considers it possible that it could occur and is undetected at higher elevations, up to perhaps 7200 feet.

Effects of No Action Alternative
No occurrences of Colorado butterfly plant are known in the project area, and occurrence in the project area is unlikely due to limited areas that could contain suitable habitat. Implementation of the No Action alternative would result in no direct or indirect impacts from project activities because activities would not occur. Based on the above discussion, it is determined that the No Action Alternative may affect, but is not likely to adversely affect Colorado butterfly plant.

Effects of Proposed Action Alternative
Potential habitat for this species in the project area is limited by elevation and relative scarcity of perennial water and suitable wet meadows in treatment units. However, wet meadows would be avoided and buffered by 100 feet for mechanical treatment and avoided during manual treatments. Surveys will be conducted in all potential habitats prior to project implementation, and if any plants of this species are found, project design criteria provide for avoiding impacts during project activities. Based on the above discussion, it is determined that Proposed Action Alternative will have no effect to Colorado butterfly plant.

Cumulative Effects
Because effects for Alternative 1 are considered to be discountable based on the above analysis, this project is not expected to make a measurable contribution to positive or negative cumulative effects under NEPA or ESA. Because Alternative 2 will not affect Colorado butterfly plant or its habitat, the Proposed Action is not expected to contribute to cumulative effects for this species.

Sensitive Species: Plant species in the following section is divided into groups (Groups 1- 4) that occupy similar habitats.

GROUP 1: Rock Outcrop Species

Colorado tansyaster (*Machaeranthera coloradoensis*)
Colorado tansyaster is a perennial forb species that occurs in a variety of habitats from montane to alpine. The plant is a taprooted perennial herb with large, solitary, radiate heads (pink ray and yellow disk flowers) on short stalks. Suitable habitat in Colorado occurs in a wide range of community types including plains/park grassland, dry grassland communities within ponderosa pine (*Pinus ponderosa*) or bristlecone pine (*Pinus aristata*) areas, pinyon/juniper (*Pinus*/*Juniperus*) woodlands, alpine fellfields and meadows between 7,600 and 12,900 feet in elevation. Colorado tansyaster is vulnerable because of its restricted geographic range and small number of documented occurrences. Direct or indirect negative impacts to populations or habitats by human-related activities could occur from: motorized and non-motorized recreation, trail or road construction and maintenance, reservoir expansion, housing development, changes to natural disturbance regimes, domestic livestock activities, invasive species introduction, or small-scale mining. Lower elevation populations and those populations closest to roads and trails are likely at the most risk. No occurrences of this species have been documented from the project area.

Rock cinquefoil (*Potentilla rupincola*)
Rock cinquefoil is an herbaceous perennial of the rose family with yellow flowers and green leaves. The plant is endemic to the Front Range of Colorado between 6,900 and 10,500 feet in elevation. It occurs on granitic rock outcrops or thin, gravelly soils, usually with west or north exposure. Rock cinquefoil often occurs with limber pine and ponderosa pine. Current threats to the species include: exotic species invasion, residential and commercial development, secondary impacts of grazing, right-of-way maintenance, off-road vehicle use and other recreation, effects of small population size, global climate change, and pollution. The plant is reported to be fairly resistant to disturbance, and threats from human activities are expected to be minor due to the inaccessibility of its habitat. Any activities concentrated in its habitat are likely to threaten the plant. No occurrences of this species have been previously documented from the project area.

GROUP 2: Riparian Area, Stream Bank, Spring and Seep (and occasionally Fen) Species
Park milkvetch (*Astragalus leptaleus*)
Park milkvetch is an inconspicuous perennial herb in the pea family. Suitable habitat includes sedge-grass meadows, swales and hummocks, wetlands, aspen glades, and streamside willow communities between 7,675 and 9,500 feet in elevation. Rangewide, the major threats to park milkvetch involve large-scale habitat modification from development or meadow conversion for hay production. Local threats include livestock grazing, competition from invasive non-native plants, off-highway vehicle use, road building and resource development. No occurrences of park milkvetch have been documented from the project area.

Slender cottongrass (*Eriophorum gracile*)
Slender cottongrass is a rhizomatous perennial graminoid found in fens, bogs, wet meadows, peatlands, pond edges, and other open, saturated, organic substrates. In Colorado, this species occurs between 8,100 and 12,000 feet in elevation. No occurrences of this species have been documented from the project area.

White adder's-mouth (*Malaxis brachypoda*)
White adder's-mouth is a small, inconspicuous, perennial orchid. This plant is distributed from the Canadian Shield southward to Colorado and California. White adder's-mouth is disjunct in Colorado, where it is known to occur along shady streamsides and in mossy wet areas and cool drainages between 7200 and 8000 feet in elevation. There are two known occurrences of white adder's-mouth in Colorado. No occurrences of white adder's-mouth have been documented from the project area.

Budding monkeyflower (*Mimulus gemmiparus*)
Budding monkeyflower is a small yellow-flowered plant in the figwort family. Habitat for the species includes the moist soil of forest seeps or springs or slopes and alluvium in open sites within spruce-fir and aspen forests, and granite outcrops with surface seepage water. The plant is often found in areas protected by granite overhangs and is usually associated with other monkeyflower species. The species has limited dispersal ability. Reproduction occurs mainly by "gemmae" or swollen leaf bases that fall from the plant in autumn. These propagula are thought to be water-dispersed. This particular method of reproduction is not known in any other plant species. In Colorado, the species occurs between 8,500 and 10,500 feet. No occurrences of this species have been documented from the project area.

Dwarf raspberry (*Rubus arcticus*)
Dwarf raspberry is a small, rose-pink flowered, woody, rhizomatous perennial in the rose family. The species occurs in willow carrs and along mossy streamsides, and occasionally occurs in meadows, mossy willow thickets, moist forest floors, and along mountain streams. Colorado occurrences rarely appear to produce fruit. The primary threat to the species is habitat loss. No occurrences of this species have been documented from the project area.

Autumn willow (*Salix serissima*)
Autumn willow is a woody species that is found from the eastern Canadian Shield, southward to Indiana and westward to Colorado. This plant occurs in willow carrs and thickets and in marshes or fens with other willows and sedges, between 7,800 and 10,200 feet in elevation in Colorado. The species also inhabits cold, often calcareous bogs or fens, limey swamps, boggy meadows, lakeshores and streambanks. The primary threat to the species is hydrologic alteration of its habitat. Any activity that disrupts saturated soils and peat formation is likely to have a negative impact on the species. Other activities currently threatening the species include grazing and road construction. No occurrences of this species have been documented from the project area.

Lesser bladderwort (*Utricularia minor)*
Lesser bladderwort is a small, perennial aquatic plant with submerged weak stems and leaves. It is a carnivorous free-floating plant that can reproduce both vegetatively and sexually. Lesser bladderwort has been documented throughout North America in shallow ponds or pools, lakes, open water areas within fens (often alkaline), and slow-moving streams between 6,600 and 8,600 feet. Direct threats to *Utricularia minor* are hydrologic impacts, especially degradation of water quality and hydrologic alteration, habitat loss, and invasive species. No occurrences of this species have been documented from the project area.

Selkirk's violet (*Viola selkirkii*)
Selkirk's violet, a member of the violet family, is a small, rhizomatous or often stoloniferous perennial plant with blue flowers. Little information is known about habitat and population trends for Selkirk's violet. There is no current evidence to suggest an upward or downward trend in known populations at this time. No information is available regarding threats to the species range-wide or in Region 2. No occurrences of this species have been documented from the project area.

GROUP 3: Fen Species
Lesser-panicled sedge (*Carex diandra*)
Lesser-panicled sedge is a tufted perennial sedge that occurs in wetland habitats including calcareous fens and bogs, willow carrs, pond edges, hummocks in open shrub and sedge meadows, and marshes. This species is circumpolar and has a wide distribution in North America. Currently, extant populations of lesser-panicled sedge appear to be stable, but populations may be declining over time due to habitat loss and degradation associated with hydrological modification, road construction, recreational use, and loss of wetland habitat to development on non-federal lands. No occurrences of this species have been documented from the project area.

Sphagnum (Peat moss) (*Sphagnum angustifolium*)
Sphagnum angustifolium is a perennial bryophyte (moss) species that grows very slowly in areas with high evapotranspiration. Spores are distributed by the wind. This species is found in iron fens and poor fens. Its habitat is vulnerable to mining, peat-mining, construction of ditches, changes in hydrology, non-point pollution, alterations in water chemistry, and off-road motorized vehicle use. No occurrences of this species have been documented from the project area.

GROUP 4: Forest and Meadow Species
Slender Moonwort (Fork-leaved moonwort) (*Botrychium lineare*)
Moonworts are small fern allies (usually less than three inches tall in Colorado). They are dependent on mycorrhizal fungi throughout their life cycle. These specialized fungi assist with water and nutrient uptake. The fungal association allows moonworts to remain dormant for several years at a time, which can be advantageous during periods of drought or other conditions that limit the species. Moonworts could be adversely affected by habitat alteration if below-ground mycorrhizae, stems, roots, and leaf primordia are impacted. Road maintenance and construction, mine reclamation activities, trampling by hikers, and alteration of soil and hydrological regimes could also threaten the species. Slender moonwort has been considered one of North America's most rare plants. The status of many slender moonwort occurrences is unknown, as many have not been relocated in several years or decades. Moonworts are difficult to detect in the field due to their small stature (no more than a few inches tall in Colorado plants) and inconspicuous appearance. No occurrences of sensitive moonwort species have been documented from the project area.

Yellow lady's slipper (C*ypripedium parviflorum*)
Yellow lady's slipper is a perennial deciduous forb that grows as a single plant or in a colony. It is 10 to 80 cm in height with three to six alternate green leaves and topped with one or rarely two conspicuous flowers which are colored yellowish-green to purplish-brown (Mergen 2006). In Colorado, the plant occurs at elevations between 5,800 and 8500 ft in aspen, lodgepole pine, ponderosa pine, and spruce-fir-aspen forests. Yellow lady's slipper appears to be adapted to a range of moisture requirements. As are all orchids, yellow lady's slipper is entirely or partially dependent of mycrorrhizal fungi throughout its life cycle. Plant collecting, timber harvest, road construction, grazing, and all other activities that cause habitat loss are probably the greatest risks to *Cypripedium parviflorum*. No occurrences of this species have been documented from the project area.

Direct and Indirect Effects to Region 2 Sensitive Species (No Action Alternative)
GROUP 1: Rock Outcrop Species
Implementation of the No Action Alternative would result in no direct or indirect impacts from project activities because activities would not occur. Neither Colorado tansyaster nor rock cinquefoil were found in the project area; however suitable habitat was observed and some areas have not yet been surveyed. Occurrences of either or both species could be present but undetected in the project area.

Implementation of the No Action Alternative could result in continued accumulation of hazardous fuels within the project area, increasing the potential for high-intensity, high-severity wildfire. In the event of wildfire, individuals of rock cinquefoil, and Colorado tansyaster could be directly affected by flames burning plants, potentially resulting in mortality in areas with heavy fuel loading. Plants could also be injured by low-intensity flames passing between areas of heavier fuels. These species often occur in

areas of sparse vegetation cover, where fire intensity and severity are not expected to be high. For this reason, the possible direct effects of a wildfire on the species are not anticipated to affect the long-term viability of the species, even though individuals may be injured or destroyed by flames. Indirect effects of a severe wildfire could include soil erosion and increased susceptibility to noxious weed invasion, which could lead to habitat alteration, competition for resources, and ultimately, species displacement. Such effects of noxious weed invasion have been observed at a rock cinquefoil site elsewhere on the Canyon Lakes Ranger District.

GROUP 2: Riparian Area, Stream Bank, Spring and Seep (and occasionally Fens) Species
Implementation of the No Action Alternative would result in no direct or indirect impacts from project activities because activities would not occur. No Group 2 species (park milkvetch, slender cottongrass, white adder's-mouth, budding monkeyflower, dwarf raspberry, autumn willow, lesser bladderwort, and Selkirk's violet) are not known to occur in the project area. It is possible, however, that any of them could occur but have been missed during surveys, and some areas have not yet been surveyed. Severe wildfire could kill or injure Group 2 individuals, if they are present, through burning of plants, crushing by falling trees, and loss or degradation of habitat through changes in light and hydrological regimes associated with removal of overstory vegetation. Loss of aboveground parts of plants due to felled trees or burning would likely have a negligible impact on park milkvetch, if present, because the species appears to spread vegetatively once established. Wildfire could have a beneficial effect on autumn willow, if present, by promoting vigorous resprouting after fire, as seen in several other willow species. The remaining Group 2 species, except for budding monkeyflower, are perennial and may regrow if above-ground parts are crushed but below-ground parts remain intact.

The magnitude of wildfire effects would be expected to be lower in areas of suitable habitat for Group 2 species than in adjacent uplands, because hydrological conditions in riparian habitat limit the potential for build-up of hazardous fuel loading seen in upland vegetation adjacent to riparian areas. In addition, fire would be expected to reduce in severity (or become extinguished) in wet, inundated areas that provide suitable habitat for Group 2 species. Indirect effects of wildfire on Group 2 species, if present, may include increased sediment loading into watercourses and riparian areas, erosion, soil degradation through nutrient loss and hydrophobicity in areas of high-intensity fire, and noxious weed invasion in disturbed areas. Although there is potential for effects to occur associated with wildfire under the No Action Alternative, direct and indirect effects would not likely be of a magnitude sufficient to result in an adverse impact to the long-term viability of Group 2 species if present. Wildfire intensity within suitable habitat would be expected to minimally impact individuals of Group 2 species that may be present. For these reasons, the No Action Alternative (if wildfire occurred) would not be expected to threaten the viability of Group 2 species on the Planning Area.

GROUP 3: Fen Species
Implementation of the No Action alternative would result in no direct or indirect impacts from project activities because activities would not occur. Within the project area, there is the potential for high tree mortality associated with crown fire and overstory removal. If present, sphagnum or lesser-panicled sedge individuals could be injured or destroyed through burning of plants, falling trees crushing plants, and loss or degradation of habitat through change in light and hydrological regimes associated with removal of overstory vegetation. These effects would likely have a negligible impact on populations, however, because fire would be expected to decrease in intensity and severity (or become extinguished)

in wet, inundated areas. However, during extreme drought conditions, peat or other organic substrates in fens and other wetlands may ignite and burn for long periods of time, damaging species and habitat. Indirect effects of a wildfire on Group 3 species, if present, could include altered water quality due to sediment loading and ash deposition into watercourses and riparian areas, and increased susceptibility to noxious weed invasion. Although there is potential for effects to occur associated with wildfire under the No Action Alternative, there is a low likelihood that Group 3 species are present within the project area because there are few potential areas of suitable habitat.

Based on the above discussion, direct and indirect effects would not likely be of a magnitude sufficient to result in an adverse impact to the long-term viability of any Group 3 species. In the absence of wildfire, the current condition of suitable habitat for Group 3 species is expected to be maintained, and no impacts to these species are anticipated.

GROUP 4: Forest and Meadow Species

Implementation of the No Action Alternative would result in no direct or indirect impacts from project activities because activities would not occur. If wildfire occurs, individual moonworts or yellow lady's-slipper, if present, could be directly affected by flames burning above-ground plant parts. In areas of heavy fuel loading where high-severity fire would be expected, mycorrhizae and other below-ground parts could be damaged or killed by hot temperatures penetrating the soil, potentially resulting in mortality of the entire above- and below-ground plant structures. Although loss of above-ground parts is not detrimental to individual moonwort plants, loss of below-ground structures generally results in complete loss of the plant. Loss of below-ground parts of yellow lady's-slipper is also detrimental since it is also dependent on mycorrhizae. In more open-canopied areas where moonworts typically occur, fire severity would be expected to be low, due to relative lack of fuels. Above-ground parts could be injured by low-intensity flames passing through an area, while below-ground structures could remain intact. In aspen stands and other moist areas where yellow lady's-slipper is more commonly found, fire severity would be expected to be low; however the species also occurs in less moist habitats with greater potential for higher fire severity.

Indirect effects of the No Action Alternative, if wildfire were to occur, may include soil erosion and vulnerability to noxious weed invasion. The possibility of wildfire under the No Action Alternative could affect individuals of Group 4 species, but this possibility is not considered to be of a magnitude sufficient to affect the long-term viability of the three Group 4 species on the Planning Area. Wildfire could potentially have a long-term beneficial effect on moonworts, if present, through the creation of additional suitable habitat.

In the absence of wildfire, conifer encroachment into aspen stands and fuel loading in conifer forests would be expected to increase in the long term. Increased tree density within suitable habitat for Group 4 species could cause alteration of light, hydrological and soil regimes, degrading habitat and potential occurrences over time. The effects of this are considered inconsequential for moonworts in the foreseeable future, because the areas of suitable habitat within the project area are naturally relatively open, and it is unlikely that fuel loading would occur to a level where occurrences of moonworts, if present, would be shaded by adjacent fuels to the extent that viability of the species within the Planning Area would be compromised. Depending on frequency and intensity, wildfire may have beneficial or detrimental impacts, or a combination, to yellow lady's-slipper and its habitat.

Insect invasion within conifer forest could also affect suitable habitat for Group 4 species by resulting in higher tree mortality and ultimate crushing of plants due to weakened, dead trees falling into occupied habitat. Although impacts to Group 4 taxa are possible if these species are found to occur within the project area, it is unlikely that habitat alteration under the No Action Alternative (if wildfire did not occur) would be of a magnitude sufficient to compromise the viability of any of these species within the planning area or across their range in the foreseeable future.

Alternative 1(No Action) may adversely impact individuals, but would not be likely to result in a loss of viability in the planning area, nor cause a trend to federal listing for species in Groups 1, 2, 3, and 4.

Direct and Indirect Effects to Region 2 Sensitive Species (Proposed Alternative)
GROUP 1: Rock Outcrop Species
If the proposed action is implemented, some plants could be damaged by trampling, crushing by moving felled trees, or pile burning. Pile burn sites for slash disposal could have direct effects to individuals, where present, by burning plants if piles are placed on or within flame length of occurrences. Indirect negative effects associated with thinning, burning, and slash disposal may include changes in light regime through overstory removal and thinning, habitat degradation associated with soil compaction and displacement (from vehicles and personnel), and increased susceptibility to noxious weed invasion as a result of ground disturbance and native vegetation removal. Potential project impacts would likely be limited to a few individuals. Therefore, potential impacts from the proposed action alternative would not be considered of a sufficient magnitude to threaten the viability of these species on the planning area in the short or long term.

Fuels treatment activities throughout the project area could be indirectly beneficial to known or discovered occurrences and habitat for Group 2 species by reducing the risk of high-intensity, high-severity wildfire that could spread into occupied or suitable habitat and adversely impact individuals or populations.

GROUP 2: Riparian Area, Stream Bank, Spring and Seep (and occasionally Fens) Species
Under the Proposed Action, all riparian areas, fens, wetlands, wet meadows, seeps, and springs would be excluded from mechanical fuels treatment and also buffered, which would mean limited potential for direct impacts to areas of potentially suitable habitat for Group 2 species. Limited impacts may occur due to tree felling into these areas.

Impacts to Group 2 species individuals or suitable habitat from hand treatment activities are possible. Fens, wetlands, wet meadows, seeps, and springs are excluded from manual treatment; however manual treatments may occur in riparian areas. Proposed vegetation treatments could involve incidental adverse impacts to Group 2 taxa, if present, through trampling, damage or burial of individuals by soil displacement and slash piles, and crushing by falling trees or trampled by implementation personnel. Dragging of slash through habitat and burning of piles in riparian areas could also damage plant individuals and habitat. Indirect effects of thinning activities could include modification of light and moisture regimes associated with removal or reduction of canopy cover, habitat degradation involving soil disturbance and associated native vegetation removal, and increased risk of noxious weed invasion and native plant displacement in disturbed areas. Although these impacts are possible, it is likely that

only a few individuals within an undetected occurrence would be affected, and no threat to viability of the eight Group 2 species on the Planning Area would be anticipated.

Fuel treatment activities in upland vegetation, including manual and mechanical treatment, could be indirectly beneficial to Group 2 species, if present, by reducing the risk of high-intensity, high-severity wildfire that could spread into suitable habitat and have a potentially adverse impact on species individuals or populations. Upland treatments, however, could also create increased erosion that could result in increased sedimentation into riparian areas and could encourage the spread of noxious weeds.

GROUP 3: Fen Species

Under the Proposed Action, all riparian areas, fens, wetlands, wet meadows, seeps, and springs would be excluded from mechanical fuels treatment and also buffered, which would limit potential for direct impacts to areas of potentially suitable habitat for Group 3 species. Limited impacts could occur due to tree felling into these areas.

Impacts to Group 3 species individuals or suitable habitat from hand treatment activities could be possible. Fens, wetlands, wet meadows, seeps, and springs would be excluded from manual treatment; however manual treatments may occur in riparian areas. Group 3 species not detected during botany surveys could be crushed by trees falling from adjacent thinning units or trampled by implementation personnel. Dragging of slash through habitat could also damage plant individuals and habitat. Indirect effects of thinning activities could include modification of light and moisture regimes associated with removal or reduction in canopy cover, habitat degradation involving hydrological alteration, erosion and compaction, and increased risk of noxious weed invasion. Although these impacts are possible, there is a low likelihood that they would occur. In addition, there is a low potential for the two taxa in Group 3 to occur, and if they are present, only a few individuals within an undetected occurrence would be expected to be affected. Therefore, no threat to Group 3 species viability on the Planning Area would be expected as a result of treatment activities.

Fuel treatment activities in upland vegetation could be indirectly beneficial to Group 3 species, if present, by reducing the risk of high-intensity, high-severity wildfire that could spread into suitable habitat and have a potentially adverse impact on species individuals or populations.

GROUP 4: Forest and Meadow Species

In areas proposed for thinning, plants of the three Group 4 species, if present, may be impacted by alteration of light regimes through overstory removal, crushing of individuals by felled trees, trampling of plants by personnel or equipment, and hydrological or soil disturbance. Mechanical treatment may cause indirect effects including downstream sediment loading, erosion, and alteration of hydrology. Design Criteria incorporated into the Proposed Action provide for minimizing soil displacement and other disturbance, which would also minimize impacts to above- and below-ground moonwort and orchid structures that may be present. Based on the Proposed Action, including Design Criteria, and survey efforts, these effects are not considered of a sufficient magnitude to negatively affect Group 4 species viability because they would be incidental and localized in nature.

It is possible that moonworts, if present, could be adversely affected by ground disturbance during treatment, but there could be a long-term beneficial effect (several decades after disturbance,

depending on site conditions), through the creation of additional suitable habitat. Several occurrences of slender moonwort have been observed at sites where ground disturbance has historically occurred, despite a possible loss of individuals at the time of disturbance.

Proposed pile burning to dispose of slash could damage mycorrhizae and other below-ground moonwort and orchid parts through soil sterilization associated with high temperatures penetrating the soil surface. Above-ground parts could also be burned if present within pile sites. Given the habitat variability of moonworts, suitable and potentially occupied habitat for the species could be directly impacted by pile burning, but given the low likelihood that the species occurs and the probability that only a few individuals would be incidentally impacted, no threats to long-term viability are expected. Yellow lady's-slipper habitat is also variable; however, the most common habitats on the ARP are aspen stands, and in Region 2 the species is more common in areas with moist to saturated soils. Design criteria provide for minimizing impacts to these areas. Based on these factors, potential impacts to yellow lady's-slipper are not expected to threaten long-term viability.

Potential effects to moonworts and yellow lady's-slipper, if present, from the distribution of chipped and masticated slash material could include crushing or smothering of aboveground parts as mats of processed slash are distributed, possibly hindering photosynthesis and respiration. However, it is probable that only a few undetected aboveground individuals would be impacted by chipped and masticated material, given the lack of known occurrences of Group 4 species in the project area. Project design includes direction for avoiding wet areas to minimize impacts to soil and native vegetation. Due to the lack of known occurrences and the potential for a small number of individuals to be impacted by these activities, the potential effects of slash disposal under the Proposed Action are not anticipated to be of a magnitude sufficient to impact long-term viability of Group 4 species.

Under the Proposed Action, aspen enhancement activities may occur within treatment units. This would involve conifer removal within and along the perimeter of aspen stands to promote regeneration and proliferation of the stand. Aspen stands may support occurrences of slender moonwort and yellow lady's-slipper. Aspen enhancement activities could potentially impact undetected occurrences of these species by felled conifers crushing plants within the aspen stand, foot trampling by implementation personnel, and increased vulnerability to nonnative species invasion as a result of ground disturbance and vegetation removal on the periphery of some aspen stands.

Fuel treatment activities in upland vegetation could be indirectly beneficial to Group 4 species, if present, by reducing the risk of high-intensity, high-severity wildfire that could spread into suitable habitat and have a potentially adverse impact on species individuals or populations. Yellow lady's-slipper may benefit from some canopy removal.

Based on the above discussion, Alternative 2 (Proposed Action) may adversely impact individuals, but would not be likely to result in a loss of viability in the planning area, nor cause a trend to federal listing for species in Groups 1, 2, 3, and 4.

Effects of Prescribed Fire for all Groups

No Region 2 Sensitive plant species were found in Unit 1, the only unit proposed for prescribed fire treatment. Group 1 species tend to occur in areas with sparse vegetation that do not usually carry fire

well. However, they are often near or surrounded by forests and meadows that may burn. Any plants under heavy canopy cover could be damaged or destroyed by intense fire. These species have evolved with periodic fire. Given the sparse vegetation in their habitat, the role of fire has likely been minor, but it may be important for maintaining the forest canopy openings where they grow. Prescribed fire is not likely to seriously affect Group 2 and 3 species since fire is rarely extremely intense in their habitat. Group 4 species have also evolved with periodic fire in conifer forests and meadows, while aspen stands, especially those with moist to wet understories, are less likely to burn in wildfire or prescribed fire situations.

The most likely effect from prescribed fire for all groups would be increased establishment and spread of nonnative plant species. Fire tends to release nutrients from the soil and encourages the growth of nonnative plants. Nutrient release may also promote growth of native species, but since natives are rarely nutrient limited, their post-fire responses are often less dramatic than those of the nonnatives. While all nonnative species are likely to be stimulated by and spread after prescribed burning, cheatgrass is particularly adapted to proliferate after fire of any kind. Exotic species invasion is considered the highest priority threat to the persistence of rock cinquefoil (Anderson 2004) and is a potential threat to other Sensitive species as well.

Cumulative Effects for Sensitive Plant Species

The overall landscape in the project area and surroundings has been changed considerably from pre-settlement conditions. Past, present, and reasonably foreseeable future activities that could affect plants and habitat include past firewood cutting and timber harvest, and the following activities that are past and ongoing: motorized and nonmotorized recreation, residential development, cattle grazing, road building and maintenance, use and construction of recreational facilities, commercial outfitter use, utility infrastructure development, fuel reduction, wildfire, and prescribed fire. All of these activities have the potential to negatively affect Sensitive plants or their habitats directly through disturbance of individual plants and indirectly through habitat degradation.

Through the suppression of wildfires, vegetation and stand structural diversity have been altered. It is expected that wildfires would continue to be suppressed in the future to protect other resource values and uses. Continued fire suppression would likely result in increased stand density over time.

Cumulative effects of agency and private actions across the landscape combine with natural disturbances to reduce or accentuate overall impacts. In the project area, past natural disturbances include insect outbreaks in the 1980s that changed the stand structure in portions of the forest, and wildfires. Nonnative, invasive plant species with the potential to displace native species have invaded disturbed areas. Insect outbreaks and invasive plant species invasions are ongoing.
Activities occurring on the Canyon Lake Ranger District contributing to cumulative impacts include:

- Impacts from recreation use, especially motorized recreation, throughout the landscape are significant at this time. Many roads are in poor condition. The resulting erosion affects streams and vegetation. Residential development has increased in the past several decades.
- Future impacts are expected from increased recreational use, new road construction, insect infestations, and continued development on private land in the wildland-urban interface and intermix areas, further development of utilities and water resources, and thinning and timber harvest on public and private lands.

In general, effects to sensitive plant habitat and any plants present in the area, as well as plant species and communities of local concern, can be expected to increase over time. Activities under the proposed action will add to the level of disturbance across the landscape. Disturbance may benefit some sensitive and rare species, such as moonworts, which require openings for establishment. For other species, continued and future activities are likely to reduce or degrade sensitive species habitat and could damage or destroy sensitive plant species present in the project area.

Effects to Plant Species and Communities of Local Concern - Alternatives 1 and 2
Eight plant species of local concern are known to occur in the project area, or were found during project area surveys: forked spleenwort *(Asplenium septentrionale),* yellow coralroot (*Corallorhiza trifida*), pinesap (*Hypopitys monotropa*), heartleaf twayblade (*Listera cordata*), Simpson's ball cactus (*Pediocactus simpsonii*), arrowleaf sweet coltsfoot (*Petasites sagittatus*), Rocky Mountain polypody *(Polypodium saximontanum)*, and picturleaf wintergreen (*Pyrola picta*). Potential impacts from the No Action Alternative and the Proposed Action would be expected to be similar to impacts described above for sensitive plant species. There were no plant communities of local concern observed in the project area. Design criteria provide for additional field surveys to determine if there are plant species or communities of local concern occur within the project area and proposed treatment sites.

Silviculture

Affected Environment
Elevation and moisture availability strongly influence the distribution of tree species in the Colorado Front Range: elevation and moisture availability. As elevation increases, growing seasons become shorter, temperatures are cooler and precipitation is greater. Fire and other disturbances generally become less frequent at higher elevations. Changes in vegetation composition along this gradient reflect these environmental changes. The slope, aspect and topographic position at low and middle elevations also have a major influence on the composition of forest vegetation. Slopes that face south, west and southwest are exposed to intense sunlight and dry prevailing winds.

The Elkhorn project area is characterized by elevations that range from 7,200 feet to 11,003 feet. At the lower elevations where conditions are the warmest and driest, the vegetation is dominated by shrubs and gradually transitions into open ponderosa pine forest. The ponderosa pine forest typically becomes mixed with Douglas fir and aspen at higher elevations. At about 8,000 feet, ponderosa pine, Douglas fir and aspen are joined by lodgepole pine and limber pine. This species mix forms a transitional mixed conifer forest in the higher elevations of the project area. Where there is usually a persistent winter snowpack, ponderosa pine and Douglas fir are replaced by lodgepole pine, patches of aspen and limber pine, subalpine fir and Engelmann spruce. On warm dry slopes ponderosa pine is the dominate species. Douglas fir is found on slopes with north aspects where conditions are generally cooler and moister. Most of the project area is located in the montane ecological zone. Cover types and tree species in the project area is summarized in the table below.

Table 12. Acres and percent cover type, Elkhorn project area (all land ownership)

Cover	Total Acres	% of Total
Tree Cover	18,325	82%
Lodgepole pine	12,377 (56%)	
Ponderosa pine	2,422 (11%)	
Spruce/fir	2,237 (10%)	
Aspen	933 (4%)	
Douglas fir	322 (1%)	
Limber pine	19 (<1%)	
Juniper	12 (<1%)	
Cottonwood	3 (<1%)	
Shrub Cover	1237	6%
Grass / Forb Cover	2632	12%
No Vegetation	99	<1%
TOTAL	**22,293**	

Stand structure refers to the horizontal and vertical distribution of components of a forest stand including the height, diameter, crown layers, and stems of trees, shrubs, herbaceous understory, snags, and down woody debris. In the project area, stand structure has been influenced in the past by human uses, fire exclusion and possibly climate change. During the late 19th and early 20th centuries, logging removed the largest and oldest trees. Over the last 100 years as wildfire suppression became more successful, more seedlings survived than would have under a natural fire regime.

Lodgepole pine represents 56% of the cover type in the project area. Most of the lodgepole pine stands are even-aged ranging from 90 to 120 years of age. Stand structure varies dramatically from small diameter (two to three inch DBH), densely stocked “dog-hair”, to stands where the average diameter is ten to twelve inches DBH with 150 to 300 trees per acre. Tree heights in dog-hair stands rarely exceed 40 feet. On better quality sites with deeper soils, average tree heights range from 50 to 60 feet. Many of the lodgepole stands in the project area have understories dominated by blueberry (*Vaccinium spp.*).

Within the project area, stand-replacing fires created stands dominated by lodgepole pine. Lodgepole pine establishes from large quantities of seed released by serotinous cones and initially grows rapidly on sites of favorable habitat. There is a high degree of variability in the percentage of trees with non-serotinous cones that is linked to disturbance history. Older stands tend to have higher percentages of open or non-serotinous cones. Following stand replacing fire at less favorable sites, or where insufficient seed quantities are available, seedling establishment and growth may be slower, and tree recruitment may occur over periods of 30 to 50 years. “Dog hair” stands are extremely dense stands in which trees grow very slowly and do not vary much in size. Such extremely dense stands appear to reflect abundant availability of seed, favorable climatic conditions for initial seedling survival, followed by lack of self-thinning within the stand.

The majority of the lodgepole stands in the project area are self-perpetuating where the stands are dominated by lodgepole and sometimes aspen. Some stands located in the higher elevations of the project area contain Engelmann spruce and subalpine fir. In these stands lodgepole is a seral species with subalpine fir being the climax species.

In the project area, ponderosa pine represents 11% of all tree cover. Mature ponderosa pine in the project area generally averages 12 to 16 inches in diameter at breast height (DBH) and 40 to 50 feet total height. Occasionally, larger trees greater than 20 inches DBH are found, usually in drainages where optimal growing conditions exist. On average, site productivity (as measured by the amount of radial growth increments at DBH and total height) in the project area is generally low. For example, the typical ponderosa pine site index is 48 feet of total height after 100 years of growth.

The ponderosa pine stands vary dramatically in stand structure. Mature stands are park-like with perhaps 50 to 120 large diameter trees per acre present and only a few smaller diameter and younger trees growing in a grass dominated under-story. Other stands are multi-storied with hundreds of trees of multiple diameters, ages, and heights present in the same stand.

Within the project area it is common to see dense groups of trees that have resulted from conditions favorable for tree regeneration to occur. Conditions where ponderosa pine trees establish include a large seed crop, a seed bed disturbed by fire or logging and several years with above average moisture. In the Northern portion of the Colorado Front Range these events are rare and may occur only three to four times per century.

Surface fires can affect these groups in variety of ways. Higher intensity fires often kill most of the trees. Moderate intensity fires might creep through the clump killing some of the trees. Light intensity fires may burn around the clump leaving it undisturbed allowing all of the trees to survive. In the absence of fire, most of these young trees have survived creating stands of very dense forest. Dense stands with ladder fuels increase the chances of a crown fire and high tree mortality during fires occurring in any burning conditions.

Engelmann Spruce and subalpine fir cover represents 10% of the forested acres within the project area. Many of these stands are uneven-aged with the older cohorts ranging from 150 to 300 years of age. Stand structure varies depending on the age distribution within the stand. Younger cohorts are represented by smaller diameters and older cohorts can range from 12 to 16” DBH. Uneven-aged stands are multistoried. Over-all tree heights range from 45 to 60 feet. Engelmann spruce prefer sites that are moist and north/northeast aspects. Generally spruce stands are mixed with subalpine fir and lodgepole.

Spruce bark beetle is active in the project area. Many older, large diameter spruce trees have been killed by this bark beetle. MPB also attack Engelmann spruce especially when the number of available live lodgepole pine host trees is limited. Subalpine fir is a cohort and prefers the same type of site conditions as spruce. The fir rarely exceeds 10” in diameter and range from 40 to 60 feet in height. Fir trees often have full crowns and possess the unique ability for branches close to the ground to root and produce new trees. Due to this layering effect alpine fir is often found in clumps where multiple fir grow in close proximity to each other. Fir trees also have the capability of surviving in the understory for many years or decades. When gaps in the canopy are created these sapling size trees then respond and begin to grow.

Douglas fir represents 1% of the forested acres within the project area. Where Douglas fir and ponderosa pine co-occur in the same stand and on aspects favorable for moisture conditions, there is a tendency for the fir to slowly, successionally replace the pine. In relatively old post fire stands, young

Douglas fir is typically present whereas juveniles of the shade intolerant ponderosa pine are scarce or absent. This successional pattern is due in part to the differences in shade tolerance of the two dominant species and because Douglas fir is a prolific seed producer the species has a competitive advantage. Within the project area, these stand types were probably less influenced by frequent surface fires. Conversely, in the upper montane zone, stand structures have been shaped by severe fires (stand replacing or partial stand replacing) occurring at intervals usually much greater than 50 years. Spruce budworm causes defoliation in Douglas fir. In the 1980s, spruce budworm populations were at epidemic levels contributing to considerable mortality of mature Douglas fir trees within the project area. Spruce budworm is currently present in the project area, but populations are at endemic levels.

Aspen is present throughout the project area, but represents 4% of the forested area in pure stands or clones. The mature aspen clones have diameters of six to 10 inches at DBH with total heights of 30 to 40 feet and range in age from 80 to 100 years old. Some clones are relatively healthy with sprouting occurring along the clone edge while others that are subjected to elk browsing have very few sprouts. Throughout the project area, small groups consisting of a few trees exist in ponderosa pine and lodgepole stands. These trees are remnants of larger clones that deteriorated with the succession and competition from conifer trees.

Alder, willow and cottonwood can be found in and near riparian areas. At lower elevations and in ponderosa pine dominated stands mountain mahogany and antelope bitterbrush are the most common shrubs. Limber pine is found on rocky sites. Rocky Mountain juniper is found on south aspects to about 8,500 feet.

Habitat Structure Stage (HSS) is a means of describing the condition of the stand in terms of stand age, canopy closure, and average tree size. The following table provides a summary of the principal forest cover types and HSS within the project area.

Table 13. Habitat Structure Stage (HSS) for principal forest types (acres), Elkhorn project area (all land ownership)

Forest Type	**3A** (ac)	**3B** (ac)	**3C** (ac)	**4A** (ac)	**4B** (ac)	**4C** (ac)	**Total Acres**	**% of total tree cover**
Lodgepole pine	423	4,929	2,577	169	2,651	1,170	12,377	56%
Ponderosa pine	583	434	3	778	624	0	2,422	11%
Engelmann spruce and subalpine fir	48	407	296	22	1,008	456	2,237	10%
Douglas fir	22	243	0	24	33	0	322	1%

HSS-3 represents younger stands with sapling and pole sized trees. HSS-4 stands are mature with trees greater than 9 inches DBH. HSS-A represents stands with a crown closure of less than 39%, HSS-B is 40 to 69%, and HSS-C greater than 70%.

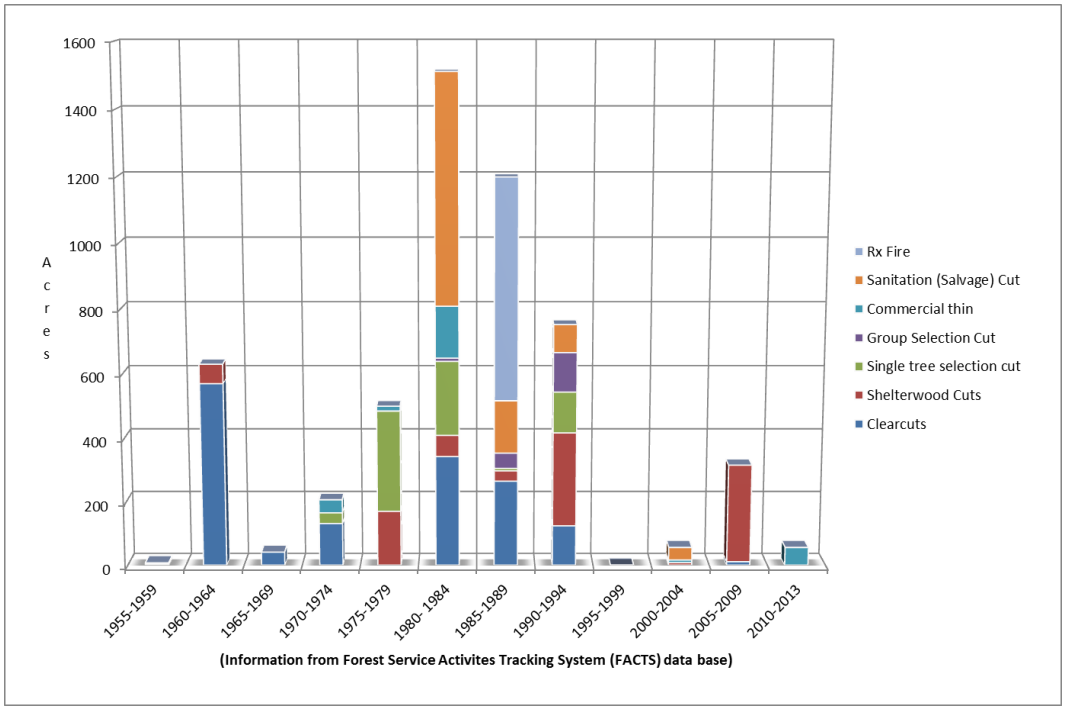
Old growth stands contain older, larger diameter trees and other structural features such as snags, down logs and gaps in the canopy layers that include patches of regeneration. The Forest Plan describes old growth management strategies and identified 1019 acres of old growth in all tree species within the

project area (Identified as Suitable Not Available - Old Growth Retention) These stands were mostly excluded from the proposed vegetation treatment units except 378 acres in four units (1, 3, 35, 43).

Dwarf mistletoe is present and scattered throughout the project area. Several locations within the ponderosa and lodgepole pine cover types have heavy concentrations of mistletoe. Mountain pine beetle (MPB) and pine engraver beetle (*Ips*) are present in the project area. Ips populations are currently at endemic levels. Although MPB prefer lodgepole pine they will also attack ponderosa pine, limber pine and Engelmann spruce. In 2009 there was a significant increase in MPB caused mortality in ponderosa pine. Large populations of MPB in the western, higher elevation and lodgepole pine dominated portion of the county thought to have dispersed following wind patterns into the lower elevation ponderosa pine area. Tree mortality data from mountain pine beetle in the Elkhorn project area was measured in 2011 using common stand exam measurement protocols. Based on the average basal area (BA), this inventory indicated that the average percent mortality over the project area for all pine cover types is 24%. Two additional MPB flights have occurred since these data were collected.

Active forest management has occurred in the project area since settlement in the nineteenth century. Since the onset of reliable activity reporting approximately 5,276 acres (24% of the project area) has had vegetation treatments. Natural restocking of the treated areas has been successful negating the need for planting and many of these areas have been treated by pre-commercial thinning. Some of the units included in the proposed action are areas that have been treated in the past (as an example, group selection prescriptions). The figure below provides additional information on historic vegetation management activities in the project area.

Figure 4. Historic vegetation management activities within the Elkhorn project area



Alternative 1 (No Action)
Direct and Indirect Effects
Under this alternative, vegetation management to achieve the purpose and need of this project would not take place. Natural growth processes, insect attacks, disease outbreaks, wind events, and wildfire would be the dominant forces of change on the landscape. The most dramatic change will result from MPB induced tree mortality that will continue to occur. MPB caused tree mortality will considerably reduce the number of mature Engelmann spruce, lodgepole and ponderosa pine in the project area. MPB generally will not attack younger lodgepole and ponderosa pine and spruce trees (generally < 6" DBH) and Douglas fir. The trees that survive the MPB epidemic that have not had suppressed growth for a long period will thrive with the reduction of competition from the mature overstory trees.

Following the MPB epidemic there will be an abundance of dead trees scattered throughout the project area. The dead trees will function as snags. Some of the snags will persist for decades but most will topple within five to ten years after death. In places, when the majority of dead trees have fallen, a jack-strawed condition (trees tilted in various directions) would be created. Dead trees that are in contact with the ground will deteriorate faster than dead trees that are suspended above the ground. These dead trees function as course woody debris (CWD) providing wildlife habitat, soil nutrient recycling and micro-site protection for new tree growth. A large accumulation of CWD will affect fire behavior as well as increase fire intensity.

In portions of the project area openings in the canopy created by MPB mortality will stimulate aspen sprouting. In other portions of the project area, aspen will continue to compete with conifers that survive the MPB epidemic. Where conifers are encroaching on aspen stands, the conifers gradually will eventually out-compete the aspen. Most of the mature lodgepole pine stands will be killed by MPB. On drier sites these stands will naturally regenerate with lodgepole pine. On moisture sites the lodgepole may be replaced with subalpine fir or Engelmann spruce.

The Douglas fir stands and younger stands of ponderosa pine would continue to develop into dense stands of multi-storied canopies; leaving the stands at an increased risk of intense wildfire behavior and more susceptible to insects and disease.

Alternative 2 (Proposed Action)
Direct and Indirect Effects
The proposed broadcast prescribed burn would thin some of the younger trees, prune lower branches, and consume flashy fine fuels such as ground juniper and small diameter dead and down material that could contribute to fire spread in the event of a wildfire. Unlike mechanical thinning treatments, prescribed burning is not exact and cannot guarantee the removal or survival of individual trees. Secondary fire effects can result in damage and stress to trees that then becomes susceptible to MPB. Due to a number of factors including the season or time of the year when the burn occurs, the continuity of fuels, fuel moisture, air temperature and wind, fire intensity and fire effects can be quite variable across a treatment area. In some areas, the effect of burning will be negligible with no signs of burning noted. Other areas may burn intensely causing torching and the loss of single and sometimes groups of over-story trees. However, the structural forest diversity resulting from the prescribed burn may come close to mimicking the natural fire regime that occurred in the lower montane in Colorado's northern Front Range.

The stands proposed for clearcutting treatment are primarily comprised of mature lodgepole pine that average 120-150 years old. A majority of the trees in these stands have been killed by MPB. The few remaining live trees, due to their age have reached the culmination of mean annual increment (CMAI). Initially, clearcutting results in moderate to extensive disturbance of the understory vegetation. Generally, within two to five years after harvesting, the understory vegetation begins to grow back and dominates the ground surface again. In stands containing a mix of tree species, clearcut areas will favor regeneration of lodgepole pine that grows best in open conditions. New stands arising from clearcutting will exhibit a single canopy layer and uniform size and age classes.

In the central Rocky Mountains, stands of lodgepole pine are generally considered susceptible to wind throw after cutting. Partial cutting, or thinning, increases the risk because the entire stand is opened up and therefore vulnerable. Less damage is associated with clearcutting, because only the boundaries between cut and uncut areas are vulnerable.

Unit layout is critical to preventing areas of low or failed regeneration success. According to regeneration surveys of previously harvested areas within or adjacent to the project area, most failures have resulted from wind scour. Overall, natural regeneration has been very successful in the project area negating the cost associated with planting.

Within the proposed treatment areas some small remnant aspen clones or a few incidental aspen exist. Opening the stands by clearcutting would create suitable conditions for aspen sprouting inside the treatment unit and where the boundary of the unit coincides with the edge of an aspen clone.

The low thin/salvage prescription is proposed in areas dominated primarily by ponderosa pine, Douglas fir and aspen. Thinning is intended to reduce the number of trees per acre leaving the healthiest trees. Generally, smaller diameter trees are targeted for cutting. Larger diameter trees, which are damaged, diseased or infested by MPB, would be selected to be cut and salvaged. Thinning is designed to achieve the preferred fire mitigation effects by reducing ladder fuels, increasing the canopy base height, creating openings in the canopy and reducing canopy bulk density. Additional fire mitigation effects would be accomplished though managing the surface fuels by concentrating the slash into piles and latter burning.

Thinning will reduce the number of trees per acre, which provides more water and soil nutrients for the remaining trees and other vegetation. This effect would tend to make the remaining trees healthier and more resistant to insect and disease attacks. Reducing tree density by thinning would increase the amount of sunlight reaching the forest floor, which is likely to increase understory forage production.

On the treated acres, varying age and size classes of ponderosa pine stands would remain. Stand composition after thinning would favor ponderosa pine and aspen in the majority of the treatment areas. Douglas fir would be favored on northerly aspects. Residual conifers in the ponderosa pine and Douglas fir cover type would be arranged singly and in clumps with a diversity of ages, sizes and densities represented. Various size openings would be created where MPB-killed trees are removed for salvage purposes. The most notable response in growth of residual trees would be an increase in diameter that otherwise would occur at a slower rate in unthinned stands.

The stand attributes that result from thinning ponderosa pine stands closely match what is desired for old growth. Larger live trees would be retained. Some of the larger trees may be in decline but may not be treated. When these declining trees die and when some of the larger diameter trees are killed by MPB, snags would be created. Younger healthy trees that are preserved will increase in diameter due to the reduced competition from other trees. Increased growth will result in the stands moving closer to old growth conditions than would naturally occur. The preservation of the younger trees provides for a multi-storied canopy. Large fallen trees will not be included in the surface fuel clean-up but will be retained as course woody debris.

The low thin - salvage treatment areas may include inclusions of lodgepole pine but generally these are areas where there is a mix of tree species. The proposed thinning in stands of mixed tree species would result in an increase in the percentage of ponderosa pine and a reduction in the number of lodgepole pine in the stand. In inclusions of pure, mature lodgepole, the proposed treatment would be to salvage the dead trees and create an opening. Mature, larger diameter lodgepole would be retained if windfirm. In areas where sapling or pole size lodgepole is growing, trees functioning as ladder fuels would be cut otherwise thinned leaving up to 300 trees per acre.

Thinned ponderosa pine stands would have increased resistance to insect attacks in the long term. In the short term, populations of *Ips* beetles could build in the piled slash potentially making isolated residual trees susceptible to insect attacks. Once the slash is burned, this threat would no longer be present. In addition, residual trees would have more available nutrients, sunlight, growing space and moisture allowing the trees to be more resistant to *Ips* beetle attacks if they occur.

The removal of a laddered forest canopy (vertically adjacent canopy layers) in thinned Douglas fir stands would be a deterrent to spruce budworm. Thinning would impede the horizontal and vertical movement of the defoliating larval stage of the budworm.

Group selection prescriptions are proposed treatment in stands dominated by lodgepole with some Engelmann Spruce and subalpine fir. Openings will be created up to two aces in size removing mostly dead lodgepole. Live spruce will be retained where possible. The intent of this prescription is to create an uneven-aged condition by developing at least three age classes of trees within the stand. Although MPB mortality is extensive at least one third of the stand will be left untreated to maintain the older age class.

An overstory removal prescription is prescribed for one unit that was previously thinned and the understory is now stocked by sapling size lodgepole pine. The overstory will be removed and measures will be taken in the harvesting operation to preserve as much of the understory trees as possible. Mistletoe is present in the stand and an effort will be made to remove all infected trees. The difference between this treatment and a clearcut is that after the overstory is removed the stand would be stocked with sapling size trees.

The selective harvest prescription is proposed is proposed in units with a mix of lodgepole pine and Engelmann Spruce. These units also are generally wetter than the clearcut treatment areas. In this entry the purpose would be to remove the dead lodgepole pine and retain any live Engelmann Spruce. Ideally,

if enough live trees are present one quarter to one third of the basal area would be removed. The intent of this prescription is to maintain the stand in an uneven-aged condition. The difference between this prescription and a group selection is that individual trees are removed creating small gaps in the canopy in contrast to openings up to two acres in size.

The two stage shelterwood prescription is proposed in units populated mostly with lodgepole pine and Engelmann spruce. Openings will be created inside the stand concentrating on removing MPB killed trees. About one half to two thirds of the stand will be left unharvested. The areas left untreated will provide a seed source and some sheltering effects that will enhance the establishment and survival of trees repopulating the newly created openings. The difference between this prescription and a group selection is that the desired stand structure for a shelterwood is an even-aged stand in contrast to an uneven-aged structure in group selections. Shortly after trees establish in the openings in the shelterwood the second stage or second harvest would be scheduled to remove the remaining overstory trees. Ultimately the entire stand in a shelterwood is populated with trees that may range in age from 10 to 20 years.

Under Alternative 2, treatments could be accomplished by hand crews using chainsaws or by equipment specifically designed to cut or mulch trees. If equipment is used, there would be some mixing of the forest litter layer with the mineral soil. If coupled with prolific seed production (the average interval between heavy cone crops of ponderosa pine is eight years) and wet conditions, seedlings could be produced. Use of machinery to complete treatments would increase potential for broken limbs and scraped bark on residual trees making them more susceptible to disease-causing pathogens.

Where treatments are manually completed, slash would be piled by hand and burned at a later date. Piles would be created in openings or kept a specified distance from residual trees. Piles would be burned when there is adequate snow cover or moisture to reduce potential of fire spread from the piles. Burning would also occur under light wind conditions to offset scorching damage to residual trees. Some scorching or burning of branches of residual trees located near the piles would be expected; however, tree mortality from pile burning would be minimal.

Although mistletoe is not found extensively in the project area, there are small groups of trees that are infected. At these locations, the infected trees would be targeted for removal which would restrict the spread of mistletoe. Mistletoe levels however would not substantially change with the implementation of the proposed action.

The existing and expected post-treatment cover types and the associated HSS within the treatment units are summarized for Alternative 2 in the table below. The most dramatic change will occur in lodgepole pine stands to be treated by clearcutting. Thinning primarily affects the understory but a measurable change to canopy closure and the HSS occurs. In ponderosa pine and Douglas fir cover types, the effects of thinning would potentially change from a high to moderate closure and from a moderate to low closure. Due to an increase in available soil moisture and sunlight, a minor increase in aspen cover would be anticipated in most of the treatment areas.

Table 14. Changes in HSS expected to occur following proposed vegetation treatments (tx), Elkhorn project

Tree Cover Type	Pre/Post Tx	**2T** (ac)	**3A** (ac)	**3B** (ac)	**3C** (ac)	**4A** (ac)	**4B** (ac)	**4C** (ac)	**TOTAL**
Lodgepole Pine	*pre-treat*	34	104	878	573	58	803	318	2,768
	post-treat	758	376	541	4	274	770	45	2,768
Spruce/Fir	*pre-treat*			46	3		117	36	202
	post treat		15.0	32.0	2	71	64	18	202
Ponderosa Pine	*pre-treat*		286	102		261	258		907
	post treat		294	94		482	37		907
Limber Pine	*pre-treat*								0
	post treat								0
Aspen	*pre-treat*		9	159	17	22.0	17	9	233
	post treat		154	28	3	26.0	15	7	233
Douglas fir	*pre-treat*		22	49		24.0	33		128
	post treat		32	39		57.0			128
Juniper	*pre-treat*		1						1
	post treat		1.0						1
Pre-Treat Total		34	422	1,234	593	365	1,228	363	4,239
% of total tree cover		<1%	10%	29%	14%	9%	29%	9%	100%
Post-Treat Total		758	872	734	9	910	886	70	4,239
% of total tree cover		18%	21%	17%	<1%	21%	21%	2%	100%
Net Change Post-Treatment		**+**	**+**	**-**	**-**	**+**	**-**	**-**	

HSS 2T – represents seedlings and saplings. HSS-3 represents younger stands with sapling and pole sized trees. HSS-4 stands are mature with trees greater than 9 inches DBH. HSS-A represents stands with a crown closure of less than 39%, HSS-B is 40 to 69%, and HSS-C greater than 70%.

Cumulative Effects

Fuel reduction projects conducted in and near the project area by private landowners would be expected to continue. In combination with proposed treatments on National Forest land, these efforts would generally reduce surface fuels and increase openings in canopies in localized areas.

It is anticipated that widespread MPB caused tree mortality will continue to occur over the next several years. As the epidemic spreads, larger diameter trees will be most susceptible. At the end of the infestation, the residual stands will contain a minor amount of surviving dominant and codominant trees.

The insect killed trees will eventually begin to fall and contribute to coarse woody debris. In a study completed in Southern Oregon, mountain pine beetle killed trees began to fall to the forest floor after five years, with 50% of trees falling within nine years, and 90% falling by 14 years post-attack. In the

relatively dry conditions experienced in the Elkhorn Project Area, these time frames could be longer as the dead trees tend to dry quickly and caseharden.

Dense ponderosa pine forests are at greatest risk of severe losses to mountain pine beetle as the northern Front Range epidemic develops. Nevertheless, losses are likely to be patchy in nature due to a variety of differences between ponderosa pine forests and lodgepole pine forests. Ponderosa pine forests tend to be more variable in density and canopy structure, presenting the beetles with much different environmental conditions that are less attractive to dispersing beetles. Also, ponderosa pine forests do not occur in the vast, extensive landscape pattern typical of lodgepole pine.

The wildland fire management strategy for the project area per the Forest Plan requires direct control. Wildfires occurring in the future within the project area would be suppressed to protect other resource values and uses. The historic range of variation analysis indicates that stand structure within the project area was influenced by mixed severity fires in the lower ponderosa pine sites and stand replacing fire in the higher elevation lodgepole pine. The proposed treatment and active future fire suppression activities would reduce the chances of stand replacing crown fires from occurring. As a result, tree age and insect or pathogen induced mortality may be more of an influence on stand structure dynamics than wildfire into the future. Consequently, to maintain the desired condition of the stands, future management interventions such as controlled surface fires or thinning may be needed.

A list of Knutson-Vandenberg (KV) projects for the Elkhorn project can be found in the Silviculture specialist report in the project record.

Wildlife

Affected Environment

All ARNF threatened, endangered, proposed, sensitive, and MIS species were considered in this evaluation and the following list of species were identified as either being present within or having habitat that occurs within the project area that potentially could be affected by the proposed action. Greater detail on species life history, distribution and existing habitat can be found in the Wildlife specialist report in the project file.

Section 7 of the Endangered Species Act of 1973, as amended, requires federal agencies to ensure that actions authorized, funded, or carried out by them are not likely to jeopardize the continued existence of threatened or endangered species, or result in the destruction or adverse modification of their critical habitats. In addition, the Forest Service has established direction in Forest Service Manual 2670 to include habitat management for sensitive species. This process ensures that threatened, endangered, and sensitive (TES) species receive full consideration in the decision-making process.

A total of 38 terrestrial species were evaluated to determine if the species or their habitat is present within the project area: 6 federally threatened or endangered species; 24 Forest Service sensitive species; and 10 management indicator species (including 2 MIS species that also are Forest Service sensitive). For a complete list of all species considered, refer to the Wildlife Specialist Report. Twenty species, as listed in the following table, were carried forward in the report for analysis, and the effects of the proposed action and alternatives for each species were addressed.

Table 15. Federally-listed wildlife species and Forest Service management indicator and sensitive species included in the Elkhorn wildlife project analysis.

Threatened / Endangered Species	Management Indicator Species	Sensitive Species			
		Mammals	Birds	Amphibians	Insects
Canada lynx Preble's meadow jumping mouse Wolverine	Bighorn sheep Elk Mule deer Golden-crowned kinglet Hairy woodpecker Mountain bluebird Pygmy nuthatch Warbling vireo	Marten Wolverine Bighorn sheep Pygmy shrew Fringed myotis Townsend's big-eared bat Hoary bat	Northern goshawk Flammulated owl Boreal owl Olive-sided flycatcher	N/A	N/A

Table 16. Summary of determinations and estimation of effects by alternative for the Elkhorn Project.

Species	Status	Alt. 1 – No Action	Alt. 2 – Proposed Action
Canada lynx	Threatened	NES[1], No Effect to Critical Habitat	[2]NLAA for species, No Effect to Critical Habitat
Preble's meadow jumping mouse	Threatened	NES, No Effect to Critical Habitat	[2]NLAA for species, No Effect to Critical Habitat
Wolverine	Proposed Threatened	NES	NES
American marten	FS Sensitive	NI[3]	MAII[4]
Bighorn sheep	FS Sensitive	NI	Beneficial Impact
Pygmy shrew	FS Sensitive	NI	MAII
Fringed myotis	FS Sensitive	NI	MAII
Townsend's big-eared bat	FS Sensitive	NI	Beneficial Impact
Hoary bat	FS Sensitive	NI	MAII
Northern goshawk	FS Sensitive	NI	MAII
Flammulated owl	FS Sensitive	NI	MAII
Boreal owl	FS Sensitive	NI	MAII
Olive-sided flycatcher	FS Sensitive	NI	MAII
Grey wolf	FS Sensitive	NI	NI
Bighorn sheep	MIS for Openings within/adjacent to forest	NEU[5]	POS[6]
Elk	MIS Young to Mature Forest & Openings	NEU	POS
Mule deer	MIS Young to Mature Forest & Openings	NEU	POS
Golden-crowned kinglet	MIS for Interior Forest	NEU	POS
Hairy woodpecker	MIS for Young to Mature Forest	NEU	POS
Mountain bluebird	MIS for Openings	NEU	POS

Pygmy nuthatch	MIS for Old Growth	NEU	POS
Warbling vireo	MIS for Aspen	NEU	POS

[1]NES: No Effect to Species; [2]NLAA: May Affect, but Not Likely to Adversely Affect; [3]NI: No Impact; [4]MAII: May adversely impact individuals, but not likely to result in a loss of viability in the planning area, nor cause a trend towards federal listing; [5] NEU: Neutral Influence, no change to planning unit populations; [6]POS: Positive Influence, no change to planning unit populations

Direct and Indirect Effects to TES and MIS (No Action and Proposed Action)
Projected effects to wildlife, both as a result of the No Action and the Proposed Action alternatives, are grouped by species in the text that follows. The table above summarizes the determinations of effects to species by alternative.

Federally-Listed Species
Canada Lynx: Considered critically imperiled in Colorado (NatureServe 2005), native lynx historically occurred sparsely in mountainous areas above 9,000 feet elevation in the Park, Gore, San Juan, and La Plata mountains, and the White River Plateau. From 1999 through 2006, a total of 218 lynx were reintroduced by CDOW into the San Juan Mountains of southwestern Colorado. Denning habitat includes forested areas, primarily high elevation spruce-fir, which provides adequate cover and habitat for its primary prey, the snowshoe hare (*Lepus americanus*). Appropriate habitat usually includes a dense understory of thickets and windfalls, and requires minimal human disturbance. Den sites tend to be in mature or old growth stands with a high density of logs. Foraging areas include early successional forests with a high density of stems and branches that protrude above the snow. The primary limiting factor for lynx populations is the abundance of snowshoe hare and alternative prey species, which in turn is limited by availability of winter habitat. Suitable lynx habitat is present within the mesic lodgepole pine and mixed lodgepole/spruce-fir forest types in the upper elevations of the western portion of the planning area.

Alternative 1 (No Action): Under the no action alternative, no timber harvest, fuels reduction, or other proposed activities would be implemented. Consequently, there would be no direct or indirect effects to lynx or lynx habitat.
Alternative 2 (Proposed Action): Approximately 11,500 acres of the Redfeather Lynx LAU overlap the planning area above 9,000 feet elevation. Within this area, approximately 819 acres of suitable lynx habitat are located within treatment units. Of this, 431 acres would be treated with clearcut or group shelterwood harvests (even-aged management), and 388 acres would be treated with selective harvest or group selection harvest (uneven-aged management). The acres proposed for even-aged treatment, which would become unsuitable for lynx post-treatment, represent approximately 0.5% of the suitable acres within the LAU. The acres proposed for uneven-aged management also represent approximately 0.5% of the suitable acres within the LAU, but these acres likely would still provide suitable lynx habitat post-treatment. Even-aged management treatments are planned for single-story lodgepole pine stand types that lack dense horizontal cover near the ground. Dense horizontal ground cover provides good snowshoe hare and lynx habitat. Uneven-aged management treatments are planned for mature multi-storied and late-successional stands that contain mixed lodgepole pine and spruce-fir that do have sufficient dense horizontal cover near the ground. These treatments by stand type meet the direction for allowable harvest treatments in the SRLA Implementation Guide. If the proposed action is selected, the determination for Canada Lynx is 'may affect, not likely to adversely effect'. Because designated

critical habitat for lynx is not present on the ARNF or in Colorado, the Elkhorn project will have "no effect" to lynx critical habitat.

Preble's Meadow Jumping Mouse (PMJM): This species is considered Critically Imperiled in Colorado. The U.S. Fish and Wildlife Service (FWS) listed PMJM primarily due to rapid loss of habitats from development on private lands along Colorado's Front Range. Development of wetlands, wet meadows, and closure of irrigation canals and ditches for commercial and private real estate posed a serious and rapid decline in available habitat for the mouse. The Preble's meadow jumping mouse subspecies currently occurs only along Colorado's Front Range and in southeastern Wyoming and occurs mostly in low undergrowth consisting of grasses, forbs, or both, in open wet meadows and riparian corridors, or where tall shrubs and low trees provide adequate cover. The active period for the mouse is estimated to be May 1 through October 31; they hibernate during the remaining period.

Due to the elevation range within the Elkhorn planning area, little potential Preble's habitat is located in proximity to proposed actions for this project. Designated critical habitat for Preble's mouse is not present within the analysis area, and the nearest critical habitat is located approximately 3 miles downriver on the mainstem Cache la Poudre River from the eastern edge of prescribed burn unit 1. The prescribed burn unit is the only proposed unit near potential Preble's habitat, which may occur along the mainstem Cache la Poudre River. However, the burn unit is separated from the river and potential riparian habitat by Highway 14.

Alternative 1 (No Action): Under this alternative, the proposed burn would not be implemented, and therefore no direct or indirect effects would occur in or adjacent to Preble's habitat.
Alternative 2 (Proposed Action): Suitable habitat is not present that could be impacted by the prescribed burn unit or other proposed management actions, with the exception of watershed restoration work along the lower one mile of Sevenmile Creek (below 7,600 feet). Habitat or ground disturbance from the watershed improvement work along this one mile reach is estimated at less than 500 square feet total. Consequently, the proposed Elkhorn project may affect, but is not likely to adversely affect Preble's meadow jumping mouse. Because designated critical habitat is not present in proximity to project activities, Alternative 2 would have no effect to Preble's mouse critical habitat. This restoration work is specifically aimed at aquatic/fish habitat improvement, but it should lead to improved riparian habitat conditions that would also benefit Preble's habitat.

Wolverine: This species is considered Critically Imperiled in Colorado. Wolverines are solitary, wide-ranging animals that exist in low densities in large roadless or isolated areas. Suitable habitat includes alpine and arctic tundra and boreal and mountain forests (primarily coniferous). Wolverines are omnivorous, feeding on small mammals, birds, fish, carrion, and plant material. In winter the diet is mostly mammalian prey and carrion, with more diversity at other times of the year. Suitable wolverine habitat is present within the Elkhorn planning area. Primary wolverine habitat, which may be suitable for resident adults, likely would largely overlap suitable lynx habitat.

Alternative 1 (No Action): Under the no action alternative, timber harvest, fuels reduction, or other proposed activities would not be implemented. Consequently, there would be no direct or indirect effects to wolverine or wolverine habitat.

Alternative 2 (Proposed Action): Approximately 819 acres of timber harvest units are proposed within suitable wolverine habitat within the Elkhorn planning area. Of this, 431 acres would be clearcut or even-aged harvest treatments, with the remaining 388 acres treated by uneven-aged harvest practices. Due to the small scale of these treatments relative to wolverine home range and habitat needs, appreciable impacts to wolverine habitat quality are not expected to occur. Consequently, the proposed Elkhorn Vegetation project is "will not affect" the wolverine.

Forest Service Sensitive Species

American Marten: The marten is considered Apparently Secure in Colorado, marten occur throughout Alaska, Canada and the lower 48 states except for the Midwest and the South. Marten are considered common in subalpine forest, Douglas-fir, lodgepole pine and high-elevation riparian habitats. Voles and mice may constitute over 60-88% of the marten diet, but other small mammals also are eaten. Marten are crepuscular to nocturnal, though they may exhibit diurnal behavior in the summer where diurnal ground squirrels are an important prey source. Marten remain active year-round and rely upon downed logs, woody debris, brush piles and rootwads to access the subnivean environment in search of food. Marten are generally tolerant of human disturbance, but are vulnerable to habitat loss or modification. Suitable marten habitat is present in the Elkhorn planning area. High quality habitat would occur in the same forest types described above for wolverine habitat, specifically the mesic lodgepole pine and mixed lodgepole/spruce-fir forest types.

Alternative 1 (No Action): Suitable marten habitat occurs across the higher portions of the planning area. With this alternative, proposed activities would not be implemented, and suitable habitat would not be altered.

Alternative 2 (Proposed Action): Suitable marten habitat that would be impacted by the proposed treatments units, as described above, generally is of high quality. Approximately 431 acres would be clearcut harvested, which would remove marten habitat. 388 acres would be treated with selective harvest or group selection harvest methods and salvage harvest of beetle-killed and hit trees, which likely would substantially reduce marten habitat quality. Consequently, the proposed Elkhorn Vegetation project may impact individuals, but is not likely to result in a loss of viability within the planning area (ARNF), nor cause a trend towards federal listing for American marten.

Rocky Mountain Bighorn sheep: This species is Apparently Secure in Colorado. Bighorn sheep have a wide ranging distribution, with numerous herds dispersed throughout the state's mountains and foothills. Two subspecies exist in Colorado, *Ovis canadensis canadensis*, Rocky Mountain bighorn (native), and *O. c. nelsoni*, the desert bighorn (introduced). Bighorn sheep habitat is present only within the southern portion of the project area, associated with the steep open slopes within the Poudre Canyon. Bighorn sheep occur throughout Colorado's mountains and foothills in areas consisting primarily of very steep, rocky terrain. Suitable habitat is generally defined as areas that contain numerous grasses, shrubs and rock cover as well as ample escape routes and good visibility. Bighorn sheep are grazers, with a predominant diet consisting of grasses, forbs, and browse.

Alternative 1 (No Action): No treatment activities would occur within bighorn habitat, and habitat conditions would remain unchanged. Forested areas would continue to grow denser over time, until disturbance processes occurred, such as wildfire, beetle-caused tree mortality, or natural inter-tree

suppression mortality. Without wildfire, the grassland/shrubland habitats would likely have increasing densities of shrubs and conifer encroachment over time.

Alternative 2 (Proposed Action): Approximately 600 acres of bighorn habitat are within the proposed burn unit. Although the burning treatment would maintain and improve bighorn habitat, it is possible there could be some temporary displacement of bighorn to adjacent habitat during project activities. However, this would not be expected to cause adverse impacts to bighorn populations because of the availability of winter and summer range habitat in adjacent areas, and also because of the seasonal restriction for prescribe burn unit that would prevent disturbance during the lambing and summer concentration season. The prescribed burn should result in an increase in preferred sheep habitat by opening up areas that may have become moderately dense with tall shrubs or trees in the absence of wildfire. Therefore, it is expected that the proposed Elkhorn project would have a beneficial impact to bighorn sheep habitat, but likely would result in no change to populations at the planning unit (ARNF) level with the proposed action Alternative 2.

Pygmy Shrew*:* Considered Imperiled in Colorado, pygmy shrews are Colorado endemics with relatively unknown status, trend and distribution. Pygmy shrew occurrence in Colorado is one of two disjunct populations in the lower 48 states, with the other population occurring in the Appalachians. In Colorado, pygmy shrews are thought to occur in higher elevations (above 9600 feet). Pygmy shrews use a variety of moist habitats, preferring grassy openings within a boreal forest matrix. The species has been found in subalpine forests (spruce, fir, and lodgepole pine), clear-cut and selectively logged forests, forest-meadow edges, boggy meadows, willow thickets, aspen-fir forests, and subalpine parklands.

Alternative 1 (No Action): Because no timber harvest activities would occur, no effects to potential pygmy shrew habitat would occur.

Alternative 2 (Proposed Action): Potential pygmy shrew habitat is present in treatment units, as well as the higher elevation forest types of the planning area. Habitat conditions would be changed substantially by harvest treatments units discussed above, and it is possible that direct mortality of pygmy shrews may occur from harvest operations equipment. However, abundant forest types that should provide suitable habitat surround the harvest units, and the harvest units themselves may provide shrew habitat once herbaceous and shrub habitat reestablishes after several years. Therefore, it is concluded that the proposed project may impact individuals, but is not likely to result in a loss of viability within the planning area (ARNF), nor cause a trend towards federal listing for pygmy shrew.

Fringed Myotis: This bat is considered Vulnerable in Colorado. This species ranges in western North America from south-central British Columbia, south through western United States to southern Mexico. Suitable tree roosting habitat consists of largely late-successional pine with high densities of snags in early to medium stages of decay. Where available, caves, buildings, underground mines, rock crevices in cliff faces and bridges are used for maternity and night roosts, while hibernation has only been documented in buildings and underground mines. Diets consist mainly of beetles and foraging usually occurs over vegetative canopies.

Alternative 1 (No Action): As described above, no treatments would occur and forest stands would continue to grow under relatively natural processes. Because no timber harvest or burning would occur, there would be no chance for direct impacts by removal of a roost tree. Potential foraging habitat would remain unchanged in the short term.

Alternative 2 (Proposed Action): Prescribed burning within potential fringed myotis habitat is proposed on approximately 100 to 200 acres in the very southeast corner that lies mostly below 7500 feet in shrub/grassland habitat. Foraging habitat for fringed myotis would remain unchanged in this area and may be improved further upslope in moderately dense forest stands by the expected increase in herbaceous and shrub vegetation that typically occurs after stands are opened up to more sunlight, which may increase prey abundance. The thinning treatment in ponderosa pine units noted above also would maintain or restore more open forest conditions that are more conducive to fringed myotis foraging. The overall snag project criteria may result in low to moderate levels of snag habitat for roosting within treatment units, depending on the timing of unit treatments (see snag discussion at end of this discussion for further information about snag recruitment).

Although smaller trees generally are being targeted by the thinning treatments, some larger trees and snags likely will be cut and direct impacts may occur if an occupied roost tree is removed. Unlikely and/or minor indirect impacts of treatments may include removal of potential roosting trees, although the majority of larger trees would be retained. In the long-term, the proposed thinning treatments would maintain and improve habitat for this species by restoring more open forest habitat conditions and hastening development of late-successional (mature and old-growth) forest conditions. Additionally, the fuels thinning treatments would reduce the potential for large stand-replacing wildfires that could remove suitable habitat for decades. Implementation of Alternative 2 may impact individuals, but is not likely to result in a loss of viability within the planning area (ARNF), nor cause a trend towards federal listing.

Townsend's Big-eared Bat: This bat is considered Imperiled in Colorado. The main portion of the species range occurs in the western half of the United States, extending northward across the Canadian border into central British Columbia, and southward into western and central Mexico. In Colorado, it occurs over most of the western two-thirds of the state and extreme southeastern Colorado to elevations of about 9,500 feet. In Colorado, Townsend's have been found roosting during the summer in caves that range from 6120 to 9890 feet elevation, and it is surmised that they could occur in lodgepole and spruce-fir forests if suitable cave or cave-like roost sites are present. Although it is associated with a wide variety of habitats, its distribution tends to be geomorphically determined and is strongly correlated with the availability of caves or cave-like roosting habitat (e.g., abandoned mines) (Gruver and Keinath 2006, Schmidt 2003). They also will use abandoned buildings and crevices on rock cliffs for refuge. Bats glean insects from leaves and foraging mostly occurs over water, along the margins of vegetation, and over sagebrush.

Alternative 1 (No Action): As described above, no treatments would occur, so there would be no chance for direct effects to occur to foraging habitat or roost sites that may be located within treatment units. Because no timber harvest or burning would occur, forest stands would continue to grow under relatively natural processes, and potential foraging habitat would remain unchanged in the short term.

Alternative 2 (Proposed Action): The proposed timber harvest treatments include both clearcut harvest, and selective harvest and thinning that would treat primarily understory trees and leave most of the mature overstory trees within potential foraging habitat. There are no known roosts, hibernacula, or maternity sites, or structures (e.g. caves or abandoned mines) that could provide such roosting habitat, within the project area, so there would be little chance for direct effects to these habitat features from project activities. Treatments may have a long-term positive effect on foraging habitat

due to maintaining and restoring more open forest conditions of ponderosa pine and mixed Douglas-fir/ponderosa stands in treatment units in these forest types. The thinning also would reduce the risk of large stand-replacing wildfire in the dry forest types of ponderosa pine and mixed conifer. Townsend's bats have evolved in low-intensity fire-associated environments, so impacts are expected to be minimal (Schmidt 2003). The clearcut treatment units may create foraging habitat by creating openings and edge habitat in what currently is dense single-story lodgepole pine stands. The proposed Elkhorn project should result in a beneficial impact to this species.

Hoary Bat: The hoary bat is considered "demonstrably widespread, abundant, and secure" in Colorado. It is the most widespread of all North American bats, occurring throughout North America, except above the limits of trees in Canada. In Colorado, the hoary bat probably occurs statewide from the plains to timberline. In Colorado, the species is frequently taken in ponderosa pine forests where large deciduous trees are lacking. They reportedly have strong preferences for moths, but also are known to eat beetles, flies, grasshoppers, termites, dragonflies, and wasps. Loss of roosting habitat due to timber harvest is likely the biggest threat to this species.

Alternative 1 (No Action): As described above, no treatments would occur and forest stands would continue to grow under relatively natural processes. Because no timber harvest or burning would occur, there would be no chance for direct impacts by removal of a roost tree. Potential foraging habitat would remain unchanged in the short term.

Alternative 2 (Proposed Action): Timber harvest treatment within potential hoary bat habitat is proposed on approximately 2,770 acres total. The treatments in ponderosa pine and mixed conifer units (989 acres) generally are intended to enhance stand conditions by removing primarily smaller diameter trees, while leaving a residual stand of larger trees. It is estimated that canopy cover classes would likely be reduced from high (class C) to moderate (class B), or moderate to low (class A). Foraging habitat may be improved by the expected increase in herbaceous and shrub vegetation that typically occurs after stands are opened up to more sunlight, which may increase insect prey abundance. The treatment also would maintain or restore more open forest conditions that are more conducive to hoary bat foraging. Approximately 1393 acres of clearcut or shelterwood harvest would occur in lodgepole-dominated stand types, and 388 acres of selective harvest or group selection in mixed lodgepole/spruce-fir units. These treatment units may create foraging habitat by creating openings and edge habitat in what currently is dense single-story lodgepole pine and mixed lodgepole/spruce-fir stands.

Although smaller trees generally are being targeted by the thinning treatments, some larger trees that may provide suitable roosting conditions could be cut and direct impacts may occur if an occupied roost tree is removed. However, because this species roosts in the foliage at the ends of branches, it is likely that bats roosting on a tree would be able to fly away before potential injury from tree felling occurred. Unlikely and/or minor indirect impacts of treatments may include removal of potential roosting trees, although the majority of larger trees would be retained in thinning units. In the long-term, the proposed thinning treatments would maintain and improve habitat for this species by restoring more open forest habitat conditions and hastening development of late-successional (mature and old-growth) forest conditions. Additionally, the fuels thinning treatments would reduce the potential for large stand-replacing wildfires that could remove suitable habitat for decades. Implementation of Alternative 2 may impact individuals, but is not likely to result in a loss of viability within the planning area (ARNF), nor cause a trend towards federal listing.

Northern Goshawk: The goshawk is considered vulnerable in Colorado and it is a rare to uncommon resident of the foothills and mountains. It is deemed a rare spring and summer migrant and winter resident in western valleys, mountain parks, and on the eastern plains. This species requires large blocks of mature forest for nesting and foraging, often associated with small (less than one acre) openings; foothills populations thrive in mosaic landscapes. Opportunistic hunters, they prey on small mammals (squirrels, rabbits, etc.) and birds.

Alternative 1 (No Action): Many of the treatment units appear to provide goshawk habitat, and goshawk nesting activity was detected during surveys of the more probable habitat. However, no treatments would occur under Alternative 1, so there would be no chance for direct effects to nesting goshawks or goshawk habitat that may be located within treatment units. Because no thinning or clearcut treatments would occur, forest stands would continue to grow under relatively natural processes, and potential habitat would remain unchanged in the short term. Without the thinning treatments, stands would grow more slowly than with treatment, and they also would be more susceptible to wildfire and insect attack (i.e. mountain pine beetle). Alternative 1 would have no impact on northern goshawk.

Alternative 2 (Proposed Action): Two goshawk nests are known within the analysis area, but treatment units are located far enough away that no disturbance should occur to these nest sites when active. Forest stands in and near project units do provide suitable goshawk nesting and foraging habitat. The proposed thinning treatments would remove smaller diameter trees and some overstory trees, as well as salvage harvest of most snags, while leaving a residual stand of larger dominant trees. Although the treatments would initially result in a reduction of canopy cover, in the long-term these treatments should improve conditions for goshawk habitat by hastening development of mature and old-growth forest stands that may provide goshawk habitat, as well as maintaining the limited areas of existing large tree structure. Thinning in the very dense, pole-sized, or “doghair” conifer stands may improve habitat quality by reducing tree densities in the understory and midstory that currently might make it difficult for goshawks to utilize such stands due to limited flight space between trees and branches. Growth rates of residual trees would be increased after the thinning treatments over growth rates without treatments because of the reduction in stem densities and basal area, which would reduce inter-tree competition for water and nutrients. Additionally, residual ponderosa pine, Douglas-fir, and lodgepole pine trees should be healthier and more resilient after thinning, which may prevent some insect mortality from mountain pine beetle or other insects. Beetle activity in the lodgepole pine stands in this area already is moderately high. The proposed fuel reduction thinning treatment also would reduce the risk of high-intensity stand-replacing wildfire and loss of potential habitat in the future. Potential habitat would be removed by the proposed even-aged treatments (clearcut, overstory removal, and shelterwood) on approximately 1393 acres.

Due to changes to forest canopy cover from thinning and even-aged harvest treatments under this alternative, the Elkhorn proposed action may adversely impact individuals, but is not likely to result in a loss of viability within the planning area (ARNF), nor cause a trend towards federal listing for the northern goshawk.

Flammulated Owl: This owl is apparently secure in Colorado. The flammulated owl is now thought to occur more widely than previously thought. The owls are present in the ponderosa pine and Douglas-fir

forests of the ARNF and confirmed summer breeding does occur in Larimer County. These owls occur regularly from 6,000 to 10,000 feet elevation and prefer old growth or mature ponderosa pine. Key habitat features seem to be the presence of larger trees and snags, scattered clusters of shrubs or saplings, clearings, and a high abundance of nocturnal arthropod prey. These birds arrive in Colorado in late April to early May and most owls migrate from Colorado by early October.

Alternative 1 (No Action): Because no treatment would occur, there would be no chance for direct effects to flammulated owl nest trees. Suitable habitat is present within portions of the analysis area, as described above. Although the proposed thinning treatments would reduce the chance of stand-replacing wildfire and potentially the level of insect mortality, these disturbance events are uncertain. Suitable habitat is present, and Alternative 1 would maintain this condition. Compared to the no action alternative, the proposed action may lead to a more rapid development of mature and old-growth forest habitat conditions over a wider area than is now present.
Alternative 2 (Proposed Action): The proposed action calls for hand or mechanical low thinning treatment on approximately 989 acres of ponderosa and mixed conifer forest types, much of which may provide suitable habitat. Suitable flammulated owl habitat is present throughout the lower-elevation project units dominated by ponderosa pine and Douglas-fir. Foraging habitat should be improved by thinning activities and by the expected increase in herbaceous and shrub vegetation that occurs after stands are opened up to more sunlight. Additionally, the risk of stand-replacing wildfire and consequent long-term loss of forest habitat would be reduced by the fuel reduction treatments.

The overall snag project criteria may result in low to moderate levels of snag habitat for owl nesting within treatment units, depending on the timing of unit treatments (see snag discussion later in this discussion for more detail). For the proposed thinning treatments, direct impacts may occur if an occupied nest tree is removed during the nesting season. Unlikely and/or minor indirect impacts of treatments include removal of potential nesting and roosting trees. All thinning treatments are expected to maintain or enhance conditions preferred by flammulated owls by reducing stand density in younger dense stands and removing understory thickets, by maintaining the majority of mature overstory trees, and by hastening development of mature and old-growth stand conditions by reducing stem densities.

Any impacts from Alternative 2 are expected to be over the short-term with long-term benefits overall. The scale and the proposed prescriptions and their enhancement of owl habitat warrant a determination of may impact individuals, but is not likely to result in a loss of viability within the planning area (ARNF), nor cause a trend towards federal listing for flammulated owl.

Boreal Owl: Considered Imperiled in Colorado, boreal owls are a rare to locally common resident in higher mountains and accidental in the lower mountains. In Colorado, boreal owls occur mainly in mature to old age (over 150 years) Engelmann spruce and subalpine fir above 9,000 feet elevation, but they also frequent higher elevation lodgepole pine and aspen. They prefer wet situations near streams or bogs for foraging. Small mammals are primary prey, but they also will consume birds and insects. As secondary cavity nesters, they usually occupy holes excavated by woodpeckers or flickers. In Colorado, nest building activities range from mid-April to early-June. Primary threats to boreal owls may be the indirect effects of forest harvesting practices which may reduce prey populations, remove forest structure used for foraging, and eliminating nesting cavities

Alternative 1 (No Action): Because no treatment would occur, there would be no chance for direct effects to boreal owl nest trees. Suitable habitat is widespread within the analysis area, especially in the higher elevation spruce-fir and mixed lodgepole/spruce-fir forest types. Suitable habitat is present, and Alternative 1 would maintain this condition.
Alternative 2 (Proposed Action): The proposed action calls for clearcut and group shelterwood harvesting and uneven-aged treatments and salvage harvest on approximately 819 acres that may provide boreal owl habitat. Suitable boreal owl habitat is present throughout the higher-elevation project units dominated by mesic lodgepole pine and spruce-fir. The proposed uneven-aged management (selective harvest and group selection) and salvage harvesting (388 acres) would reduce habitat quality for boreal owls, but owl habitat may still be present post-treatment within these units. These stands may continue to provide nesting, roosting, and foraging habitat for boreal owls due to the retention of some forest canopy. The even-aged harvest treatment (clearcut, shelterwood, and overstory removal) would remove potential owl habitat on 431 acres.

The overall snag project criteria would result in low to moderate levels of snag habitat for owl nesting, particularly in relation to late-successional mesic lodgepole pine and spruce-fir forest types, depending on the timing of unit treatments (see more discussion on snags at the end of this section). For the proposed timber harvest units within boreal owl habitat, direct impacts may occur if an occupied nest tree is removed during the nesting season. Indirect impacts of treatments include removal of and a reduction in potential nesting and roosting trees. Alternative 2 may impact individuals, but is not likely to result in a loss of viability within the planning area (ARNF), nor cause a trend towards federal listing for boreal owl.

Olive-sided Flycatcher: Considered vulnerable in Colorado, the olive-sided flycatcher breeding habitat occurs throughout the US and Canada. Non-breeding territory occurs in central and South America as far south as Peru and Brazil, associated with the Andes Mountains and the Amazon Basin. Causes of olive-sided flycatcher decline are not well known but may be due to habitat changes in the breeding range and/or in migration and wintering areas. Found in forested habitats, snags and the presence of conifers appear to be the two most important components of olive-sided flycatcher habitat. Their diet is made up almost entirely of flying insects, and this bird has a special fondness for wild honeybees and other Hymenoptera. These flycatchers breed in old-growth coniferous forest over most of their range, including Colorado.

Alternative 1 (No Action): Because no treatment would occur, there would be no chance for direct or indirect effects to birds or suitable habitat that may be present in treatment units.
Alternative 2 (Proposed Action): Although the even-aged harvest treatments within lodgepole pine stands would remove some suitable forest habitat (approximately 1393 acres), it also could provide foraging openings and edge habitat for flycatchers. The uneven-aged treatments (388 acres of selective harvest and group selection) would generally retain some forest canopy habitat, and also would create small openings for flycatcher foraging. A low to moderate level of snags (3/acre) would be retained that would provide some perch site within clearcut harvest units, in addition to the unit edges. The thinning and salvage treatments (989 acres) primarily would remove smaller trees and ladder fuels, while leaving stands of larger dominant trees. Treatment effects on the stands would be to raise average canopy height, increase average tree diameter, and reduce canopy cover in denser stands. By reducing stem densities, stands would develop into mature and old-growth conditions more quickly than without the

treatments, thereby improving or providing potential olive-sided flycatcher habitat in the long-term. Alternative 2 may adversely impact individuals, but is not likely to result in a loss of viability within the planning area, nor cause a trend towards federal listing for olive-sided flycatcher.

Gray Wolf: Historically, wolves occurred throughout Colorado before they were extirpated by the mid-1930s. Wolves were eradicated from the state by shooting, trapping, and poisoning because of their depredation on livestock. Currently, wolf populations are not known to be present on the ARNF or in Colorado. However, a few wolves have been documented in Colorado within the last 10 years. Wolf populations have been restored to Wyoming, Idaho, and Montana through reintroductions in 1995 and 1996 by the USFWS. Those populations recently were removed from the Endangered Species List by USFWS, and they are now managed by the respective State wildlife agencies. It is thought that wolves could eventually reestablish populations in Colorado through animals migrating from Wyoming, or migrating Mexican wolves from New Mexico. In the northern Rocky Mountains, packs typically occupy and defend a territory of 200 to 400 square miles. The gray wolf is an opportunistic carnivore that is adapted to hunt primarily large ungulate prey species, such as elk, deer, and moose. Wolves are not habitat specific, but they generally occur where there is plentiful large prey. Suitable wolf habitat occurs throughout the Canyon Lakes Ranger District and within the Elkhorn planning area. If wolves were to reestablish in the area, abundant elk, deer, and moose populations should provide ample prey for wolves.

Alternative 1 (No Action): Suitable wolf habitat occurs across the planning area. With this alternative, proposed activities would not be implemented, and suitable habitat would not be altered.
Alternative 2 (Proposed Action): Because wolves are habitat generalists and primarily prey on large ungulates, habitat changes from proposed timber treatments would not adversely impact wolf habitat. Proposed timber treatments (thinning and clearcuts) would be expected to enhance habitat conditions for wolf prey species, primarily elk, deer, and moose, by improving forage conditions in thinned and clearcut units. Decommissioning of routes and roads also may improve wolf habitat by also improving elk and deer habitat. Although gray wolf populations are not currently present in the planning area or on the ARNF, suitable wolf habitat that would be impacted by the proposed treatment units and project activities generally is of high quality. As described above, habitat changes from timber treatments and road decommissioning would likely improve wolf habitat by providing enhanced forage habitat for wolf prey species. Consequently, the proposed Elkhorn Vegetation project would have no impact for gray wolf.

Forest Service Management Indicator Species (MIS)
Elk *(*MIS for young to mature forest and openings): In Colorado, where they are considered secure, elk range throughout the western two-thirds of the state, generally at elevations above 6,000 feet, although they are occasionally reported in the South Platte River drainage on the eastern plains. Generalist feeders, elk are both grazers and browsers. Elk breed in the fall with the peak of the rut in Colorado occurring during the last week of September and first week of October. Elk tend to inhabit higher elevations during spring and summer and migrate to lower elevations for winter range.

Alternative 1 (No Action): With this alternative, no treatments would occur. Stands would continue to progress in development until disturbance events such as wildfire or insect mortality occurs, or until inter-tree competition causes suppression mortality. Although as described below, the proposed timber

harvest and burning treatments may have a positive influence on elk habitat conditions, no direct or indirect effects are expected from the no-action alternative because habitat conditions generally would remain unchanged. Therefore, Alternative 1 is expected to have a neutral influence on elk habitat, and no changes to elk populations at the planning unit level (ARNF) are expected.

Alternative 2 (Proposed Action): Even-aged harvest treatments (clearcut, overstory removal, and shelterwood) would create early seral openings that would provide quality forage habitat. The thinning and prescribed fire treatments are expected to improve forage conditions for elk because they should stimulate and rejuvenate herbaceous and shrub species growth in the more open forest conditions created by the treatments and by consumption of duff in the burn unit. Vegetative hiding cover within even-aged treatment units would be removed. In thinning units, it would be reduced in the short-term by the reduction in seedling, sapling and pole-sized trees. However, cover still would be provided in areas outside of treatment units, and by topography. The 1,200 acres proposed for prescribed burning are likely to improve forage conditions for elk as new grasses, forbs, and shrubs would populate the burned area over time. Grasses and forbs in particular would respond rapidly in a few years, while shrubs should come back over a somewhat longer period of time (approximately 5 to 15 years).

Project activities taking place from May 15 to June 15 could cause temporary displacement of cow elk using the area during calving season, and activities from June 15 through August 15 could cause temporary displacement of elk in the summer concentration area. However, such displacement would be temporary and localized because harvest activities would be localized in scope at any one time (i.e. not all units would have simultaneous treatment implementation). However, two project design criteria are included that would limit the potential disturbance of timber harvest activities to certain groups of units during the calving and summer concentration periods for elk (see Wildlife project design criteria section). Winter range is quite limited within the project area, and consequently no seasonal restrictions are necessary for winter range habitat.

Slash created from the treatments would be disposed of by pile and burn, chipping, or mastication. These disposal methods are not expected to negatively influence elk. They may temporarily leave the area while treatment occurs, but are expected to return once operations are completed.

Overall, the proposed treatments of Alternative 2 are expected to create favorable changes to elk habitat primarily by creating openings and reducing stand canopy cover, which should result in an increase of grasses, shrubs, and forbs over existing conditions. These improved forage conditions should maintain healthy local populations. An overall positive influence is expected locally at the project level, but changes to elk populations or trends at the planning unit level (ARNF) are not expected from the proposed project.

Mule Deer (MIS for openings within and adjacent to forest): Apparently Secure in Colorado, mule deer are found statewide in all ecosystems. Mule deer spring and summer ranges most typically are mosaics of meadows, aspen woodlands, alpine tundra-sub alpine forest edges, or montane forest edges. Seasonally, the animals appear to be relatively sedentary, staying within areas of about 100 to 2200 acres.

Alternative 1 (No Action): With this alternative, no treatments would occur. Stands would continue to progress in development until disturbance events such as wildfire or insect mortality occurs, or until

inter-tree competition causes suppression mortality. Although as described below, the proposed timber harvest and burning treatments may have a positive influence on deer habitat conditions, no direct or indirect effects are expected from the no-action alternative because habitat conditions generally would remain unchanged. Therefore, Alternative 1 is expected to have a neutral influence on mule deer habitat, and no changes to deer populations at the planning unit level (ARNF) are expected.
Alternative 2 (Proposed Action): Even-aged harvest treatments (clearcut, overstory removal, and shelterwood) would create early seral openings that would provide quality deer forage habitat. The thinning and prescribed fire treatments are expected to improve forage conditions for deer because they should stimulate and rejuvenate herbaceous and shrub species growth in the more open forest conditions created by the treatments and by consumption of duff in the burn unit. Vegetative hiding cover within even-aged treatment units would be removed. In thinning units, it would be reduced in the short-term by the reduction in seedling, sapling and pole-sized trees. However, cover still would be provided in areas outside of treatment units, and by topography. The 1,200 acres proposed for prescribed burning are likely to improve forage conditions for deer as new grasses, forbs, and shrubs would populate the burned area over time. Grasses and forbs in particular would respond rapidly in a few years, while shrubs should come back over a somewhat longer period of time (approximately 5 to 15 years).

As stated previously, all of the treatment units occur within deer summer range habitat. Project activities taking place from June 1 to June 30 could cause temporary displacement of deer using the area during fawning season. However, such displacement would be temporary and localized because harvest activities would be localized in scope at any one time (i.e. not all units would have simultaneous treatment implementation). The two project design criteria for elk also would help to limit potential disturbance of timber harvest activities to certain groups of units during the deer fawning period (see Wildlife project design criteria section). Winter range habitat is limited within the project area, but widely available to the east of the project area. Consequently, no seasonal restrictions are deemed necessary for deer winter range habitat.
Slash created from the treatments would be disposed of by pile and burn, chipping, or mastication. These disposal methods are not expected to negatively influence deer. They may temporarily leave the area while treatment occurs, but are expected to return once operations are completed.
Overall, the proposed treatments of Alternative 2 are expected to create favorable changes to deer habitat primarily by creating openings and reducing stand canopy cover, which should result in an increase of grasses, shrubs, and forbs over existing conditions. These improved forage conditions should maintain healthy local populations. An overall positive influence is expected locally at the project level, but changes to mule deer populations or trends at the planning unit level (ARNF) are not expected from the proposed project.

Golden-crowned Kinglet (MIS for interior forest): Apparently Secure in Colorado, golden-crowned kinglets inhabit conifer forests year-round across the northern U.S. and Canada. This kinglet species was never abundant in Colorado and most occur west of the Continental Divide, so there is not a high likelihood of presence in the project area. Golden-crowned kinglets are most commonly found in spruce/fir forests, but they apparently have a very limited presence in Douglas-fir, lodgepole pine, and ponderosa pine forests. They breed primarily in dense coniferous forests, especially where spruce is present, and winter in coniferous forests (occasionally in deciduous woodland scrub and brush). Golden-

crowned kinglets eat insects and their eggs, and also fruit and seeds. This interior forest species tolerates little change on nesting grounds.

Alternative 1 (No Action): No treatments would occur with this alternative, and limited high-quality kinglet habitat (late-successional spruce-fir) is present in or adjacent to treatment units. Because no treatment would occur, there would be no chance for direct or indirect effects to golden-crowned kinglets or suitable habitat that may be present in treatment units. Consequently, Alternative 1 is expected to have a neutral influence on golden-crowned kinglet habitat, and no changes to kinglet populations at the planning unit level (ARNF) are expected.
Alternative 2 (Proposed Action): Because of the existing habitat types and absence of detections on the CLRD within higher-quality habitats, it is unlikely that golden-crowned kinglets occur in the project area. However, potentially suitable habitat for this species is present, particularly in the late-successional spruce-fir stands at the highest elevations in the analysis area. Approximately 153 acres of mature spruce-fir forest is located within treatment units. These units would be treated with uneven-aged management and salvage logging, which would substantially reduce habitat quality for this species. However, it is a fairly limited amount of acres impacted. Therefore, an overall neutral influence is expected locally, and changes at the planning unit level (ARNF) are not expected from the proposed project.

Hairy Woodpecker (MIS for young to mature forest): Considered Secure in Colorado, hairy woodpeckers occur across the U.S. and Canada, north into west-central Alaska, and breed south to Panama. In Colorado, they breed throughout the mountains and in scattered locations on the plains. Breeding is confirmed in Larimer County. Mountain forests, mixed woodlands and river groves are all suitable habitat. They live throughout Colorado from timberline to the plains, more common in the mountains in summer, and at lower elevations in winter. They occur predominantly in conifers (of all types), although a substantial number use aspen forests and deciduous foothills streams. Six to nine acres per pair is required for successful breeding. Hairy woodpeckers excavate cavities in snags or in live trees with decaying heartwood, and consume a diet that is about 80 percent animal food (wood-boring beetles removed from dead and diseased trees are an important source of food). They also eat other insects, fruits, corn, nuts, and cambium.

Alternative 1 (No Action): No treatments would occur with this alternative, and habitat is widespread in the analysis area for this woodpecker species. Habitat would continue to develop for this species as forest stands grow larger trees and snags are recruited over time. Because no treatment would occur, there would be no chance for direct or indirect effects to hairy woodpeckers or suitable habitat present in treatment units. Consequently, Alternative 1 is expected to have a neutral influence on hairy woodpecker habitat, and no changes to this species' populations at the planning unit level (ARNF) are expected.
Alternative 2 (Proposed Action): Even-aged harvest treatments would remove hairy woodpecker habitat in harvest units because these harvest practices generally remove all overstory trees. Within clearcut units, particularly with a minimum of 3 snags per acre prescribed for retention, these areas would provide little or very low-quality habitat for several decades until the next stand is old enough to begin snag recruitment. The proposed thinning treatment is designed primarily to remove smaller trees, some overstory trees, and salvage of beetle mortality, while retaining the majority of larger live overstory trees. This may improve woodpecker habitat conditions over the long-term by maintaining or

hastening stand development toward mature and old-growth forest conditions, which provide preferred woodpecker habitat. Additionally, the fuels reduction treatments would reduce the risk of habitat loss from potential stand-replacing wildfire.

As described in further detail later in this section, design criteria to maintain snags in thinning and clearcut units are included in the project, so potential nest and foraging tree habitat would be maintained at a low to moderate level. It is likely that some snags may be consumed in the prescribed burn, but most of the targeted burn area is dominated by shrub/grassland or have scattered ponderosa pine. However, it also is expected that some snags will be created by the prescribed burn through scattered tree torching or later insect mortality of excessively-scorched or damaged trees. For portions of the burn conducted by hand drip-torch ignition, lighting patterns can be adjusted to try to minimize loss of larger snags. Hairy woodpeckers may be temporarily displaced or disrupted during treatment activities, but these impacts would be temporary. Consequently, Alternative 2 is expected to have an overall neutral influence on hairy woodpecker habitat, and no changes to this species' populations at the planning unit level (ARNF) are expected.

Mountain Bluebird (MIS for openings): Mountain bluebirds breed in western North America from east-central Alaska to New Mexico. These birds nest in nearly all forest types of the Rocky Mountain region, usually from 7,000 to 11,000 feet in open forests or near forest edges. In Colorado, prime nesting habitat is typically above 7500 feet, but mountain bluebirds will nest at elevations as low as 4500 feet in southeastern Colorado. During migration and in winter, mountain bluebirds also frequent grasslands, open brushy country, and agricultural lands. They usually nest in old woodpecker holes, natural cavities or nest boxes in open areas near forest edges. Bluebirds hunt from high perches or fly to the ground to catch prey. Nearly 92 percent of the diet is animal material (insects), and the small amount of vegetable food includes fruits, hackberry seeds, and cedar berries.

Alternative 1 (No Action): No treatments would occur with this alternative, and suitable habitat is present in the analysis area for this species. Habitat would continue to develop for this species adjacent to open grassland foraging habitat, as forest stands grow larger trees and snags are recruited over time. Because no treatment would occur, there would be no chance for direct or indirect effects to mountain bluebirds or suitable habitat present in treatment units. Consequently, Alternative 1 is expected to have a neutral influence on mountain bluebird habitat, and no changes to this species' populations at the planning unit level (ARNF) are expected.

Alternative 2 (Proposed Action): Stands that are treated with thinning treatments are expected to maintain and provide potential nesting habitat for mountain bluebirds because treatments would open the understory, and thin the overstory leaving the majority of mature trees standing. Foraging habitat (i.e. insect prey abundance) may be improved, particularly in more dense forest stands, by the expected increase in herbaceous and shrub vegetation that typically occurs when stands are opened up to increased sunlight. Although mountain bluebirds more typically occur in ponderosa pine and mixed conifer forests, the proposed even-aged harvest treatment units in lodgepole pine and spruce-fir stands may increase bluebird habitat by creating useable foraging habitat with nest trees in proximity.

Current snag densities within the project area generally are high, due to mountain pine beetle mortality. Substantial numbers of large snags may be removed because of high levels of beetle mortality and the proposed prescription for snag retention, and the overall snag project criteria may result in low to

moderate levels of snag habitat. However, unlike woodpeckers, bluebirds require snags only for nesting (see later discussion on snags). Adequate snag habitat is expected to be retained in timber harvest units. It is likely that some snags may be consumed in the prescribed burn. However, it also is expected that some snags will be created by the prescribed burn through scattered tree torching or later insect mortality of excessively-scorched or damaged trees. For portions of the burn conducted by hand drip-torch ignition, lighting patterns can be adjusted to try to minimize loss of larger snags. Direct impacts may occur if an occupied nest tree is removed during the breeding season. Nest cavities commonly are in snags, typically in an advanced state of decay. These types of snags are not targeted for removal unless they pose a direct safety hazard, and actually would be targeted for retention due to their higher snag habitat value. Unlikely and/or minor indirect impacts of treatments include removal of potential nesting trees. Because the thinning would leave the majority of larger trees, and snags retained in all timber harvest treatment units would be the largest available, adequate levels of potential nest trees should remain after treatment. Any impacts are expected to be short-term, with long-term benefits overall. As discussed above, the proposed project may have temporary impacts on mountain bluebird but would not affect population trends at the local or planning unit (ARNF) level; an overall positive influence is expected.

Pygmy Nuthatch (MIS for old-growth forest): Apparently Secure in Colorado, the nuthatch is a fairly common to common resident in the foothills and lower mountains. The pygmy nuthatch typifies Colorado's ponderosa pine forests. They rely on healthy, mature ponderosa pine trees and occur less frequently in logged tracts. Because they excavate their own cavities, they need larger trees with old or decayed wood, hence their association with mature and old-growth forest habitats. Pygmy nuthatches tend to forage in the crowns of ponderosa pine and their diet consists of insects, spiders, and conifer seeds. Food is mainly insects that are gleaned from bark but they also eat conifer seeds. During years of poor pine cone production, pygmy nuthatches may switch from pine to spruce and fir seeds. Regarding threats for pygmy nuthatch populations, decreases in snag availability, loss of foraging habitat, and loss of contiguous habitat appear to be the prominent threats.

Alternative 1 (No Action): With this alternative, no treatments would occur. Habitat would continue to develop for this species as forest stands grow larger trees and snags are recruited over time. Because no treatment would occur, there would be no chance for direct or indirect effects to pygmy nuthatches or suitable habitat present in treatment units. Consequently, Alternative 1 is expected to have a neutral influence on pygmy nuthatch habitat, and no changes to this species' populations at the planning unit level (ARNF) are expected.

Alternative 2 (Proposed Action): The proposed thinning treatments in ponderosa and mixed conifer stands generally are intended to improve or maintain ponderosa pine and mixed Douglas-fir/ponderosa stand conditions by removing mostly smaller-diameter trees, while leaving a residual stand of larger dominant trees. However, some overstory trees also would be removed, as well as salvage of beetle mortality. Partial removal of the understory also helps to reduce the risk of stand-replacing wildfire (by changing potential fire behavior), and would help move the stand towards mature and old-growth forest conditions more quickly by reducing inter-tree competition for resources (water and nutrients). Pygmy nuthatches typically forage in the crowns of ponderosa pine, and thinning treatments will retain much of the crown cover from live overstory trees. Treated stands are expected to continue to provide both nesting and foraging habitat, and the existing denser pine stands should provide improved habitat for nuthatches after stem densities are reduced by the treatments.

Pygmy nuthatches may be temporarily displaced by project activities during operations (short term), but are expected to return once activities are complete. Direct impacts include the potential loss of active nest trees during the prescribed burn and from thinning and salvage harvest. Unlikely and/or minor indirect impacts of treatments include removal of potential nesting trees. Because the thinning would leave the majority of larger trees, and snags retained would be the largest available, adequate levels of potential nest trees should remain after treatment. Short-term displacement may occur while fuel reduction activities take place, but there is a benefit to moving stands towards late-successional forest conditions and reducing the risk of damaging wildfires. Although some old-growth ponderosa pine trees exist within treatment units, the majority of these trees and the larger mature trees, which have not been killed by mountain pine beetle, would remain after treatment. Any impacts are expected to be short-term, with long-term benefits overall. A favorable influence is expected locally at the project level, but population changes at the planning unit (ARNF) level are not likely.

Warbling Vireo (MIS for aspen forest): Considered Secure in Colorado (NatureServe 2005), the warbling vireo is a fairly common summer resident in the foothills and lower mountains. In the western valleys and eastern plains, it is considered uncommon to fairly common. As a spring and fall migrant, it is thought to be uncommon in the western valleys, foothills, and eastern plains. Warbling vireos forage and breed almost exclusively in deciduous habitats, and in Colorado, they occupy two main habitat types: aspen forest and riparian stream bottoms. Breeding habitat in Colorado is primarily aspen woodlands. Warbling vireos build their nests in aspens or shrubs within 12 feet of the ground. They glean most of their food from the mid to upper canopy of deciduous trees, and their diet consists of caterpillars, beetles, grasshoppers, and ants. Possible long-term threats include fire suppression, use of pesticides, and use of insecticides.

Alternative 1 (No Action): With this alternative, no treatments would occur. Ponderosa pine stands would continue to progress in development until disturbance events such as wildfire or insect mortality occurs, or until inter-tree competition causes suppression mortality. Aspen stands would continue to develop under relatively natural conditions, with the exception of wildfire suppression. In some cases, aspen stands would grow into suitable vireo habitat as tree size increases, and in some cases aspen habitat may be reduced or degraded as conifers encroach in and eventually overtop them. Therefore, Alternative 1 is expected to have a neutral influence on warbling vireo habitat, and no changes to this species' populations at the planning unit level (ARNF) are expected.

Alternative 2 (Proposed Action): Proposed treatments within aspen stands that occur within thinning units would be to remove the smaller encroaching conifers. This also would be the case for any treatment of aspen stands outside of the proposed fuels reduction units that may be accomplished as funding is obtained. This is intended to maintain and improve aspen habitat conditions by reducing conifer competition and potential overtopping of the aspen over time by conifers. Additionally, thinning treatments in ponderosa pine stands adjacent to aspen stands or willow would be expected to improve vireo habitat by opening up these stands and reducing competition, shade, and encroachment into the aspen and willow habitat. Existing habitat (primarily aspen) within the treatment units is expected to continue to provide potential nesting and foraging habitat for warbling vireos after treatments and over the long-term.

For all activities, warbling vireos may be temporarily displaced while treatments are occurring, but once

operations are complete, they are expected to return and utilize the area. An overall positive influence is expected locally, but changes to populations at the planning unit (ARNF) level are not expected.

Cumulative Effects
Primary past and present activities within the analysis area that can have appreciable impacts on habitat include: (1) previous timber harvest mostly along the 517, 171, and 333 road systems; and (2) recreational use in and around the road systems above and Bellaire Lake campground area. Additionally, minor amounts of forest products such as lumber, post and poles, and firewood have been removed from the Deadman vicinity for at least the last 100 years related to settlement of the Red Feather Lakes and Manhattan areas. This material primarily was removed by ranchers and homesteaders.

Alternative 1 (No Action): Under this alternative, proposed project activities would not occur. Because no effects or impacts are expected for any federally-listed threatened or endangered species or Forest Service sensitive species (TES) from Alternative 1, there is no potential for cumulative impacts to occur from selection of this alternative.

Alternative 2 (Proposed Action): Under this alternative, no adverse effects or impacts are expected for Preble's meadow jumping mouse and wolverine, and beneficial impacts are expected for bighorn sheep and Townsend's big-eared bat. Consequently, there is no potential for adverse cumulative impacts to occur for these species from implementation of this alternative.

Canada Lynx – Of the activities noted above, past timber harvest at higher elevations in mesic lodgepole pine and spruce-fir stands has removed some lynx habitat. The proposed project would remove a relatively small amount of lynx habitat (431 acres), while suitable lynx habitat would remain over approximately 8,000 to 9,000 acres within the portion of the project area that is within the Red Feather LAU. Because of the lack of appreciable habitat impacts, the availability of lynx habitat, and conformance of the action with the SRLA, implementation of Alternative 2 is not expected to lead to or contribute to appreciable cumulative effects for Canada lynx.

Forest Service Sensitive Species (fringed myotis, hoary bat, flammulated owl, northern goshawk): Habitat for fringed myotis, hoary bat, and flammulated owl would primarily be located within ponderosa pine and mixed conifer forest types within the planning area. Where proposed, timber harvest treatments in these forest types, most of the large live overstory trees would be retained, and suitable habitat should be retained in the units, including snags for flammulated owl nesting and roosting. Impacts to these 3 species from the proposed action are expected to be minor or of low probability, with long-term benefits for habitat maintenance and development. Therefore, the proposed action is not expected to lead to or contribute to appreciable cumulative effects for these species, when added to impacts from past, present, and reasonably foreseeable future activities.

For goshawk, the proposed action would remove approximately 1,393 acres of potential habitat through even-aged treatment. Habitat in ponderosa pine and mixed conifer stands that would be thinned and salvaged as described above would generally be retained and provide foraging habitat. As noted above, large areas of habitat are available outside treatment units, particularly within the Roadless area and MA 1.3 and 3.3 portions of the analysis area, where timber harvest is restricted. Additionally, treatment units are not located near the 2 known goshawk nest sites within the planning area. Consequently,

impacts to this species from the proposed action are not expected to lead to or contribute to appreciable cumulative effects for these species, when added to impacts from past, present, and reasonably foreseeable future activities.

American marten, Boreal owl, pygmy shrew, olive-sided flycatcher – Habitat for these 4 species primarily would be located within the mesic lodgepole pine and spruce-fir forest types at higher elevations in the project area. As discussed for Canada lynx above, a relatively limited amount (431 acres) of habitat would be removed through even-aged harvest. Suitable habitat would still be available and fairly widespread within the planning area. Additionally, pygmy shrew and olive-sided flycatcher may still be able to utilize the clearcut harvest units post-treatment, as they have been documented to do so. Because only a limited amount of potential habitat would be impacted by the proposed treatments, it is expected that the Elkhorn project would not result in or contribute to appreciable cumulative impacts for marten, boreal owl, pygmy shrew, and olive-sided flycatcher.

Discussion of Other Forest Plan Habitat Attributes

Old Growth: The ARNF Forest Plan addresses multiple types of "existing" or "inventoried old growth" forest, "old-growth retention", and "old-growth development" stand polygons ("old-growth related"). Numerous old-growth related polygons are located within the analysis area, with proposed treatment units overlapping portions of these polygons, as discussed below.

Existing Old Growth polygons - A total of approximately 818 acres identified as inventoried (existing) old-growth polygons are located within the Elkhorn analysis area. Of these, approximately 290 acres are located within timber treatment units within the analysis area. Of these 290 acres, approximately 96 acres are proposed to be clearcut harvested, with the remaining 194 acres having group selection or selective harvest proposed as the treatment. A 13-acre inventoried old-growth polygon is located in the far west edge of the prescribed burn unit. It is located in an area that is not targeted for burning, and should not be impacted.

Old Growth Retention polygons - A total of approximately 1,019 acres identified as "Tentatively Suitable-Unavailable-Old Growth Retention" (SNO) polygons are located within the Elkhorn analysis area. Of these, approximately 99 acres identified as "Old Growth Retention" (SNO) overlap portions of unit 3 (ponderosa pine/mixed conifer type) and all of units 35 (lodgepole pine) and 43 (mixed lodgepole/spruce-fir). A project design criterion is included for units 35 and 43 to preclude harvest treatment, if they are still providing old-growth habitat at the time of implementation. Unit 3 may be treated, but in a manner to retain the old-growth characters in this ponderosa pine and mixed conifer type stand. Treatment should be designed to emulate conditions representative of a nonlethal understory fire regime and to emphasize old-growth recruitment and retention, as allowed for in the Forest Plan. Forest Plan direction for these stand allocations in lodgepole pine or ponderosa pine types is to manage vegetation to achieve a mix needed for wildlife habitat and to reduce fuel loading, manage lodgepole stands to reduce fuels, and manage ponderosa pine to emulate conditions of a non-lethal understory fire regime and to emphasize old-growth forest conditions, and prescribed fire or thinning treatments that maintain or encourage their development towards old-growth forest conditions is allowable.

Old Growth Development polygons - Another Forest GIS layer delineates “high-elevation” and “low-elevation” old-growth development areas. High-elevation old-growth development polygons generally are located within spruce-fir or higher-elevation lodgepole pine forest types. Low-elevation old-growth development polygons generally are located within ponderosa pine, Douglas-fir, and lower-elevation lodgepole pine forest types. An 11,670-acre high elevation old-growth development polygon overlaps the western portion of the planning, and also runs further west outside of the Elkhorn planning area. Of this polygon, approximately 6,840 acres lies within the planning area, and most or all of treatment units 33 through 46 and 63 through 67 are located within it. In total, approximately 743 acres of the proposed treatment units are located within the 6,840 old-growth development polygon within the analysis area. A low-elevation old-growth development polygon overlaps much of the south-facing slopes targeted for burning within prescribed burn unit 1. Approximately 914 acres are located within the prescribed burn unit. Prescribed burning is consistent with maintaining old-growth characteristics in this ponderosa pine type because most of the large overstory trees would be expected to survive the burn, and the burn treatment also would reduce the risk of a potential high-intensity wildfire (i.e. crown fire) in the future.

There is much overlap between the different types of old-growth related polygons discussed above (and also interior forest polygons described below). For all the stand allocations described above, the proposed clearcut harvest treatment in these polygons would remove old-growth forest Group selection and selective harvest treatments, and also salvage of dead trees (except 3 per acre for snag retention), would substantially alter old-growth habitat conditions, but some old-growth characteristics would be retained. The thinning and prescribed burn treatments proposed in these old-growth related polygons are intended to retain the large majority of mature overstory trees and to reduce the risk of stand-replacement wildfire by thinning out primarily the smaller or younger trees through mechanized and hand (i.e. chainsaw) treatment and prescribed burning. This is the objective for stands dominated by ponderosa pine or mixed conifer stands of ponderosa and Douglas-fir. There are portions of SNO polygons that overlay units 35 and 43 that include clearcut and group selection prescription. These harvest treatments would not occur in these stands unless it is determined at the time of implementation that these stands have levels of beetle mortality so that they are no longer functioning as old-growth.

Interior Forest: Interior forests are considered to be contiguous areas of relatively dense and large trees that are buffered from the temperature, light, and humidity differences of sizeable openings in the forest, and from human disturbance along regularly used roads and trails (Forest Plan 1997). Numerous interior forest polygons totaling approximately 1,280 acres are located within the analysis area. Approximately 69 acres of several interior forest polygons overlap proposed treatment units around the 333 road system. All of this acreage is in the lodgepole pine or mixed lodgepole/spruce-fir stands. Of these 69 acres, 31 acres are proposed for clearcut harvest and 38 acres for selective harvest. Clearcut harvest would remove interior forest conditions, and selective harvest and salvaging would substantially reduce interior forest habitat conditions to where it likely would not be providing the dense canopy cover that partially defines interior forest. Approximately 143 acres of interior forest is located within 3 polygons within the prescribed burn unit. A 98-acre polygon is located in the far west portion of the unit in lodgepole pine forest. This area is not targeted for active burning and is not expected to be impacted. The other 2 interior forest polygons (45 acres) are within the target burn area. However, as described above for old-growth related polygons, burning is consistent with maintaining ponderosa pine forest

structural conditions, and the proposed burning should maintain these stands and reduce the risk of potential high-intensity crown fire.

Aspen: From Forest GIS vegetation information, aspen stands are mapped on 747 acres on FS lands within the project area, and 233 of those acres fall within proposed treatment units. Aspen generally would not be cut as part of the mechanical or hand treatments. However, young or smaller conifers may be cut out of aspen stands during project implementation, or as funds are obtained, for aspen habitat maintenance. Within units where small aspen clones are present within mapped conifer stands, typically conifers less than 12 to 14 inches dbh (less than 10 inches for spruce) may be felled. This would benefit these small aspen clones by reducing conifer encroachment and competition within the aspen. Some mature aspen stands are present in the northwest portion of the prescribed burn unit 1. Prescribed fire may occur in these aspen stands, but they would not be actively ignited. Therefore, it is expected that most of the mature overstory aspen would be retained, and the fire also would stimulate suckering from aspen that are killed.

Habitat Effectiveness: Effective habitat is considered to be mostly undisturbed habitat which is buffered from regularly used roads and trails (both motorized and non-motorized travel – Forest Plan 1997). Most of the proposed timber treatment units are located within the Deadman GA, except for units 22, 23, 24, 25, 60, and parts of 21 and 59, which are in the Elkhorn GA. Approximately 356 acres of timber treatment units are located within the Elkhorn GA, all in the northeast portion of the project area. From the Forest Plan, habitat effectiveness is at 56% for the Deadman geographic area, and 54% for the Elkhorn geo area. Only one new permanent road is proposed for construction, which is a 0.26 mile extension of 171.I through to the 171.A road. This extension is proposed to make an additional loop within the Christmas tree cutting area, and it would only be open for 2 weeks during that time. The rest of the year it would be gated and closed. Because of this brief seasonal use only, current habitat effectiveness levels will not be reduced from existing conditions. All temporary roads constructed or ways used for mechanical thinning units will be closed and restored. As funding is obtained, existing unauthorized roads or "ways" within the project area that are not used for mechanical thinning units could be decommissioned. These add up to about 22 miles total of unauthorized ways that may be decommissioned over time. Additionally, approximately 2.6 miles of system roads are proposed for decommissioning. Consequently, habitat effectiveness may be improved somewhat.
Impacts of road or way closures or obliterations on all species: As described above, unauthorized roads or ways and some system road segments may be closed after project completion and as funds are obtained. The closure of ways and unneeded system roads would be beneficial to all species in the long term because this reduces the potential for disturbance from human presence and activities. In addition, closure of roads or ways allows for the regeneration of vegetation in what was previously a road bed. Species may be displaced and/or disrupted temporarily by the presence of humans and equipment needed to close or decommission the road beds.

Riparian/Wetlands: Perennial or intermittent stream systems within or adjacent to timber treatment units include: South Lone Pine Creek, Elkhorn Creek, South Fork Elkhorn Creek, Swamp Creek, and Manhattan Creek. All of these creeks have unnamed intermittent and possibly perennial tributaries as well. Sevenmile Creek runs within or along the north boundary of the broadcast burn unit. Spruce, subalpine fir, and aspen occurs along most of the intermittent and perennial streams and draws, and riparian shrubs (e.g. alder, water birch, willow, Rocky Mountain maple) occur along the perennial and

wetter portions of intermittent stream channels. Unit boundaries generally are located such that they exclude all perennial stream and most intermittent streams, although these streams may run parallel to some unit boundaries. Note that the Cache la Poudre River runs parallel to a portion of the south boundary of the broadcast burn unit 1, but the unit is located above Highway 14, which lies between the unit and the river. Numerous ephemeral drainages also are present within units. These features typically have little or no riparian vegetation.

A few lakes and ponds are present within the planning area, but all are located outside of units. Units 23 and 60 are adjacent to Bellaire Lake, units 13 and 14 run parallel to a series of beaver ponds along Swamp Creek, a small pond is located in Section 31but is outside of unit 26, and a small ponds is located east of and outside of unit 12. Additionally, project design criteria incorporate buffers and protections around all riparian areas for mechanical treatment, slash piling and burning, and prescribed burning. Although few intermittent stream channels appear to be located within treatment units, hand thinning by chainsaw, particularly to remove or reduce young conifers (Rocky Mountain juniper, ponderosa pine, and Douglas-fir) from within the riparian buffers, would be expected to improve riparian habitat conditions by removing encroaching conifers that are currently or eventually would shade out and compete for resources with riparian vegetation. Removing these encroaching conifers and thinning the conifer overstory also would reduce the risk of and burn intensity if a wildfire were to run through these riparian drainages in the future. Consequently, riparian habitat would be protected and not adversely impacted by the proposed project activities.

Impacts of watershed improvement projects on all wildlife species: Potential impacts of proposed watershed improvement projects for all species are discussed here, with the exception of Preble's meadow jumping mouse (discussed specifically in the Preble's mouse section of this document). Because watershed improvement projects would improve and protect wetland and riparian/stream habitats, wildlife species that utilize these habitats would benefit from the improved habitat conditions. Disturbance from proposed work activities could potentially impact wildlife during sensitive nesting or denning periods. However, activities would occur primarily at heavily used recreation sites that already receive high levels of disturbance from human activities. For restoration sites in more remote areas, project work activities would occur during the late summer and fall season after sensitive nesting and denning periods. Additionally, where necessary to protect known raptor nest sites, a seasonal restriction would be implemented on work activities from March 1 through August 31. Disturbance from these watershed/habitat improvement activities is not expected. Consequently, wetland and stream/riparian habitat for wildlife species would be improved and protected by the proposed project activities.

Snags and Downed Woody Debris: The Forest Plan requires that snags and down woody debris be retained and recruited on all treatment projects. Down woody debris (DWD) would be retained at a minimum of 50 or 33 linear feet per acre (depending on forest type) of randomly distributed DWD with a minimum diameter of 5 inches and a minimum length of 8 feet.

Except for timber units 24 and 25, all timber treatment units are located within MA 5.5 (Dispersed Recreation – Forest Products), with some being MA 5.11 (Forest and Rangelands – Forest Vegetation Emphasis). Units 24 and 25 are located within MA 3.5 (Forested Flora and Fauna Habitats). The prescribed burn unit overlaps MA 4.4 (Recreation Rivers), 3.5, 5.5, and 5.11.

The emphasis in MA 3.5 is on providing adequate amounts of quality forage, cover, escape terrain, solitude, breeding habitat, and protection for a wide variety of wildlife species and associated plant communities. From the Forest Plan, management activities within MA 3.5, including timber harvest and thinning, should be to gain the greatest benefit to wildlife habitat possible. For the Elkhorn Vegetation project, project design criteria are included to leave snags levels that are moderately higher than the minimums described in the Forest Plan (i.e. proposed 3 snags/acre vs. 1 snag/acre from Forest Plan minimums).

The areas within the prescribed burn unit that are targeted for ignition are mostly non-forested or contain fairly open ponderosa pine, except for shady aspects in draws. For the prescribed burn unit, loss of larger snags would be minimized by lighting patterns. Although some snags will be toppled and burned in the prescribed burn unit, the prescribed burn also would create new snags, and snag levels are expected to remain well above the Forest Plan minimum guidelines.

Noxious Weeds

Affected Environment

Management of noxious weeds on the Forest is based on the concept of integrated pest management. The goal is not total eradication of noxious weeds, which is not often possible, but successful long-term management through a combination of education, prevention, biological, chemical, cultural, and physical treatments. In general, noxious weeds are prioritized for treatment based on aggressiveness, current extent of infestation, and priority of species by state and county weed programs.

Risk of noxious weed invasion or expansion is highest in the montane zone. Areas most likely to facilitate introduction of weeds through disturbance and seed-spreading vectors are roads, trails, stream corridors, dispersed recreation areas, individual residences, horse feeding or riding areas, areas with previous fire or timber cutting activity, wildfires, and heavily grazed areas (currently or in the past). Once established, weeds may spread to adjacent, less disturbed or even undisturbed areas. Weeds are most likely to establish and spread in open areas that receive plenty of sunlight, and less likely to establish and spread in densely forested, more shaded areas. Riparian and open meadow habitats are particularly susceptible to noxious weed invasion, due to the availability of sunlight, and in riparian areas, the presence of water as a vector. Higher elevations tend to have fewer occurrences of noxious weeds, due to a combination of harsh growing conditions that deter some species and generally fewer human disturbances which provide sources of introduction. In vegetation treatment projects, noxious weeds are most commonly found in heavily disturbed areas such as landings and staging areas, burned pile areas, other areas of heavy activity or where mineral soil is exposed.

Field surveys in the project area found that lower elevations on the east side of the Elkhorn area near the Manhattan road had higher concentrations of weeds, while in the western, higher elevation proposed treatment units there were fewer weeds. As expected, occasional small scattered patches of Canada thistle (*Cirsium arvense*), and common mullein (*Verbascum thapsus*), particularly on the eastern proposed units were found but not considered problematic. There were also occasional areas of musk (*Carduus nutans*) and bull thistle (*Cirsium vulgare*) detected in the project area. Diffuse knapweed (*Centaurea diffusa*) was found and treated on FSR 225. The only weeds found that were out of the

ordinary was a small patch of scentless chamomile (*Matricaria perforata*) and sulfur cinquefoil (*Potentilla recta*) near the beginning of road 517 (not within a proposed treatment unit) and these plants were treated.

Due to access difficulty, the proposed broadcast prescribed burn unit received only limited observation relative to its size. There are significant patches of cheatgrass (*Bromus tectorum*) visible from the highway and presumably in many other areas of the unit, particularly on south facing slopes.

Alternative 1 (No Action)
Direct and Indirect Effects
Noxious weeds can be expected to continue to spread into existing disturbed areas and possibly into more intact native ecosystems throughout the project area. The rate of weed spread if the Elkhorn project is not implemented would likely be less than the rate of spread after the proposed project implementation. However, over time, without vegetation management or wildfire, or other watershed or road projects, surface and canopy fuel loads will continue to increase and the potential for extreme fires within the project area will continue to rise. If no fuel reduction treatments occur, and if a severe wildfire occurs, openings for weed establishment would be created, soil nutrients would be released, and weed spread would likely be more rapid than spread resulting from proposed vegetation management activities.

Alternative 2 (Proposed Action)
Direct and Indirect Effects
All proposed project activities involving ground disturbance (fuels reduction, watershed improvements, transportation management and bighorn sheep habitat enhancement) are expected to increase risk of introduction and spread of noxious weeds in the Elkhorn project area. This risk is greater where project activities involve: a) mechanical equipment; b) prescribed fire (broadcast burning and burning piles of slash); c) creation of (including temporary) skid roads, fire lines, landings, and other areas of soil disturbance; d) opening of the forest canopy; or e) where weeds already occur in or near potential treatment units.

Burn pile areas are problematic for weed invasions. Within the approximately 2,770 acres of proposed vegetation treatments, it is estimated that a footprint of up to 84 acres where pile burning occurred could result. These sites have a high potential for noxious weed invasion, and Canada thistle is especially aggressive in these sites. These infestations usually occur within one to two years subsequent to burning.

Where mechanical equipment will be employed for vegetation treatment, heavy equipment operation can be expected to increase soil compaction and ground disturbance, particularly within skid-trails, landings, and temporary roads, which can increase the risk of noxious weed invasion. In addition, all landings are likely to have large machine piles that will be burned leaving these sites susceptible to colonization by noxious weeds as described in the previous paragraph.

The proposed broadcast prescribed burn unit (Unit 1) is characterized by steep south-facing slopes, with the majority of the vegetation consisting of grasses and shrubs. The cheatgrass component of this site could likely increase as a result of the prescribed burn activities. In sagebrush ecosystems, prescribed

burning alone will generally decrease cheatgrass cover only in the short term by killing most cheatgrass seeds near the soil surface. In the proposed Elkhorn burn, post–fire seeding or herbicide application to this unit is not practicable. Unless desirable species establish and outcompete cheatgrass, density of cheatgrass plants may actually exceed pre-burn levels. This is because cheatgrass plants that do establish the first post-fire year tend to produce so much seed per plant that total post-fire cheatgrass seed production for a site may actually increase by a factor of 100 over pre-burn production.

Late spring or early summer burns, before cheatgrass seed matures, may effectively control cheatgrass; however, burning before the seed is ripe is difficult because the plants are still green. This timing is also a period of high sensitivity to fire damage for cool-season perennial grasses. In areas where native warm-season grasses are desired, a prescribed fire that kills cheatgrass seedlings and reduces the surface seed bank may be effective.

Cumulative Effects Common to Both Alternatives

Past, present, and reasonably foreseeable future activities impacting invasive plant infestations include past and ongoing motorized and non-motorized recreation, past and present cattle grazing, past and ongoing road construction and maintenance, past and ongoing timber harvest and fuel reduction activities, and past and ongoing residential use. Increasing recreational pressure is expected. In addition, the High Park Fire burned over 43,000 acres of NFS lands in June and July of 2012, which is adjacent to the Elkhorn project area. All of these activities are expected to potentially introduce and spread invasive plants to the project area, even if the no action alternative is chosen.

Under the proposed action alternative, both direct and indirect effects would be expected to result in an increase in noxious weed infestations over time, contributing to the long term cumulative impacts of increased infestations from other past, present, and future activities. Appropriate project design criteria, mitigations, and a proactive weed management program will help to reduce these risks.

Rangeland Resources

Affected Environment

The Elkhorn project boundary overlaps portions of one active grazing allotment (Elkhorn-Ladymoon), and three vacant grazing allotments (Deadman, Nunn Creek, and Seven Mile). There are no grazing allotments within the proposed broadcast burn area (Unit 1). The Elkhorn-Ladymoon Allotment is currently permitted with 75 cow/calf pairs from 6/10 to 9/30. It is the current permittee's intention to keep the majority of grazing east of the Manhattan Road; therefore, most active grazing occurs outside the Elkhorn project boundary. The vacant allotments have not been actively grazed in many years, and there is no intention to permit these allotments in the near future.

Alternative 1 (No Action)

Direct and Indirect Effects

None of the proposed project activities would occur with Alternative 1. Selection of this alternative could have either beneficial or adverse consequences for rangeland resources, as it applies to livestock grazing management. If the No Action Alternative is selected, there would be no potential for range improvement damage (e.g. fences and water developments) from proposed activities including tree thinning operations, hauling, and pile burning.

Greater probability exists for high-intensity wildfires to occur in the project area if no action is taken due to the continued buildup of surface fuel loads and an increase in ladder fuels. If a significant wildfire occurs, it could adversely affect livestock grazing and rangeland resources by reducing or altering forage production, or necessitating removal of livestock from burned areas for longer recovery periods.

If no action is taken, livestock grazing management on the Elkhorn-Ladymoon Allotment would continue, at its current incidental use within the project boundary. Direct and indirect impacts of Alternative 1 to rangeland resources (livestock grazing management) are expected to be somewhat less than Alternative 2.

Alternative 2 (Proposed Action)
Direct and Indirect Effects
Project activities as proposed (fuels reduction, watershed improvements, transportation management, and bighorn sheep habitat enhancement) would occur if Alternative 2 is selected. Selection of this alternative may have either beneficial or adverse consequences for rangeland resources, as it applies to livestock grazing management. Openings created in the tree canopy by vegetation management may increase production of herbaceous forage, and therefore benefit rangeland resources. However, depending upon what species are present before treatment, the benefits would not be as notable if much of the production response is composed of annual grasses and weeds. There would be no effects to livestock grazing in the vacant allotments (Deadman, Nunn Creek and Seven Mile) where the proposed treatments would primarily occur.

Overall, it is expected that there would be minimal effects to active livestock grazing (Elkhorn-Ladymoon Allotment) within the project boundary as livestock grazing principally occurs east of the project boundary. Although the allotment boundary extends west of the Manhattan Road into the project area, there is little available forage, and management is more difficult due to terrain. The proposed broadcast prescribed burn does not overlap any grazing allotment boundaries. Vegetation treatment in Unit 21 south of Bellaire Lake could open the canopy enough to establish an herbaceous cover that encourages livestock to move more frequently to the west of the Manhattan Road. However, preliminary plans for a new one mile fence along the east side of the Manhattan Road, could discourage grazing use in Unit 21.

The proposed changes to the Elkhorn transportation system, including road decommissioning, improvement and construction, and the proposed watershed enhancement activities are expected to impact livestock grazing management minimally on the Elkhorn-Ladymoon Allotment. Activities such as moving or decommissioning roads, or installation of log jams along creeks, could change livestock grazing and distribution patterns by introducing barriers to or providing easier access for livestock movement. However, livestock grazing west of the Manhattan in the past few years and into the foreseeable future remains minimal.

Cumulative Effects Common to Both Alternatives
Past, present, and reasonably foreseeable future activities impacting livestock grazing include past and ongoing motorized and non-motorized recreation, and past and present vegetation management (timber harvest, fuels treatment, prescribed fire, fire suppression) within and adjacent to the project area. Livestock grazing in the Elkhorn area is currently complicated by factors such as the allocation of forage resources between livestock and wildlife, recreation activities (e.g. hiking, dispersed camping,

OHV use, horseback riding, hunting, special uses), considerations necessary due to wildland and prescribed fire management, forage removal, and livestock distribution. High numbers of big game animals, especially elk, have a significant effect on herbaceous vegetation, and the dietary overlap between elk and livestock is similar.

SOCIAL RESOURCES

Heritage

Affected Environment

Section 106 of the *National Historic Preservation Act of 1966*, as amended, requires Federal agencies to determine if federally funded, permitted, or licensed activities would adversely affect significant historic properties. Cultural resources are considered historic properties if they are eligible for the National Register of Historic Places (NRHP). Sites considered not eligible for the NRHP may be directly affected once adequately recorded and evaluated, and concurrence is received from the State Historic Preservation Office regarding NRHP eligibility.

Prior to this project proposal much of the Elkhorn project area had not been surveyed for cultural resources. The majority of the cultural resources that have been found are related to historic mining and homesteading. All sites identified to date have been assessed as 'not eligible' or 'unevaluated'. The specific results of the cultural resource inventories (Class I and II) that have been conducted within project area and the project area vicinity (within ½ mile) can be found in the Heritage Specialist Report in the project file.

The Northern Arapaho, Northern Cheyenne, Northern Ute, Southern Arapaho, Southern Cheyenne, and Southern Ute Tribes were consulted to determine whether any culturally significant places or locations of concern to these Tribes were located within the analysis area. No concerns about culturally significant sites within the analysis area were identified by Tribal representatives.

Alternative 1 (No Action)

Direct and Indirect Effects

The No Action Alternative would have little to no direct effect on cultural resources within the analysis area. No mitigations would be necessary. Under the no action alternative, current management plans would continue to guide management of the project area. No vegetation management activities, road construction or decommissioning, prescribed burning nor watershed restorations activities would be implemented to accomplish the project purpose and need.

The no action alternative would have the indirect effect of maintaining the current level of hazardous fuels in the area surrounding the known significant cultural resources within the analysis area. High fuel loads and the increased potential for a catastrophic wildfire are a threat to cultural resources. If no action is taken to reduce these risks, significant cultural resources are vulnerable to modification or destruction as a result of wildfire.

Areas along streams and in riparian areas have a high potential for containing cultural site. If no watershed restoration activities are undertaken, the potential for disturbance of cultural materials at

these sites is increased. Watershed areas would continue to be vulnerable to future erosion and site stability would be increasingly diminished.

Alternative 2 (Proposed Action)
Direct and Indirect Effects
The effects to cultural resources that could occur as a result of the proposed action are separated by treatment type for the purpose of this analysis.

Primary impacts to cultural resources from mechanical vegetation treatments may include the displacement, alteration, and destruction of surface artifacts and cultural features, as well as disturbance to site soil deposition and site stability. In addition, architectural components such as standing wooden or stone walls may be knocked down by machinery. Cultural resources could be disturbed within ATV or vehicle access routes. Burning of slash piles within vegetation treatment units could disturb the integrity of archeological artifacts in the area. In addition, removal of forest products through firewood or fencepost permits could adversely affect cultural resources by introducing traffic in around the sites and therefore opportunities for vandalism or removal of artifacts.

Vegetation treatments accomplished by handcrews with chainsaws is not expected to have the potential to adversely affect cultural resources except to sites, such as culturally peeled trees or aborglyphs, that are themselves cultural resources.

The reduction of fuels in the analysis area, as well as the other, previously discussed activities, would have indirect effects on significant historic properties in the project vicinity by reducing the probability that an uncontrolled wildfire would modify or destroy these sites. Although proposed activities would have the potential to cause adverse effects to cultural resources, a sample cultural resource inventory of the analysis area found no new significant (NRHP eligible) cultural resources within the proposed treatment units.

Road improvement, construction and/or decommissioning may disturb subsurface cultural deposits. Watershed improvement projects, as proposed, would have the potential to impact cultural resources in ways similar to mechanical thinning and could include the displacement, alteration, and destruction of surface artifacts and cultural features, as well as disturbance to site soil deposition and site stability. In addition, architectural components such as standing wooden or stone walls may be knocked down by machinery. The proposed stream stabilization and recontouring, and restoration of dispersed camping areas would take place in areas that have high potential for containing cultural sites and could increase the potential for disturbance of cultural materials. Since many of the proposed watershed treatments would also stabilize and restore previously disturbed areas the treatments have the potential to decrease future erosion and increase site stability of resources adjacent to the proposed activities. The restoration of dispersed camping areas could discourage visitor use, which could help stabilize vegetation and soils, and potentially reduce looting and vandalism of cultural sites.

Broadcast burning poses relatively little threat to cultural resources, except for wooden architectural sites such as log cabins or corrals. No such sites have been found within the treatment unit proposed for broadcast burning. Construction of ground-disturbing control lines also has the potential to disturb subsurface cultural deposits; however the locations of these lines would be subjected to an intensive

cultural resource inventory prior to construction and any significant cultural resources found within the proposed line would be avoided by relocating the fire line (See Heritage design criteria, pages 27-28).

Cumulative Effects Common to Both Alternatives

Cultural resources are non-renewable. The loss of archaeological resources has occurred in the past and will continue to occur in the future through both natural and human causes. Although efforts have been made to locate cultural resources within the project area, it is possible that there are undiscovered cultural resources that may be affected by project activities. The accumulated loss of individual cultural resources has the potential to limit our ability to understand broad patterns of human history as well as local historical events. Over time, fewer cultural resources would be available for study and interpretation. Although individual cultural resources may be impacted by proposed activities, these resources are not considered to be significant, as none are eligible for the NRHP.

Lands, Special Uses, and Minerals

Affected Environment

The majority of the project area is not intermixed with parcels of private or other non-Federal land. However, there is a high density of homes in the communities adjacent to the project area including Crystal Lakes, Red Feather Lakes, Manhattan and the Upper Poudre Canyon. A key consideration in planning for the Elkhorn project for lands, special uses and minerals is to identify and determine existing Forest Service legal access rights and needed access across non-Federal land to the proposed treatment units/project areas. Property boundaries between non-Federal and Federal properties have not been posted for all landline within the project area.

Below is a summary of the lands, special uses and minerals existing condition within the project area. Details (i.e. location, permit holder) can be found in the specialist report in the project record.

- Most of the National Forest System land is reserved public domain status (on June 12, 1917) by the authority of the Creative Act of March 3, 1891. There are parcels of NFS land within the project area that were acquired in land exchanges.
- There are no right-of-way easements acquired by the Forest Service across non-Federal land. Pre-existing rights may exist.
- Easements either granted from Forest Service or outstanding rights and encumbrances within the project area include a right-of-way easement for the Mitchell Irrigation Ditch, an easement to the Greeley-Poudre Irrigation District for the Bellaire Reservoir and Ditch and two easements to Larimer County totally 0.9 miles.
- There is currently an application from Larimer County for a proposed communication site in the vicinity of Middle Bald Mtn. Also proposed is a ½ mile access road and approximately 11 miles of power line (along Deadman road to NFSR 300 to proposed site). After an EIS analysis and if the project is approved, PVREA will submit an application to build the power line and the County will construct the building and tower along with an access road off of NFSR 517.
- Poudre Valley REA has transmission and distribution power lines on NFS land authorized on the Canyon Lakes District and Pawnee National Grassland under a master special use permit. The transmission and distribution lines are located on the east edge of the project boundary along the Manhattan road and to Bellaire Lake campground. PVREA is currently cutting hazard trees

approved under a separate 15-year special use permit. Approximately 8 miles of line, with a corridor width of 20 feet, exist within the project area.

- Two land exchanges have occurred within the project area in which the Forest Service acquired an approximate total of 115 acres.
- There are currently two minerals-related operations in the project area, both of which are reviewed annually: one for minerals exploration on an unpatented mining claim and one for a "pick and shovel" operation.
- There are currently no pending applications for special use permits or proposals for land adjustments that would be affected by this project.
- There are Federal Energy Regulatory Commission (FERC) power withdrawals located throughout the project area.

Alternative 1 (No Action)
Direct and Indirect Effects
Under the no action alternative, there would be no changes to land use on NFS lands for authorized special uses and mining operations or an impact on the existing landownership pattern of NFS land. Current authorizations (permits or easements) allowing uses on NFS land would continue to be administered and any applications for special use permits processed. There would not be an immediate need to acquire rights-of-ways. Rights-of-ways would be acquired or reciprocated as opportunity, staffing and funding allow. Boundary lines would continue to be posted as required by any future projects.

Alternative 2 (Proposed Action)
Direct and Indirect Effects
There are no known effects to existing lands, special uses and minerals uses that would result from the proposed action. Implementation of this project in some areas would require the acquisition of right-of-ways through private land, either easements or temporary road use permits. An increase in the use of the roads (across non-federal) by the Forest Service and contractors to the treatment units will not be to an extent to significantly impact the roads or increase the use of NFS land if temporary short-term permits are acquired. There is the potential to increase use of NFS land if the Forest Service determined and a landowner is willing to grant an easement that has full public rights. Inability to acquire access from an unwilling landowner may result in not treating some of the proposed projects.

Marking of boundary lines between NFS land and private land may be required to implement a proposed treatment. This may result in the discovery of encroachments/trespasses on NFS land including fences, homes and other improvements. These encroachment cases would need to be resolved and could include processing a case under authority of the Small Tracts Act or resolving by administrative efforts to notify the landowner that removal from NFS land is required.

Table 17. Vegetation treatment units, as part of the Elkhorn proposed action, requiring an easement or temporary road use permit from private landowners

Unit #	Road Access	Access needs across non-Federal lands
2	171.L	May need authorization across two segments of private land.
24 & 25	1W162.0	Most is accessible off of CR 69 but north of Lone Pine Creek may require authorization from landowner
26	U162.A and 1W162.0	Connects to road on private land and would need an authorization from landowners

Cumulative Effects Common to Both Alternatives

For lands, special uses, and minerals, only cumulative effects within the project area were considered. Alternative 1 should not have any impact on authorized special uses (easements or permits) in the project area so there are no known cumulative effects.

For Alternative 2 the potential effects of acquiring any public easements would be to increase use into those areas of NFS land otherwise not accessible. If public easements are not required or cannot be acquired then a request from a landowner for either a temporary short-term permit or limited-use easement (Forest Service/contractors of Forest Service only) would be pursued. This would have the effect of increasing use into an area for short periods of time and not be expected to have any cumulative impacts.

Prior to project implementation if there is a requirement to conduct a boundary survey between NFS land and private property there could be an increase in encroachment/trespass cases. These cases would need to be resolved and that could potentially have cumulative impacts of modifying boundary lines and decrease in NFS land.

Scenery

Affected Environment

Landscape elements of a given area define scenery resources. Important visual components of the Elkhorn project are as follows: the project area is one of an aspect-dependent dry continental forest and precipitation is around 20 inches per year, with about a half of that coming in the form of snow. The growing season is about 70 days. The elevation of the land varies from 7,000-11,000 feet and the topography of the area is moderately rolling to steep. There are three permanent streams in the area (Seven Mile, Elkhorn and Lone Pine Creeks) and the Cache La Poudre River, a Wild and Recreational River, is on the south border of the project area while most other drainages are intermittent. The vegetation varies from open areas with grasses and shrubs to conifer trees and deciduous species. There are a few small (less than 5 acres surface area) natural and dam-enhanced ponds on private land in the project area and one 10 acre lake at the Bellaire Lake Recreation Area. The air is generally clear, the sky is often a deep blue and the views can be long. In the past, the area was used by hunter-gatherers. Livestock grazing has occurred historically and continues today. There is some residential and second-home development on the edges of the project area in the northeast, southeast and south of the project area. There is substantial evidence of past timber activity in the area and currently the Christmas tree program operates in the area.

The scenic class, which denotes the scenic attractiveness of the area, is predominately considered 'B' (common) with some areas of 'A' (distinctive) along the Bald Mountains, the area around Bellaire Lake and the southern area in the Cache La Poudre River Canyon. The main roadways that provide access to the area, Larimer County Rd(CR) 74E (The Red Feather Lakes Rd.), CR 98C (The Boy Scout Rd.), CR 69 (The Manhattan Rd.) CR 16 (The Deadman Rd.) and CSH 14 (the Cache La Poudre Scenic Byway), provide mostly far background views of the project area. The roads that are interior to the project area are used mostly for OHV travel, Christmas tree acquisition in the winter and access to the Bellaire Lake Recreation Area as well as dispersed camping and other recreation opportunities. The high travel use on the aforementioned surrounding roads, the roads that access the Bellaire Lake Recreation Area and the residential areas within and adjacent to the project area lead to a moderate to high concern to visual resources where the typical Forest user and or visitor has an elevated concern for the scenery.

The desired landscape character within the project area is a 'natural-appearing' landscape. The existing scenic integrity in this area is moderate to high.

Fire can play an important and obvious role in scenic integrity. There are areas of recent severe fire, including the North Fork and Killpecker Fires, that have had large impacts on the landscape visible from viewpoints identified as Key Observation points (KOPs) for project analysis. Many portions of the project area could be thought of as having a higher degree of instability than would 'naturally' occur. The existing scenic stability is considered high in those areas of recent fire activity and low where wildfire has not recently occurred.

The project area's communities of interest include recreational users as well as those who visit or live in the area or adjacent areas. Recreational use of the area can be light in some areas, but heavy in others where OHV recreation and recreation opportunities occur. Given the types of use that occur in the Elkhorn project area (i.e., OHV enthusiasts, hikers, anglers, hunters, skiers, snowshoers and snowmobilers and residences and the users of the Red Feather Lakes area on the north and east and the Cache La Poudre Canyon), there is a high level of interest in the scenery aspects of this project area.

Landscape visibility refers to several criteria that define how obvious changes to the landscape such as road construction, tree removal or other human development may be. Criteria include distance from viewer, number of viewpoints, and duration of view, topography, and visual absorption capability (the ability of the landscape to absorb visual change). This landscape has moderate visibility. It contains numerous important viewer locations just outside or adjacent to the project area in both wide panoramic views and detailed foreground views. It also contains very important interior views in the Bellaire Lake Recreation Area. Variety and diversity of tree species and presence of natural openings and rock outcrops makes the landscape able to absorb changes without these changes being too obvious in the eastern and southern portions. However, the central and western portions of the project area contain relatively continuous tree cover and clearcutting and other alterations to vegeation can be obvious.

Viewpoints of interest include US 14 (the Cache a Poudre-North Park Scenic Byway alongside the Cache La Poudre Wild and Recreational River) on the south side of the project area, Larimer County Road (CR) 74E (Red Feather Lakes Rd.), CR 98C (Boy Scout Rd.), CR 69 (Manhattan Rd.), CR 16 (Deadman Rd.)

adjacent to the project area on the east and north and FSSR 163 (the road to and in the Bellaire Lake Recreation Area), the numerous FSSRs into the area (FSSR 225, the 517 complex and the 171 complex) as well as the Swamp Creek Cutoff Trail (FSST 871), the North Lone Pine Trail (FSST 953) and Middle Bald Mountain. There are also residences and second homes in the project area and numerous residences, businesses, second homes and group camps in the surrounding area. The viewpoints of interest include the Key Observation Points (KOPs) that form a base for evaluation in this report (See KOP map, Figure 6).

See Visual Resources Specialist report, in the project file, for a description of the analysis methodology used and the effects of the no action and proposed action alternatives by proposed treatment.

Alternative 1 (No Action)
Direct and Indirect Effects
If the no action alternative is chosen, the project area would be managed as it is at present. The landscape would undergo alterations as the pace of natural ecological change and some activity related to the Christmas tree program and continued recreation management would occur. It would continue to show the effects of fire suppression and recreation impacts including a forest more dense with vegetation from fire suppression and more soil compaction in use areas, erosion, tree scarring and littering from recreation. Previous timber harvest areas would continue their regeneration and those areas would eventually be considered visually 'recovered'.

Indirect effects of the No Action alternative could include a condition of a more dense forest or a lighter forest with greater forest inter-visibility with much deadfall in the coming years depending upon the localized extent of MPB-caused mortality.

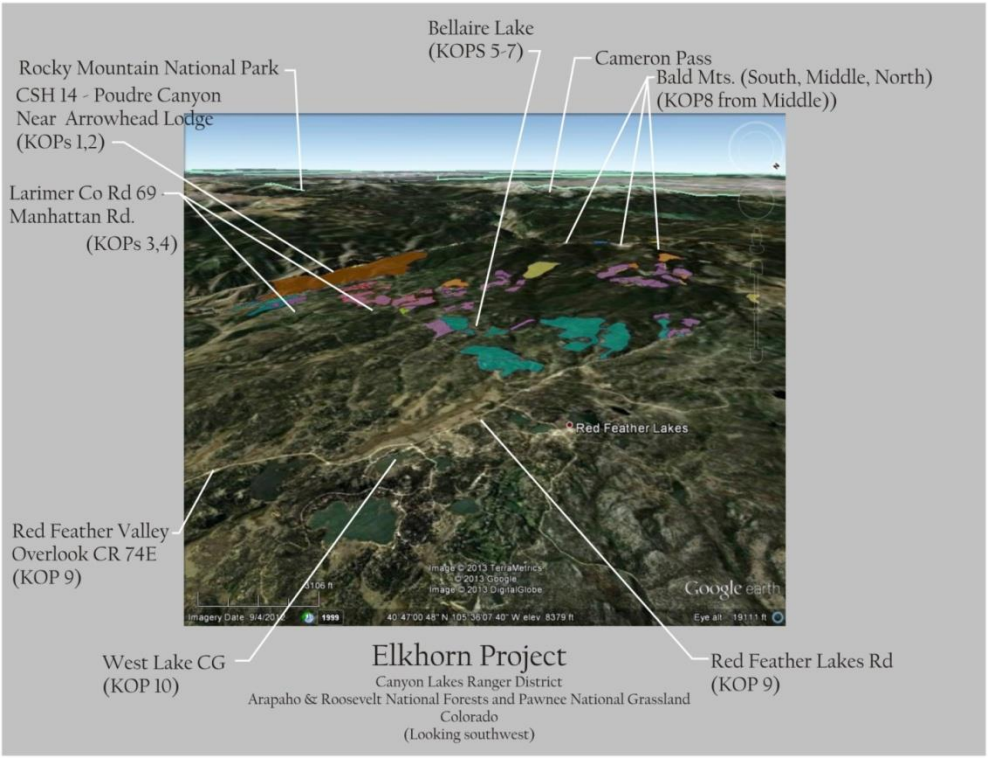
The No Action Alternative would have short-term negligible impacts on the scenery of the project area. The stability of the landscape would decrease. However, the impacts could be major and adverse if a large wildfire were to occur. There are no irretrievable or irreversible impacts to visual resources predicted under this alternative.

Cumulative Effects
Projects that are presently active in or adjacent to the analysis area are the Deadman, Crystal Lakes, Redfeather, Magic Sky and Lone Pine timber and fuels reduction projects on the northwest, north and east. Activities from these projects are noticeable from some of the KOPs for this project and do not violate the SIOs for the area. There are no cumulative effects beyond that described in the direct and indirect effects

Alternative 2 (Proposed Action)
Direct and Indirect Effects
The result to visual resources of vegetation treatments would be greater interforest visibility and a greater variety in forest vegetation. The areas of activity would be a bit 'raw' for the short term: fresh-cut stumps and slash treatment products (i.e., slash, chips, masticated material and burn pile scars) and freshly burned areas. However, this evidence of activity would fade rapidly and not be noticeable to the casual forest visitor after one or two growing seasons. Thinning and vegetation treatments in and around aspen stands would have minimal visual impact, except in the immediate foreground, and would result in aspen spread. The noise, smoke and fire from operations associated with the proposed

treatments would be sporadically present in the short-term and would be a direct effect. Skid trails are located according to general contract specifications and their visual impact will meet the SIO for these areas. Black ground and blackened tree boles would also be a direct effect of pile burning and broadcast prescribed burning that would persist for some time after the activities. Design criteria for visual resources are expected to ameliorate the visual effects of slash treatments and burning activities (see visual design criteria, pages 33-34).

Figure 5. Key Observation Points and proposed vegetation treatment units, Elkhorn Project Area (*image Google Earth*)



If the proposed actions are exercised with the design criteria referred to above, the desired landscape character; the scenic integrity and the scenic stability will conform to the Forest Plan. Particular attention should be directed to:

- Unit 1 which is along the Scenic Byway in the Poudre Canyon
- Units 4 and 58 which are in frontal view from southbound travelers on CR 69
- Units 5-16 which are close to each other in the interior of the project area
- Units 22-27, 59 and 60 that are adjacent to the Bellaire Lake Recreation Area, along CR 69 or in the Recreation Area
- Units that have linear boundaries.

Indirect effects from some elements of the proposed action such as skidder activity and pile burning could also result in soil compaction, erosion, attendant lack of vegetative cover and soil sterilization. Further, the possibility of blowdown exists where forested stands are opened by vegetation treatments. These indirect effects could include holes in the canopy of the forest landscape, black circles from pile burns and two tracks from skidder activities. Indirect effects could include also the smoke effects on and off-site while burn activities are in progress, for example, decreased visibility and respiratory problems.

Indirect effects would also include the increased 'openness' of the forest landscape due to vegetation manipulations. This increased openness could allow for greater dispersed recreation with attendant negative impacts of litter, sanitation challenges, soil compaction and erosion and campfire scars. On the positive side, increased forest openness ground disturbance activities will also result in greater vegetation variety. Indirect effects would also include a forest that is less susceptible to insects, disease and large scale wildfire, most likely leading to a more stable system from a visual resources viewpoint because it is less susceptible to drastic change.

The Proposed Action would have minor adverse impacts for the scenery resource in the short-term and a moderate beneficial impact in the long-term. Through forest thinning and prescribed burning the landscape will become less susceptible to catastrophic fire and hence the scenic stability will be enhanced. Long term effects would include a reduction in the threat of wildfire and greater age class diversity. There are no irretrievable or irreversible impacts predicted for visual resources.

Cumulative Effects

Projects that are presently active in the analysis area are the Deadman, Crystal Lakes, Redfeather, Magic Sky and Lone Pine fuels and timber projects on the northwest, north and east. Activities from these projects are noticeable from some of the KOPs for this project and do not violate the SIOs for the area. With the implementation of this alternative, the landscape in the project area could go from 'moderate' to a higher level of scenic stability when considered cumulatively with the other vegetation management projects recently implemented or planned.

Socio-Economic

Affected Environment

The Elkhorn project area is located entirely within Larimer County, Colorado. Larimer County has experienced steady population growth over the last forty years, although it has slowed in the last several years. In 2010, the estimated population was 299,630 with nearly 70% of that number living in the cities of Fort Collins and Loveland. Major employers include Colorado State University and several software and computer manufacturing firms. Agriculture, while still a factor in the County economy, is gradually losing ground as lands are developed for housing, and water rights are converted from agricultural to municipal use. Although farms are more numerous than in the past, the trend is towards smaller acreage farms.

When compared to counties nationwide, Larimer County is relatively affluent and educated. The Median Family Income (MFI) in Larimer County grew 12.5% between 2007 and 2011. The 2011 MFI for Larimer County is $76,700. Colorado per capital personal income consistently exceeded United States per capita income by 7.1 to 11.6% between 2000 and 2011. The per capita income in Larimer County increased

22.1% since 2002, from $32,579 in 2002 to $39,767 in 2011. When adjusting for inflation to 2011 dollars, however, per capita income in the county has decreased by 2.4% since 2002.

In 2011, 52% of Larimer County residents possessed an associate's degree or higher. Over 39% of Larimer County residents have received a Bachelor's Degree or higher, ranking it 71st out of the more than 3,000 counties in the nation for education level (DataPlace.org). However, education is becoming more expensive. In the last ten years, resident undergraduate tuition at Colorado State University, located in Fort Collins, CO, has increased 136%. It is estimated that 54% of Colorado students carry college loan debt.

Despite Larimer County's relative affluence, a substantial number of the county's residents live in poverty; 14.3% of the county's population lives at or below the poverty level (2010 data). This is slightly less than the national average. The poverty line is considered to be earnings below $22,050 annually for a family of four.

According to the 2010 Census, the population of Larimer County is predominantly Caucasian (nearly 90%). Self-identified Hispanics compose 10.6% of the county population. Hispanics are the second largest and rapidly growing ethnic group in the county. The number of Hispanics living in Larimer County has increased 52.0% between 2000 and 2010. Very few Larimer County residents are Asian, black, or American Indian.

Alternative 1 – No Action
Direct and Indirect Effects
Under Alternative 1, no management to meet the project purpose and need would be implemented. Hazardous fuel reduction activities would not occur to change wildfire behavior and reduce the risk of economic loss to these areas. The potential loss of or damage to infrastructure in the case of a wildfire such as homes, electrical transmission and communication lines would not be reduced. Economic value would not be realized from timber extracted from the project area. Transportation system modifications and watershed improvement projects would not be initiated which could, in the long term, lead to downstream water quality degradation and soil loss.

Under the No Action Alternative, there would be no direct costs to the federal government associated with completing the proposed treatments. If no vegetation treatments were completed, it is likely that fire suppression costs as well as other economic and social costs would be higher during a wildfire event.

Alternative 2 – Proposed Action
Direct and Indirect Effects
Implementation of Alternative 2 would allow for vegetation management including thinning, clearcutting and prescribed burning on nearly 5,000 acres. Effects to adjacent landowners and forest visitors would include noise from chainsaws or mechanized equipment during tree cutting operations and a temporary increase in the amount of traffic on roads used to access the vegetation treatment areas. When slash from the tree cutting operations is piled and burned smoke may be noticeable to private landowners and forest visitors.

The cost of treating the proposed fuels reduction units is highly variable. If thinning treatments are completed by hand crews with chainsaws, costs currently average $600 per acre. An additional $130 per acre cost is typically incurred for Forest Service crews to burn the hand piles. If thinning treatments are completed with mechanized equipment such as tree shears or hydro-axes, costs average between $700-1000 per acre. Large machine piles must be burned after mechanical operations by the FS which costs an estimated $50 per treatment unit acre. Given the variability involved, it is difficult to directly correlate the number of acres treated with the number of acres that could be burned in a wildfire. However, any reduction in fire size and intensity would translate to a reduction in fire suppression costs and reduce potential losses of private infrastructure.

Under certain conditions, treatment costs can be partially offset through the sale of forest products and the proposed action considers this possibility. These sales could either be "stewardship" type contracts where the stumpage cost of the product would be used to offset the cost of the treatment, or, sold to a purchaser through the appropriate timber sale contract. Several factors limit opportunities to recover costs from projects located along the Colorado's Front Range. First, the majority of the material that needs to be removed consists of smaller diameter trees and currently there is not a high demand locally for products that can be processed from this size of material. Ponderosa pine and Douglas fir typically are used as firewood and perhaps wood chips or mulch, which is of relatively low value. Lodgepole pine produces more valuable products such as lumber and posts.

Timber product removal requires roads that are passable for log trucks and machinery associated with logging operations (e.g. skidders, hotsaws, bulldozers). Some of the roads in the Elkhorn project area would have to be improved in order to implement the project. It is estimated that such improvements would cost approximately $45-50,000 to complete (see Engineering specialist report in the project file for more information on this calculation). If vegetation units are harvested as proposes the value of forest products extracted, given current market values, is estimated at approximately $145,000.

Prescribed burns are conducted under weather conditions that allow smoke to rapidly disperse; however, there could be instances during a burning period when smoke would be visible to adjacent landowners and forest visitors. These effects would be short term and infrequent. Temporary noise levels could increase, if helicopters are utilized, during the broadcast prescribed burn. On average, broadcast prescribed burning costs $70-80 per acre $135/ac in urban interface areas.

Transportation system modifications proposed in Alternative 2 would incur costs to the FS. The estimated cost for new road construction (approximately 0.26 miles) for FSR 171.I is estimated around $2,000. The estimated cost to decommission roads ranges from $2000 - $5,500 per mile which typically includes ripping, water bar placement, and seeding. However this figure could vary depending on actual ground and other field conditions. Road maintenance costs are not included here as they would not be greater if the proposed action is selected. Watershed improvement projects, as proposed, could cost approximately $1-2,000 per dispersed campsite to decommission depending on size and roughly $10,000 per mile for stream restoration work.

Cumulative Effects

Under the No Action Alternative, hazardous fuel reduction treatments would continue to take place on adjacent private property without the benefit of treatments on adjacent National Forest land. If markets

develop for products that utilize smaller diameter material such as industrial type pellets for energy, the ability to offset treatment costs would improve. Land that is currently vacant would likely continue to be developed increasing the amount of infrastructure and values at risk to wildfire.

Executive Order 12898, Environmental Justice, requires all federal agencies to consider the effect of a proposed action on low income and minority populations. From the 2010 Census data, 90.5% of the population in Larimer County is white with the Hispanic or Latino population estimated at 10.6%. Figures for landownership by race or ethnicity are not available specifically for the project area; however, there is no information that would suggest any higher proportion of minority populations. The Median Family Income in Larimer County is $76,700 which is well above the $22,050 that is considered the Federal Poverty Guideline. Based on these numbers, implementation of either alternative would not be expected to have negative impacts to low income or minority populations.

Recreation

Affected Environment

The Elkhorn project area varies in elevation providing recreationists with a variety of terrain, habitat, and opportunities to recreate. Recreational use within the project area overall is considered high due to the urban nature of the National Forest as a “front door” to Front Range cities such as Denver and Fort Collins, its location near the vacation area of Red Feather Lakes, and the variety of recreational opportunities found within the project area.

A wide variety of recreational uses occur within the project area depending upon location, access and topography. Popular recreation activities in the project area include motorized recreation, hiking, hunting, recreational shooting, fishing, picnicking and camping. Use along four-wheel drive roads by OHV users is high during the summer and fall months when the roads are open. Developed recreation sites within the project area include the Arrowhead Visitor Center and Bellaire Lake recreation complex. Camping occurs in the Bellaire Lake area as well as in dispersed sites. Forest Service system trails including North Lone Pine, Killpecker and Swamp Creek Trails. The project area also includes the Christmas tree sale area which is utilized each December for a two week time period. Recreation special use permits that are currently active in the project area include hunting outfitters, four-wheel drive instruction, guided hiking and horse and llama deliveries. Recreationists to the area come primarily from Fort Collins, Loveland, Red Feather Lakes and surrounding communities. More specific recreation use statistics can be found in the Recreation specialist report in the project file.

The Green Ridge East Inventoried Roadless Area overlaps 6,777 acres of the Elkhorn project area. It varies in elevation from approximately 9,000 to 11,000 feet. Vegetation within the Roadless area is characterized by shrubs and grasses along the Cache la Poudre River with of ponderosa pine, juniper, Douglas-fir, lodgepole, and spruce-fir at increasing elevations. Recreation within the area includes hunting, camping and hiking. Opportunities for backcountry experience and solitude exist throughout the area except near roads near the well-traveled Colorado Hwy. 14. The Roadless Area provides year round range for bighorn sheep and transitional range for deer and elk. The Swamp Creek trail is located within the Roadless Area.

Alternative 1 (No Action)

Direct and Indirect Effects

Under the No Action alternative, current management plans would continue to guide management of the project area. This alternative would have no immediate, direct effects on recreation and recreation infrastructure. No mitigations would be necessary.

The No Action alternative would have the indirect effect of maintaining or gradually increasing the current level of fuels within the project area. Fuel loads and the increased potential for a catastrophic wildfire are a threat to recreation, recreation infrastructure, and the character and diversity of Inventoried Roadless Areas, especially from high severity fires.

The No Action alternative would have no effect on the existing transportation system and the dispersed campsites would remain in their current locations. The Christmas tree area would not be enhanced or expanded with the addition of one loop road. Unauthorized routes would not be decommissioned. Timber projects would not be undertaken.

Cumulative Effects

Under the no-action alternative, recreational activities would continue to increase as the population and desire for natural experiences increases. The urban interface will continue to grow and become more complex, and the same areas that are impacted now will continue to be impacted by off-road vehicular use increasing the likelihood of restrictions on road access. At the same time, fuels and the potential for insect epidemics will continue to build up within the area, leading to the possibility of catastrophic wildfires which would have the potential to destroy recreation infrastructure and degrade both the recreational experience and the natural character of the area's Inventoried Roadless Areas.

Alternative 2 (Proposed Action)

Direct and Indirect Effects

Proposed treatments within the project area were analysed based on the potential recreation and resource impacts that project implementation could have. The highest potential impacts were those vegetation treatment units or other proposed activities with close proximity to motorized access via roads, and potential impacts from illegal off-road trespass. Potential impacts to recreation and recreation resources that could occur as a result of the proposed action are presented below by type of activity.

Proposed vegetation treatments: The proposed vegetation treatments and temporary roads are not expected to change the long-term recreational use within the project area; however, there may be several short-term effects that result. Proposed vegetation treatments would change the character of portions of the project area where recreation takes place. The treatment units, in particular the units to be clearcut, would have an altered natural appearance for several years until regeneration occurs. The change in appearance of these treated areas may be noticeable but would not be expected to cause any adverse effects to recreationists.

Short-term effects of the vegetation treatment activity would include noise, visual activity, smells, and smoke that could affect the experience of recreationists using the project area. Traffic associated with mechanical operations and prescribed burning would also affect recreationists using this area. Prior to the burning of the piles created by vegetation activities, logging slash may be noticeable to visitors in some areas. During pile burning operations, recreationists would need to avoid these areas for public

safety reasons. Although these effects would be considered minor, some recreationists may choose to avoid the affected areas while harvest activities are being conducted.

Road and area closures for project implementation may impact recreational use of the area with the greatest impacts occurring during the summer and fall months. Closing roads and areas within the project area would cause displacement of recreationists to other areas. If the Bellaire Lake recreation complex is closed during the timeframe when it is typically open, it could result in a loss of revenue for the concessionaire. However, the closures would be temporary and result in only minor, short-term effects.

Equipment and surface fuels burning used to treat slash treatment has the potential to incur damage to facilities, gates, and signs. Project design mitigations are recommended to occur in all units where gates and signs are present

The proposed vegetation treatments could increase the potential in some units for the development of unauthorized roads and trails unless design criteria are carried out. Many of the units are located in areas where high motorized use occurs and where unauthorized routes are frequently developed. Other units are located in fairly inaccessible terrain, not accessible to the public by road, motorized trail or far enough from roads or motorized trails and would not be expected to lead to an increase in unauthorized use.

The vegetation treatments proposed in the area used for the annual Christmas tree cutting sale could yield young trees that would be suitable for the Christmas tree sale program which would enable the program to be carried out in this area for a longer period of time.

Proposed treatments adjacent to the Bellaire Lake recreation complex could result in an altered sense of place at this popular recreation site. The primary effect of these treatments would be visual in nature. Areas where there was once dense forest would be thinned or clearcut resulting in a different visual character, the effect of which would depend upon the sensitivity of the individual. The recreational experience in Manhattan designated dispersed campsite numbers 6 through 12 may also be impacted as a result of the proposed vegetation treatment in Unit 59.

Proposed vegetation treatments along the Killpecker and North Lone Pine trails would require closing the trails for varying periods of time during vegetation treatments. After treatment, hikers, OHV riders, bicyclists, and horseback riders using the portions of the trails that pass through the project area would observe a more open forest. The treatments would not affect the ability to use the trails or adversely affect their recreational experience.

Improvements of Bald Mountain Rd. (FSR 517) for hauling material could affect the integrity of the four-wheel drive experience along this popular road.

(See recreation design criteria that address proposed vegetation treatments, pages 29-30).

Watershed Improvement Projects: Proposed dispersed campsite restoration and removal could reduce the number of dispersed campsites currently available along Deadman Road (CR 86) and could

temporarily close areas where dispersed camping occurs. There should be minimal effects to recreation if ample dispersed camping opportunities persist outside of riparian areas. The proposed watershed improvement projects along Seven Mile Creek could result in temporary closures of the popular Seven Mile Road (FSR 225). There would be no long-term effects to recreationists as the intent would be to preserve the integrity of four-wheel drive experience while mitigating negative watershed impacts.

Broadcast prescribed burning: The proposed broadcast prescribed burn is located within the Green Ridge Inventoried Roadless Area and is located adjacent to the Arrowhead Visitor Center. The primary effect to visitors of this facility would be visual. The change in appearance of the treated area may be noticeable but would not be expected to cause any adverse effects to visitors. There may be a short-term effect to recreationists if Seven Mile Road (FSR 225) is closed during operations. Any road improvements to FSR 225 implemented to carry out the broadcast prescribed burn could impact the four-wheel drive experience along the road. The proposed broadcast prescribed burn in the Roadless Area could create a more natural appearance and would not alter the roadless characteristics of the area. Roads would not be constructed into the Inventoried Roadless Area for this project.

***Modifications to the transportation system*:** The proposed decommissioning of system roads is expected to have minimal impact on recreationists due to limited recreation occurring along the roads with several exceptions. The closure of FSR 171e could affect OHV and dirt bike users that utilize this popular short segment, in addition to removing a few dispersed camping opportunities. Closure of FSR 171f could result in lack of access to several dispersed campsites that are utilized along this road. Closure of FSR 225.1 could affect dirt bike, jeep, and OHV users that utilize this popular segment of road off of the Seven Mile Road (FSR 225).

The proposed action would decommission 22 miles of unauthorized and undetermined routes. None of the routes that would be decommissioned have been designated for use. Several of these routes provide access to and along riparian areas resulting in damaged riparian vegetation and erosion in many areas. By decommissioning the unauthorized routes, the routes will be restored to a near natural condition, allowed to revegetate and blocked to discourage future use. There could be a short-term disruption for recreationists while decommissioning work is being completed. Individuals who may use the unauthorized routes with their OHVs could be displaced, but there are many other sanctioned opportunities in the area for these activities to take place, so the effect would be minor.

One new segment of road totaling approximately 0.26 miles is being proposed for construction. The proposed new road segment (FSR 171i) would provide an additional loop in the Christmas tree area by connecting FSR 171i to FSR 171a and an area with a greater number of Christmas trees would be made available to the public during the annual Christmas tree sale. This would be beneficial to recreationalists visiting the area for Christmas trees. Short-term effects to recreation from the road construction would include noise, visual activity, and traffic associated with construction equipment. The proposed road would be utilized only during the Christmas tree sale two week period and would be closed the rest of the year. Therefore there would be no anticipated adverse effects to recreation resulting from the road.

Cumulative Effects

The recent vegetation treatment in the Bellaire Lake recreation complex resulted in an impact to the recreation experience at this site due to the visual changes and the lack of shading in the campground. Additional vegetation treatments in this area, as proposed in this project, could further impact the

recreational experience at this site and alter the sense of place. It is expected that visitor use to the area would stay the same or slightly decline. The lake is the main attraction in the area, but visitors may decide to visit another campground where there is shade. Visitation to other campgrounds on the Forest has generally decreased where similar tree removal activities have occurred.

Treatments in the adjacent Red Feather area and the Seven Mile project (found within the Elkhorn Area) combined with the Proposed Action would result in a cumulative increase in vegetation management activity in the project area. For the period when activities are concurrent, the cumulative effects may increase the feeling of crowding and negatively affect the recreation experience. This effect would be short-term and would last until activities are completed.

The long-term cumulative effect of these combined actions would be a reduction in fire risk and, therefore, a reduction in the potential for adverse effects to recreational resources due to a large catastrophic fire.

Roads

Affected Environment

As summarized in the table below, the project area includes approximately 74 miles of inventoried NFSR's and unauthorized roads within the Elkhorn project area boundary. Most of these roads are native surface roads, with a small amount of aggregate surface roads. Included in the inventory are roads identified as possibly providing access to the Forest or roads that cross Forest Service land.

A Motor Vehicle Use Map (MVUM) was published in 2009 and is revised as necessary. This map contains the existing direction for motor vehicle use open to the public on the district. Motor vehicle use (excluding snowmobiles operating on snow) is allowed on designated roads and trails shown on the MVUM. The MVUM's for the ARP, are available on the web (under "Maps and Publications") at http://www.fs.usda.gov/main/arp/home

Table 18. Summary of existing road mileages in Elkhorn project area

System	Maintenance Level	On MVUM	Admin Access Only	Total Miles	
National Forest System (NFSR)	5	0	0	0	53.67
	4	1.68	0	1.68	
	3	1.42	0.07	1.49	
	2	40.85	8.39	49.27	
	1	N/A	N/A	1.26	
Unauthorized**				19.92	19.92
TOTAL					**73.59**

** Two of the tools used to catalog information about roads are geographic information system (GIS) and the corporate database known as INFRA (or IWeb). Each of these computer-based tools contains slightly different information. INFRA and GIS-derived information within this report was based on the information contained in these two systems at the time of the analysis. Although the best information at the time of this study, it is approximate and may change. The INFRA database lists all the system roads on the Forest and includes a variety of survey-based information about each route, such as route number, length, beginning and ending locations, ownership, ranger district, surface type, and other similar data. The geographic information system, or GIS, spatially displays the roads and trails and other information across the landscape. Using GIS, transportation routes may be overlaid with streams, wildlife areas, land ownership, and a host of other information.

** This number is different than the proposed action due to a decrease in miles by eliminating additional "private" jurisdiction roads.

This table does include the following: roads with NFSR System and FS jurisdiction, the entire mileage for NFSR 333.0, including the portion outside of the project boundary, and NFSR's on the project boundary including 517.A and 517.0. The table does not include the following: private roads and driveways, the portion of private roads that connect with NFSR roads, previously labeled decommissioned roads, county roads or state highways, other roads outside of the Elkhorn planning boundary or mileage for NFSR 300.0 outside of the project area.

National Forest System Roads are assigned a specific maintenance level which defines the level of service provided by, and maintenance required for, each specific road. Roads may be currently maintained at one level (operational maintenance level) and planned to be maintained at a different level (objective maintenance level) at some future date. The above mileages are the current operational maintenance level. Basic definitions of maintenance level are summarized below and more in depth explanations of each can be found in the Roads specialist report in the project file.

- **ML 1 (Basic Custodial Care,** closed to all travel but not decommissioned**)** - These are roads that have been placed in storage between intermittent uses. The period of storage must exceed 1 year. Basic custodial maintenance is performed to prevent damage to adjacent resources and to perpetuate the road for future resource management needs.
- **ML 2 (High Clearance Vehicles) -** Assigned to roads open for use by high clearance vehicles. Passenger car traffic, user comfort, and user convenience are not considerations. Warning signs and traffic control devices are not generally used. Motorists should have no expectations of being alerted to potential hazards while driving these roads.
- **ML 3 (Suitable for Passenger Cars) -** Assigned to roads open and maintained for travel by a prudent driver in a standard passenger car. User comfort and convenience are not considered priorities. Warning signs and traffic control devices are provided to alert motorists of situations that may violate expectations. Roads in this maintenance level are typically low speed with single lanes and turnouts.
- **ML 4 (Moderate Degree of User Comfort) -** Assigned to roads that provide a moderate degree of user comfort and convenience at moderate travel speeds. Most roads are double lane and aggregate surfaced. However, some roads may be single lane. Some roads may be paved and/or dust abated.
- **ML 5 (High Degree of User Comfort) -** Assigned to roads that provide a high degree of user comfort and convenience. These roads are normally double lane, paved facilities. Some may be aggregate surfaced and dust abated.
- **Administrative Road -** National Forest System road is any National Forest System road that is not a public road.
- **Unauthorized Road -** An Unauthorized Road is a road or trail that is not a forest road, or a temporary road and is not included in a forest transportation atlas.

The addition of new roads to the system should occur only where resource management objectives and benefits are clearly demonstrated and where long-term funding obligations have been carefully considered. The addition of new roads to the forest transportation system must be informed by a travel analysis conducted at an appropriate scale, as well as appropriate site-specific environmental analysis and public involvement. Unauthorized roads, temporary roads, and any NFS roads should be closed at

the conclusion of a project activity as well as those roads no longer needed for the use and management of NFS lands should be decommissioned.

Alternative 1 (No Action)
Direct and Indirect Effects
Under this alternative there would be no immediate direct impact to the existing transportation system. Unauthorized roads that would have been decommissioned by the project will likely not be obliterated. The existing transportation system will continue to be maintained to the extent possible given the current year funding. Deferred maintenance of the transportation system would continue to increase. Additionally, under this alternative vehicle use patterns would likely continue and no indirect effects are anticipated.

Alternative 2 (Proposed Action)
Direct Effects
Under this Alternative, modifications to the travel network within the Elkhorn project area are proposed. The extent of and closure methods employed will be determined later prior to implementation. However, the roads design criteria (see pages 30-31) prescribe a number of standards for road decommissioning. Failure to properly obliterate the road prisms may lead to future illegal use of the roads.

Most roads or ways utilized for vegetation treatment will need to be improved for vehicle and heavy equipment access. Except for temporary roads, these routes are likely not to be decommissioned or returned to original condition after use. Road and drainage work would follow the roads design criteria. Recommendations for road improvement or modification prior to implementation of the proposed action and costs associated with road construction, reconstruction, and decommissioning is included in the Roads specialist report in the project file.

Indirect Effects
In addition to discouraging unplanned uses, such as illegal OHV recreation use, if unauthorized roads in the project are properly closed to eliminate traffic, including restoration of natural ground contours and drainages, it is expected that sedimentation from the roads will likely decrease and the quality of the watershed increased over the long-term. However, immediate project activities will likely increase erosion and sedimentation in the watershed until vegetation is established on the roads and drainages have reached a natural equilibrium.

Although not authorized for vehicle use, closing of unauthorized routes could result in the creation of additional unauthorized routes or an increase in use of existing authorized routes. Vegetation management activities such as thinning and clearcutting associated with the project could make illegal cross-country motorized travel easier in certain places and/or make it easier to drive illegally around gates and other road blocks. It is recommended that law enforcement proactively patrol the area after project implementation to prevent illegal use of temporary roads or illegal cross-country travel.

Cumulative Effects Common to Both Alternatives
It is anticipated that as the population increases in the Front Range, the use of National Forest roads will increase. With the backlog of road maintenance needs increasing, the presence of non-

system/unclassified roads will lead to a continuing increase by unplanned uses, such as illegal OHV recreation, until these roads can be effectively obliterated or added to the transportation system.

Along roads and at recreation sites hazard tree removal within a distance equal to 110% of the height of the tallest hazard tree from the edge of roads open to motorized travel. It is possible that all, some, or little of the road related proposed actions would be implemented based on available funding. If the proposed action is chosen, hazard tree removal would likely not occur along the portions of road that are being recommended for decommissioning as part of this project. Likewise, hazard tree removal may occur along new segments of road that are being proposed as part of this project.

The proposed action for the Middle Bald Communication site could possibly include road construction and thus, the addition of miles to the National Forest Road System in the vicinity of the Middle Bald Mountain area. However, at the time of this report, a proposed action has not been fully developed.

The Sevenmile project included the addition of existing travelways to the National Forest Road system and the obliteration of unauthorized routes. The extent of road additions or obliterations associated with the Sevenmile project within the Elkhorn Project area is unclear.

CHAPTER 4: CONSULTATION AND COORDINATION

The Forest Service contacted, consulted, and scoped with the following individuals, Federal, State, and local agencies, and tribes during the development of this environmental assessment:

Interdisciplinary Team Members

Kevin Atchley, District Ranger
Lenora Arevalos, Recreation
Cambria Armstrong, Fuels/Air
Tom Bates, Botany
Luke Brandy, Contract Admin.
Reghan Cloudman, Public Affairs
Kevin Colby, Scenery
Dick Edwards, Fire/Fuels/Planning
Deb Entwistle, Hydrology
Larry Fullenkamp, Archaeology
Sue Greenley, Lands/Specials Uses/Minerals
Nehalem Clark, Project Lead & Socio/Econ
Dave Hattis, Silviculture
Mike Montgomery, Contract Admin.
Janice Naylor, GIS
Lizandra Nieves-Rivera, Soils
Kim Obele, Range and Noxious Weeds
Dale Oberlag, Wildlife Biology
Andrea von der Ohe, Recreation
James White, Fuels Implementation
Michele White, Transportation & Travel

Federal, State, and Local Agencies

Big Thompson Watershed Forum
Bureau of Reclamation
City of Fort Collins (and City Utilities)
City of Greeley (and City Water)
City of Loveland Water and Power
Colorado Division of Wildlife
Colorado State Board of Land Commissioners
Colorado State Forest Service
Colorado State Historic Preservation Office
Colorado State University
Crystal Lakes Fire
Glacier View Fire
Larimer County
Northern Colorado Water Conservancy
Poudre Canyon Fire
Poudre Valley REA
Red Feather Lakes Fire
Rocky Mountain National Park
U.S. Fish and Wildlife Service

Tribes

Cheyenne and Arapaho Tribes of Oklahoma
Northern Arapaho
Northern Cheyenne
Northern Ute
Southern Arapaho
Southern Cheyenne
Southern Ute

Others

Colorado Congressional Delegation
Environmental and Ecological Organizations
Forest Products Companies
Local Residential Developments and Associations
Local Residents and Businesses
Private Citizens
Recreation Groups
University Researchers

GLOSSARY OF TERMS

Airshed: A geographic area which, because of topography, meteorology, and climate, routinely shares the same air mass. For this document, political/civil boundaries (Forests, Wilderness, counties) were also used to a lesser extent where physical boundaries were not apparent.

Area: A discrete, specifically delineated space that is smaller, and in most cases much smaller, than a Ranger District.

Aspen Enhancement: A treatment where all conifers within and occasionally surrounding an aspen stand are cut to maintain aspen stand health and vigor.

At-Risk Community: As defined by the HFRA, Title I, Section 101, (1), the term ''at-risk community'' means an area:

Available Canopy Fuel is the part of the canopy that can burn in the flaming front of a crown fire.

Blackline: Pre-burning of fuels adjacent to a control line before igniting a prescribed burn. Blacklining is usually done in heavy fuels adjacent to a control line during periods of low fire danger to reduce heat on holding crews and reduce potential for spotting across control lines.

Broadcast Burn (a type of prescribed fire): Controlled application of fire to fuels in either their natural or modified state (such as slash), under specified environmental conditions that allows the fire to be confined to a predetermined area, and produce the fire behavior and fire characteristics required to attain planned fire treatment and resource management objectives.

Burn Severity: Qualitative measure of the amount of heat released to the soil by the consumption of surface fuels and duff during a fire. Burn severity relates to soil heating, large fuel and duff consumption, consumption of the litter and organic layer beneath trees and isolated shrubs, and potential for plant mortality. Burn severity classes are measured as unburned, scorched, low severity, moderate severity, and high severity. A high severity burn would describe a condition in which most woody debris and the entire forest floor is consumed down to bare mineral soil. Also, fine roots and organic matter are charred in the upper one half inch of mineral soil.

Canopy Bulk Density: The density of available canopy fuel in a stand. It is defined as the mass of available canopy fuel per canopy volume unit. The term is used to determine the initiation and spread characteristics of crown fires across landscapes. Canopy bulk density is expressed in kilograms per cubic meter and can range from zero, where there is no canopy, to about 0.0312 lb/ft^3 (0.5 kg/m^3), in very dense stands.

Chipping: The process of reducing woody slash into smaller material (generally three inches and smaller). This is typically accomplished with a chipping machine. Chips are then randomly scattered so as not to exceed three inches in depth and so as not to increase overall fire danger.

Community Wildfire Protection Plan: As defined by the HFRA, Title I, Section 101, (3), the term ''community wildfire protection plan'' refers to a plan for an at-risk community that:

Condition Class: A qualitative measure describing the degree of departure from historical fire return intervals and a measure of the risk of losing key ecosystem components such as species composition, stand age, and canopy closure. One or more of the following activities may cause such a departure: fire suppression, timber harvesting, livestock grazing, introduction and establishment of exotic plant species, introduced insects or disease, or other past management activities.

Crowning index is defined as the open windspeed at which active crown fire is possible for the specified fire environment (surface and canopy fuel characteristics – i.e. fuel model, windspeed and direction, relative humidity, and slope steepness).

Culmination of Mean Annual Increment: CMAI is a silvicultural term indicating a stand of trees has reached its maximum average growth.
Cultural Resource Evaluation: consists of the following steps: the identification of areas that have a high potential for impact; the identification of known sites that are potentially eligible (needs data), eligible, or listed on the National Register of Historic Places and that are located within those areas determined to have high potential for impact; and the determination of areas that have not been previously surveyed, but where significant sites are likely to occur.
Defensible Fuel Profile: A strategic area in the landscape where the vertical and horizontal arrangement of the fuels has been altered through some type of treatment with the intent of reducing the intensity and severity of wildfires. By reducing wildfire intensity, firefighters have increased opportunities to implement suppression tactics to protect at-risk values.
Defensible Space: Arrangement of vegetation between houses/structures, which is either man-made or natural, that slows the rate and intensity of an oncoming wildfire. It also provides an opportunity for firefighters to defend the house/structure and helps protect the surrounding forest from igniting in the event of a structure fire.
Designated Road, Trail, or Area: A National Forest System road, a National Forest System trail, or an area on National Forest System lands that is designated for motor vehicle use pursuant to § 212.51 on a motor vehicle use map.
Direct Control is the immediate and complete extinguishments of a wildfire. This includes exposure protection in which critical resources such as houses are shielded from a fire.
Distance Zones are the third element of landscape visibility, is the concept of distance and visual impact. Increasing the distance from an observer to an activity reduces the apparent impact and ability to identify details on the activity area. A visible activity is considered to be in one of three distance zones for scenery analysis. The Foreground (FG) extends from an identified viewing location or *viewpoint* out to 1/2 mile, Middleground (MG) is from 1/2 to 4 miles, and Background (BG) is the area visible 4 miles and beyond from the viewpoint. (US*DA Forest Service, Agriculture Handbook Number 701.put in ref. section)*
Existing Scenic Integrity is defined as the "Current state of the landscape, considering previous human alterations." (USDA FS Agriculture Handbook 701 p. Glossary-2)
Existing Scenic Stability is defined as "the ecological sustainability of the valued landscape character and its scenery attributes." (USDA FS Agriculture Hbk. 701 Appendix J, p. 2)
Existing Travel Ways and Use Areas are identified and classified to determine which observer positions would be most relevant and useful in the landscape visibility analysis. Travel ways represent linear concentrations of public viewings, including highways, roads, trails, rivers and other waterways. Use areas are spots that receive concentrated public viewing such as vista points, trailheads, campgrounds, resorts, ski areas, as well as towns, subdivisions, private land or other public lands within or adjacent to national forests. Landscapes are viewed to varying degrees from different locations and differ in their importance. **Concern levels** assist in scenic inventory and analysis by ranking this importance according to public opinion. There are three concern levels. The type of area and the level of use is an adequate indicator in discerning the level of interest people are likely to have about the forest scenery.
Fire Regime Class: The fire return interval (frequency) and expected severity of a fire in given vegetation type.
Forest Road Or Trail: A road or trail wholly or partly within or adjacent to and serving the National Forest System that the Forest Service determines is necessary for the protection, administration, and utilization of the National Forest System and the use and development of its resources.

Forest Transportation Atlas: A display of the system of roads, trails, and airfields of an administrative unit.
Forest Transportation Facility: A forest road or trail or an airfield that is displayed in a forest transportation atlas, including bridges, culverts, parking lots, marine access facilities, safety devices, and other improvements appurtenant to the forest transportation system.
Forest Transportation System: The system of National Forest System roads, National Forest System trails, and airfields on National Forest System lands.
Healthy Forests Restoration Act of 2003: A Federal Act intended to expedite hazardous fuel reduction projects on specific types of Federal land that contain wildland urban interface, municipal watersheds, threatened and endangered species habitat and that are at risk of wildland fire or insect and disease epidemics.
Intensity: Describes the nature of a wildfire in terms of rate of energy release expressed as the amount of heat given off by a wildfire over a period of time. Increasing heat released over shorter lengths of time indicate higher intensity wildfire.
Interior Forest: Contiguous areas of relatively dense and large trees that are buffered from temperature, light and humidity differences of sizable forest openings, and from human disturbances along regularly used roads and trails.
Key Observation Points (KOPs) – Representative or important viewing locations within the project area.
Ladder Fuel: Fuels that bridge the gap between surface fuels and the tops, or crowns, of a tree. For example, intermediate trees or trees with low hanging branches can provide pathways for a wildfire to move from the ground to the tops of larger trees.
Landscape Character is defined as "Particular attributes, qualities and traits of a landscape that give it an image and make it identifiable or unique" (USDA FS Agriculture Handbook No. 701 p. Glossary-3)
Landscape Character is the combination of physical, biological and cultural attributes that gives an area its visual and cultural identity. Each attribute contributes to the uniqueness of the landscape and gives a particular place meaning and value and helps to define a "sense of place." Landscape character provides a frame of reference from which to determine scenic attractiveness and to measure scenic integrity and scenic sustainability. Landscape character goal(s), objectives and design guidelines are derived by carefully balancing the constituent's concerns or desires with the opportunities and constraints of the landscape and its ecosystems. They are management prescriptions designed to maintain or modify the existing landscape character to achieve a desired future state. The goals are very broad, while objectives are more specific: align with goals, and address the indirect effects of management prescriptions. Design criteria address the direct effects; i.e. girdle conifers in aspen stands.
Landscape Visibility addresses the relative importance and sensitivity of what is seen and perceived in the landscape. It is a function of many important and interconnected considerations such as number and *context of viewers*, *duration of views*, *degree of discernable detail* (which depends in part on the position of the viewer, i.e. the landscape may be *superior*, *level with* or *inferior*) and *seasonal variation*. Landscape visibility inventory and analysis consists of three elements, including travel ways and use areas, concern levels and distance zones.

> *Low* – refers to landscape where the valued landscape character "appears moderately altered." Deviations begin to dominate the valued landscape character being viewed but they borrow valued attributes such as size, shape, edge effect and pattern of natural openings, vegetative type changes or architectural styles outside the landscape being viewed. They should not only appear as valued character outside the landscape being viewed but compatible or complimentary to the character within.

Moderate – refers to landscapes where the valued landscape character "appears slightly altered."
High – refers to landscapes where the valued landscape character "appears" intact. Deviations may be present but must repeat the form, line, color, texture, and pattern common to the landscape character so completely and at such scale that they are not evident.
Very High – refers to landscapes where the valued landscape character "is" intact with only minute if any deviations. The existing landscape character and sense of place is expressed at the highest possible level.
Very Low – refers to landscapes where the valued landscape character "appears heavily altered." Deviations may strongly dominate the valued landscape character. They may not borrow from valued attributes such as size, shape, edge effect and pattern of natural openings, vegetative type changes or architectural styles within or outside the landscape being viewed. However deviations must be shaped and blended with the natural terrain (landforms) so that elements such as unnatural edges, roads, landings, and structures do not dominate the compositions.

Maintenance: The upkeep of the entire forest transportation facility including surface and shoulders, parking and side areas, structures, and such traffic-control devices as are necessary for its safe and efficient utilization.

Mastication: The process of reducing larger woody slash and surface fuels into smaller material (generally 10 inches and smaller). Material is generally masticated in place with equipment. Noticeable deviations must remain visually subordinate to the landscape character being viewed.

Motor Vehicle Use Map: A map reflecting designated roads, trails, and areas on an administrative unit or a Ranger District of the National Forest System.

Motor vehicle: Any vehicle which is self-propelled, other than: (1) A vehicle operated on rails; and Mulching: The process of reducing larger woody slash into finer material (generally one inch and smaller). Material is generally mulched in place with equipment.

National Forest System road (NFSR): A forest road other than a road which has been authorized by a legally documented right-of-way held by a State, county, or other local public road authority.

National Forest System trail: A forest trail other than a trail which has been authorized by a legally documented right-of-way held by a State, county, or other local public road authority.

National Register of Historic Places: Determination of the eligibility of cultural resources, and the potential effects that undertakings may have on historic properties are conducted in consultation with the State Historic Preservation Office (SHPO), relevant Indian Tribes, and Certified Local Governments, if present.

Off-highway vehicle: Any motor vehicle designed for or capable of cross-country travel on or immediately over land, water, sand, snow, ice, marsh, swampland, or other natural terrain.

Perimeter Control is a strategy that seeks to confine the active zone that is responsible for fire spread. Actual fireline location will be selected to minimize the combined cost of suppression and the values that could be lost in a fire. The benefits of the fire's effects may also be used to determine location.

Perimeter Control: A strategy that seeks to confine the activity of a wildfire to a specified zone. Zones are determined by threatened values and the benefits of wildfire effects.

Pile Burn (a type of prescribed fire): Removal of forest material by burning piles of slash or trees created by tree cutting operations. Piles can be created by machine or by hand.

Prescription Control is when a fire is considered to be controlled as long as it burns within specific geographic boundaries and predetermined burning properties. These parameters are contained within a

written prescription. The prescription allows those fires to continue to burn that are seen as advancing management goals.

Prescription Control: The fire is considered to be controlled as long as it burns within specified geographic boundaries and predetermined burning conditions. These parameters are determined in advance and detailed in a written prescription. Fires that fall within this prescription are allowed to continue to burn.

Primary Burn Area: Areas within a prescribed burn project that are actively ignited under specific weather and fuel moisture conditions. The use of prescribed fire within primary burn areas must have written pre-approved plans.

Road Construction or Reconstruction: Supervising, inspecting, actual building, and incurrence of all costs incidental to the construction or reconstruction of a road.

Road Decommissioning: Activities that result in the stabilization and restoration of unneeded roads to a more natural state.

Road Reconstruction: Activity that results in improvement or realignment of an existing authorized road as defined below: (1) Road improvement: Activity that results in an increase of an existing road's traffic service level, expands its capacity, or changes its original design function. (2) Road realignment: Activity that results in a new location of an existing road or portions of an existing road and treatment of the old roadway.

Road: A motor vehicle route over 50 inches wide, unless identified and managed as a trail.

Scenic attractiveness is a measure of the landscape's scenic importance based on common human perceptions of the intrinsic scenic beauty of landforms, rock forms, water forms, vegetation patterns, and cultural features. There are three levels of inherent scenic attractiveness that classify the scenic quality of natural landscapes. (Reference SMS). Class A - Distinctive: areas where features of landform, vegetative patterns, water forms and rock formation are of unusual or outstanding scenic quality. Class B - Common: areas where features contain variety in form, line, color and texture or combinations thereof but which tend to be common throughout the landscape province and are not outstanding scenic quality. Class C - Undistinguished: areas whose features have little change in form, line, color, or texture. Includes all areas not found under Classes A and B.

Scenic integrity is a measure of the lack of noticeable human-caused disturbance in the area that detracts from the dominant, valued attributes of landscape character. The baseline from which to measure scenic integrity is dependent upon a complete and accurate description of the important and dominant positive landscape character attributes that are viewed at the time of measurement. It can be used to describe scenery in the past, as it presently exists, and as predicted in the future. Scenic integrity is a continuum that ranges from very high to low. Landscapes with a high degree of scenic integrity have virtually no discordant elements and contain only positive human alterations. They are intact, unimpaired and appear to be in good visual condition. On the opposite end of the continuum, landscapes with low scenic integrity usually have negative human alterations and are in poor visual condition. They often contain discordant and contrasting features such as geometric shapes resulting from vegetative treatment, structures that do not blend with their surroundings, or roads that create large cut and fill slopes across steep hillsides.

Scenic Integrity Objectives are defined below as follows

Scenic sustainability is a measure of the degree to which the ecosystem is likely able to restore, maintain, or continue to exhibit the positive dominant attributes of the landscape character. It is a continuum that ranges from high to low. *High scenic sustainability* is a prediction that all positive

dominant attributes of the landscape character are perpetuated (during the planning period), *moderate* is a prediction that there is some loss of attributes, and *low* is the loss of most or all attributes.
Secondary Burn Area: A buffer area designated for secondary control of prescribed burns that may or may not be ignited. The fire may also be allowed to extinguish itself when it reaches non-burnable barriers, change in fuels or topography, or when the weather moderates.
Significant cultural resources: For the purposes of this analysis, cultural resources are considered significant if they are determined to be eligible for the NRHP or if their eligibility has not been determined. They must: (a) Be associated with events that have made a significant contribution to the broad patterns of our past, or (b) Be associated with the lives of persons significant in our past, or (c) Embody the distinctive characteristics of a type, period or method of construction, or that represent the work of a master, or that present high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction, or (d) Yield or be likely to yield information important in prehistory or history.
Slash: Fuels resulting from forest treatment activities, such as thinning and clearcutting; and natural mortality events, such as wind, insects and disease. Slash can consist of branches, tree tops, logs, and broken or uprooted trees.
Smoke Receptor: Any area where heavy smoke is not desired.
Surface Fuels: Combustible forest material on the surface of the ground, which may consist of needle litter, dead branches, downed logs, and low growing plants.
System road: As used in this document, an abbreviated reference to a National Forest System road.
Temporary road or trail. A road or trail necessary for emergency operations or authorized by contract, permit, lease, or other written authorization that is not a forest road or trail and that is not included in a forest transportation atlas.
Thin from Below: A treatment that removes smaller understory trees to increase the distance between vegetation on the ground and the lowest branches of taller trees.
Thinning: A treatment in which individual trees are cut to increase the spacing between tree tops, which results in decreased opportunity for crown fires.
Torching index is defined as the open windspeed at which crown fire activity can initiate for the specified fire environment (surface and canopy fuel characteristics – i.e. fuel model, windspeed and direction, relative humidity, and slope steepness).
Trail: A route 50 inches or less in width or a route over 50 inches wide that is identified and managed as a trail.
Travel Analysis: A roads analysis that also includes motorized trails and areas.
Travel management atlas. An atlas that consists of a forest transportation atlas and a motor vehicle use map or maps.
Unauthorized road or trail: A road or trail that is not a forest road or trail or a temporary road or trail and that is not included in a forest transportation atlas.
Visual Absorption Capability: defined as the ability of the landscape to absorb changes in the scenery (USDA FS Agriculture Hnbk. 701 p. Glossary-7l .
Watershed Condition Class: The WCC system is a national forest-based, reconnaissance level evaluation of watershed condition based on a core set of national watershed condition indicators.
Way: A term used in the Forest Plan documentation to denote an unauthorized road or trail. This term has been superseded by the term and definition found in the Code of Federal Regulations. Any references to a “way” should be replaced by unauthorized road or trail.

Wildland Fire Management Strategy: Plan for management of wildfires within specific FS lands. The strategy gives consideration to the values threatened, potential fire behavior, legal constraints and natural resource management objectives. All wildland fires would be controlled using one of three strategies:

Wildland Urban Interface is the line, area, or zone where structures and other human development meet or intermingle with undeveloped wildland or vegetative fuels (NWCG Glossary of Wildland Fire Terminology, July 2012).

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Appendix 1. Elkhorn Public Scoping Comments and Responses
Similar issues received from the public during the Elkhorn Project scoping and comment period are grouped below. The comment is in bold and italicized and the Forest Service response is shown below the comment.

CHRISTMAS TREE AREA
COMMENT: ***To improve your Christmas tree area is a very specialized use and should not be done at all.***
RESPONSE: Proposed vegetation treatments in the Christmas tree area would serve multiple purposes. These treatments would provide for future Christmas trees since most of the existing trees will become too large within the next 20 years. In addition, planned treatments are intended to improve forest health, provide for public safety and reduce hazardous fuels. Due to the heavy MPB mortality in the Christmas tree area, vegetation treatments would allow these sites to regenerate more quickly than would occur otherwise.

DISPERSED CAMPING
COMMENT:*…the condition of the current dispersed camp sites in the project area which appear heavily overused. Ground cover in the current dispersed camp sites is non-existent. Many of the sites that I've seen (6-12 in particular) are particularly unattractive. We've spoken to friends who camp in the area, and they prefer not to camp in the dispersed camping due to the poor conditions of the area.*

My proposal is to encourage the NFS to decommission overused dispersed camp sites to allow for natural recovery of those areas. Replacement sites could be allocated on existing roads that currently do not have dispersed sites. After a few years these areas could be rotated back into use, and be more attractive to users of the dispersed campgrounds.
RESPONSE: Consideration of dispersed camping management is beyond the scope of this project. However, Canyon Lakes Ranger District (CLRD) plans to conduct a district-wide dispersed recreation analysis to determine needs across the district. The analysis would look at a variety of rehabilitation and mitigation possibilities such as developing hardened facility pads to direct users to one are, re-vegetation, user-number restrictions, or site closures. Closing camping along these spur roads that are open within the 300' rule would only move the problem to another area and create new unauthorized spur roads. By way of background, in the early 1980's, the roads along CR69 (Manhattan Road) and Forest Road 163 (Bellaire Lake Road) were analyzed and a dispersed management plan was created. Numerous dispersed sites were closed and 30 designated dispersed sites developed along the Manhattan road.

FUELS REDUCTION
COMMENT: ***…nothing (emphasis added) is more important than preventing homes from burning and saving lives. Therefore please analyze a Dr. Cohen fire damage risk reduction alternative in detail.***

Even if the Cohen alternative does not respond to the other project purposes stated in the P&N statement it must be analyzed in detail. USFS Responsible Officials must never make tradeoffs with public safety.

Dr. Cohen stresses that landscape-level hazardous fuels reduction is often ineffective at reducing the intensity and rate of spread of wildfire.
RESPONSE: Alternative A (No Action) will address this comment since the Forest Service does not have jurisdiction to treat hazardous fuels on private land. The proposed action will analyze the Forest Service's three-part strategy to accomplish the purpose and need of reducing the potential of damaging wildfires in and adjacent to the Elkhorn project area. The first part of this strategy is the cooperative efforts between the private landowners and state and local agencies to develop and implement a Community Wildfire Protection Plan. Secondly, fuel reduction treatments are planned on National Forest lands immediately adjacent to the private land. These treatments focus on removing ground fuels and raising the height of the canopy to lessen the chances of a ground fire spreading to the crowns of the trees, thus enhancing defensible space on the adjacent private land. The third part of the strategy would address the threat of a wildfire moving from the more distant locations towards private property. While the Cohen method of hazardous fuels reduction prescribes one method for fuels treatment, the FS strategy is based on current science-based research and provides the most effective and efficient method of accomplishing the purpose and need for fuels reduction. Refer to the Air and Fuels Section of the EA for further discussion (pages 51-61).

TRANSPORTATION
Multiple comments were received that requested that the 333.0 and 333A Roads be analyzed for decommissioning instead of designation as an ML1 road, similar to the comment below.
COMMENT: ***The proposed action for roads 333.A and 330.O should be reconsidered. The proposed action for these roads is to make them into ML-1 administrative roads after the project is completed. While this may have many positive impacts such as improving habitat, lowering maintenance costs, enhancing experiences on the North Lone Pine trail, and keeping them closed to public use, we feel that these roads should be reanalyzed and perhaps considered for decommissioning.***
RESPONSE: Forest Service Roads 330.0 and 333.A are required for internal agency use for emergency access. This area has historically been a consistent location for lightning-caused fires and these road segments provide the only road access. For this reason, these roads have been proposed for ML1 and we do not intend to decommission these two roads. We feel analysis of a decommission alternative would not be productive. It is currently maintained at the ML2 level. If it is designated as an ML1 road, it will continue to be closed to motorized public use behind the locked gate and would be used administratively on an irregular basis.

COMMENT: ***We request that the agency analyze an alternative that decommissions this road [198.0]in order to alleviate the risk to water, wildlife, and soils. Taken together, decommissioning NFS Road 198.0 and the significant decommissioning that is proposed for user-created routes directly to the east would result in the creation of a new unroaded area. As discussed above, unroaded blocks of land are important to maintain and restore ecosystem integrity.***
RESPONSE: Forest Service Road 198.0 is currently gated and used for administrative use, primarily for emergency wildfire access. There is also an active mining claim the uses the 198.0 road. Therefore, there will not be an alternative that analyzes decommissioning this road.

COMMENT: ***The Travel Analysis Process should analyze motorized trails. Considering the risks and benefits of existing designated motorized trails in the area would provide a more thorough and holistic understanding of the motorized transportation system than one that only looks at roads. We***

encourage additional Travel Analysis of motorcycle trails 970/Swamp Creek and 956/Killpecker in the analysis area included in the final project decision. Text in the Travel Analysis refers to motorized trails, but these trails were not actually analyzed. Future travel analysis should also consider all designated motorized routes.
RESPONSE: Part of the purpose and need for the Elkhorn TAP was driven by the high density of roads in the project area, both system roads and unauthorized routes. In the early phases of the internal Elkhorn travel analysis process, we did consider inclusion of the motorized trails in the project area. However, it was determined changes to these motorized trails would not be proposed and thus they were not included in the final TAP. We agree that consideration of motorized trails would be more appropriate as a district-level trail analysis as it would look at the district trail system holistically (See Alternatives Considered but Not Analyzed in Detail segment of the EA, page 12 for further explanation).

COMMENT: ***Close 171 to ATV use before it is completely destroyed!...I want 171 closed from Manhattan to the head of Swamp Creek – two miles – camping only – no ATVs.***
RESPONSE: The 171.0 road along with the connecting network of roads in this area are popular with off-highway vehicles and is the primary access for the annual Christmas tree sale. FSR 171.0 was considered in the travel analysis analyzed in TAP and deemed to be a medium risk/high benefit road. This road was not proposed for a change from the current use. All licensed vehicles, including off-highway vehicles, are currently allowed. This project proposal includes watershed improvement projects, some of which target degradation of watershed resources as a result of roads and motorized recreation.

COMMENT: ***We feel these two roads [333.0 and 333.A] were incorrectly portrayed in the public meeting documents, the final proposed action and in other project documents as 5.19 miles of currently publicly open roads that are proposed to be closed/no longer open to the public and converted to administrative roads. These two roads do not appear on the Motor Vehicle Use Map, and thus are not open to public motorized use. The Roads existing condition map does properly show these roads as administrative roads closed to public use.***
RESPONSE: We agree that the wording in the proposed action was confusing. Currently the majority of 333.0 and 333.A are open to administrative use only and is closed to public motorized traffic by a gate. There is a portion of the 333.0 that is currently open to the public before the locked gate and measures 0.09 miles. This public segment should have been listed separately in the TAP risk/benefit table. Although the open portion of 333.0 exists on the ground, it has not yet been printed on a new MVUM map. As proposed, the gate would remain in its current location and the 0.09 would continue to remain open to the public.

Multiple comments were received requesting that the 333.0 and 333.A TAP risk values are reassessed for the motorized recreational use and recreational access connectivity criteria, similar to the comment below.
COMMENT: ***In the travel analysis, Road 330.O was given a high/3 value for motorized recreational use and a medium/2 value for recreation access and connectivity. As an administrative road closed to public motorized use, how could this motorized recreation be occurring and why is it valued? We feel these assigned values are incorrect. Lowering these values would likely lower the overall benefit assessment of this road to low, which would likely change the recommended prescription for this road. Road 330.O was also given a high/3 value for jurisdiction. As it does only exists on public lands this may be warranted, but we ask is there some type of existing special use permit for this road that***

would justify keeping it as a ML-1 road instead of decommissioning it? Will the road no longer be needed for this permitted purpose (if one exists) after the proposed action occurs in this area?
RESPONSE: A portion of the 333.0 road, 0.09 miles, is open to the public before a locked gate (see comment response above).The recreation values assigned to the 333.0 in the TAP referred to this open section of road. It would have been more accurate to split the portions of 333.0 that are open to the public and not open to the public into two separate ratings. We agree that this rating didn't necessarily reflect the recreational benefits of the entire road length. The Forest Service is not planning to decommission 333.0 as it is used on an occasional basis for emergency access (see first comment response under the Transportation subtitle above) and it would be utilized for the proposed vegetation treatments. A designation of ML1, as currently proposed for this road segment, will continue to keep a vast majority of the road closed to public use and the road would not receive regular maintenance.

COMMENT: ***Both 330.O and 333.A were indicated to be Maintenance Level 1 roads (for operational and objective maintenance levels) in 2007 USFS Road Maintenance Objective documents we received from the Forest Service. Yet in the Travel Analysis Process report for this project, the maintenance levels (operational and objective) for these roads increased to ML-2. We would like an explanation for this discrepancy. Why were the maintenance levels increased? Are these actually ML-1 roads now and thus the proposed action is the same as the existing action.***
RESPONSE: Currently, Road Management Objective (or RMO) information is stored in the Forest Service Infra database. Information stored includes jurisdiction, system, status, operation and objective maintenance level, etc. A RMO report, similar to the one you provided, can then automatically be generated through the RMO Module in Infra. The RMO module pulls information stored in the database linked to that road and creates a report. As stated in FSM 7709.59 Chapter 10: While road management objectives (RMOs) provide the corporate record of decisions that collectively establish the intent, purpose, and resource constraints for individual roads, they are not decision documents themselves. Actual decisions must be made through appropriate processes (FSM 7715), including public involvement when appropriate. Line Officer approval of RMOs certifies that management objectives are correctly documented rather than as a record of a new decision.

The use of those roads did not change during this time, just a correction to correctly portray their Maintenance Level. For the 333.0 and 333.A roads, the database was changed (between the 2007 report that you provided and the date of the TAP) to reflect what was currently thought of the existing condition of those roads (ML1) which were administratively used roads that were actually frequented more than once a year (ML2 for administrative use only). This was done by adjusting the coding for Maintenance Level in the Infra database to better fit the intended management objective of the road. However, as part of the TAP, the interdisciplinary resource team (IDT) has recommended that these roads will likely not need to be accessed excepting wildfire or emergency access (except for the first 0.09 miles of 333.0 which is currently opened for recreational use in the field and then blocked via a gate) For these reasons, these two road segments are being proposed for a long-term goal of Maintenance Level 1 after proposed vegetation treatments have occurred.

COMMENT:*… specific concern is leaving open the possibility of revisiting these roads for OHV use. A ML 1 road preserves habitat integrity far better than permanently designated motorized trails as the latter constitute permanent human intrusion into a landscape.*

For this purpose, and dealing with future public expectations, it would be helpful for the final Elkhorn EA and DN to clarify these distinctions. How is the ML1 category different from an administrative category?
RESPONSE: Thank you for your comment. We agree there is a need to clarify the difference between an ML 1 road and an administrative road. An Administrative road is any National Forest System road that is not a public road (FSH 7709.56 Chapter 40). Maintenance Level 1 roads have been placed in storage between intermittent uses. The period of storage must exceed 1 year. Basic custodial maintenance is performed to prevent damage to adjacent resources and to perpetuate the road for future resource management needs. Emphasis is normally given to maintaining drainage facilities and runoff patterns. Planned road deterioration may occur at this level. Appropriate traffic management strategies are "prohibit" and "eliminate" all traffic. These roads are not shown on motor vehicle use maps. An Unauthorized Road is a road or trail that is not a forest road, or a temporary road and is not included in a forest transportation atlas. (36 CFR 212.1, FSM 2353.05, FSM 7705). Refer to the Roads section of the EA for further information (pages 127-130).

COMMENT:*…how does ML 1 address a future era when pressures arise to open ML1 routes up to OHVs? We recommend that the EA/DN include language <u>specifically discouraging</u> future consideration of these routes for motorized use.*

To reinforce this, the EA/DN could make reference to the potential for a larger, less fragmented unroaded area in the project area, and spell out the boundaries that would define such an area, as a "thinking tool" to guide future management actions.

Could the unroaded area be given a name, as a placeholder, like the "North Lone Pine natural area?"
RESPONSE: In the future, a new NEPA decision could override decisions made as part of the Elkhorn project. However, future analysis would likely refer to the Elkhorn project and associated analysis and any new decisions would be subject to a new public process. It is beyond the scope of this project to consider designation of new unroaded areas, as you proposed.

Multiple comments were received requesting that the Forest Service complete a Travel Analysis Process for the entire Canyon Lakes Ranger District, similar to the comment below.
COMMENT: ***While we are pleased to see the Forest Service conduct travel analysis, we recommend that the agency undergo travel analysis at a larger scale in the future. A single travel analysis that assesses a forest's or ranger district's entire transportation system is often the best approach to ensure continuity across watersheds.***
RESPONSE: We agree that travel analysis at the broader district level is a worthwhile approach and this effort is in progress. The Forest is currently embarking on district-wide TAPs as part of Subpart A of the Travel Management Rule. The Canyon Lakes Ranger District Travel Analysis is scheduled to be completed by the end of 2015.

COMMENT: ***The proposed action proposes to designate NFS Roads 333.A and 333.0-North Baldy as Maintenance Level (ML) 1 roads, which would put them in storage. The Forest Service is proposing several mechanical vegetation management projects (unit numbers 25, 36, 37, 38, 41, 42, and 65) near these roads. Given their spatial proximity, we deduce that the agency may use roads 333.A and 333.0 to complete the projects in these units. We remind the Forest Service that absolutely no motorized use is allowed on ML 1 roads, including access for administrative use. If the agency is indeed intending to***

use these roads to conduct vegetation treatments, then the agency cannot designate these roads as ML 1. We request that the agency analyze an alternative that permanently decommissions these roads for the following reasons:

If the proposed vegetation management treatments in the seven units listed above are ultimately included in the final decision, we request that the agency include a statement in the decision notice that commits the agency to decommissioning these roads after the vegetation treatments are complete.
RESPONSE: Maintenance level 1 (ML1) roads are roads that have been placed in storage between intermittent uses (See the Roads section of Chapter 3 for further discussion of ML1 roads, page 126). While it is true that regular vehicular use is not permitted on ML1 roads, ML1 roads could receive motorized use and basic custodial maintenance. The district has developed a tentative schedule for the proposed road decommissioning and conversion. In some cases, roads could be decommissioned or converted immediately following the NEPA decision, while others will be used to implement vegetation treatments. In general, road segments that provide access to and within the proposed vegetation treatment units, and that are proposed for decommissioning or conversion to ML1, would be employed during the treatment implementation first. In some cases, the contract used for vegetation treatments could also be used to decommission applicable roads at the same time.

COMMENT: ***The construction of a new road should be temporary. There are clearly enough roads.***
RESPONSE: There is only one new segment of road, totally 0.26 miles of new construction, proposed as part of this project. This road would provide for an additional loop in the Christmas tree area and would be open seasonally during the Christmas tree sale (approximately two weeks per year). Otherwise, there are no other new permanent road segments proposed as part of this project.

COMMENT: ***Decommissioned and closed routes should not encourage further use. Closure activities should be focused where the closed routes intersect system routes and within the line of sight from system routes. The best way to fully close routes is to completely obliterate them and rip and seed the former roadbed as soil compaction may prohibit natural re-vegetation. Where this is not possible, slash can be scattered on decommissioned routes, especially near where they leave designated routes. The visible corridor of routes that are to be closed or decommissioned should not be readily apparent where these routes leave designated routes. Structures, signs, barriers, fences, re-contouring, re-vegetation should all be used to discourage further use of decommissioned routes.***
RESPONSE: We agree. See roads and soil/water/fish design criteria (pages 31-33) and resource analysis (pages 38-50) for further explanation.

COMMENT: ***Vegetation and fuel treatment should not create new routes. The project should avoid creating new visible, linear corridors leading off system routes as a result of skidding, hauling, thinning or other treatment activities that will remove or disturb vegetation. All temporary roads or routes must be properly closed as soon as possible after treatment. These visible corridors allow, and can tempt, motorized users to travel off designated routes. Although cross country snowmobile use is allowed in most parts of the project area, removal of vegetation and creation of new corridors would facilitate new snowmobile use in new areas which would impact wildlife. In lower elevation areas, such use would adversely impact wintering big game. Slash should be scattered in any open corridors that are created, and placed along designated routes to discourage unauthorized use. All temporary***

roads must be closed to public use during the project's operating period (using gates or other removable barriers with appropriate signage) where they leave system routes, to prevent public use of them during evenings, weekends, and other times when work crews are not present.
RESPONSE: Any unauthorized or temporary ways or roads used for vegetation management activities would be decommissioned after treatments are completed. Forest Service Manual 7703.24 states that temporary roads are maintained as provided in the contract, permit, lease, or other written authorization for those roads and must be decommissioned at the conclusion of the authorized activity. No new permanent roads would be created for the purpose of vegetation management (see proposed action, page 14). Temporary roads used for vegetation treatments would be closed before completion of the contract. See design criteria (pages 31-33) and resource analysis (pages 38-50 and 127-130) for roads and soil/water/fish for road decommissioning requirements. Temporary road, skid trail and landing locations are designated by the Forest Service. These are strategically placed to reduce resource impacts (i.e., riparian areas, soil erosion) while taking into consideration existing routes and topographical restrictions. Efforts are made to reduce potential for new off road routes. To discourage off road travel where vegetation units are places along existing roads, project design criteria have been developed (see recreation design criteria, pages 29-30). The Forest Plan provides guidance to minimize the impacts of roads and trails on natural resources such as soil, water, and wildlife (see roads resource analysis). Snowmobile use in much of the project area is limited by limited snowpack in lower portions of the project area. We do not anticipate a significant increase in snowmobile activity due to vegetation treatments and therefore impacts to wintering big game species would be expected to be limited. The proposed vegetation treatment units at higher elevations in the project area are not considered winter habitat for big game species due to deep snowpack. See wildlife design criteria (pages 34-36) and resource analysis (pages 85-108) for big game discussion protection measures. Unless public safety issues exist, vegetation treatment units are not typically closed during operations. However, warning signs are posts, traffic control plans are developed and sometimes gates restricting access are erected.

Several comments were received similar to the comment below.
COMMENT: ***Dispersed motorized camping spurs should be analyzed and considered for treatment. Since most of the designated routes in the project area allow motorized travel off of them for the purpose of dispersed camping, these unofficial roads should be analyzed and treated appropriately in this project. Dispersed motorized camping can have impacts beyond mere travel on a route because it involves overnight occupancy.***
RESPONSE: All inventoried unauthorized routes were considered in the Travel Analysis including any spur roads created for dispersed camping. Segments of system road that extended beyond the 300 foot rule for dispersed camping were considered, and some proposed, for decommissioning. The proposed action includes decommissioning of all unauthorized routes, including many of the dispersed motorized spurs to which you refer. In addition, the Elkhorn project includes a proposal to remove or restore dispersed campsites that are causing damage to riparian areas (see proposed action, page 14).

COMMENT: ***To limit human disturbance to wildlife, these two roads [333.0 and 333.A] should be clearly marked as administrative routes where they intersect with the North Lone Pine Trail.***
RESPONSE: Thank you for this suggestion.

COMMENT: ***A final decision for this project should permit continued action. Treatments and actions taken with this project need to be monitored to ensure that they are accomplishing their intended***

purpose and moving the area toward desired conditions. If monitoring determines that certain follow up actions are needed to repair or complete prescribed action, the decision should permit this. For example, since the decision is closing and decommissioning all unauthorized motorized routes in the area, the decision should permit the closure and decommissioning of any new unauthorized motorized routes that may form within the project area in the future. How can this be implemented as part of this project, since there won't be public comment if new routes are discovered?
RESPONSE: We agree that there may be a need to decommission additional unauthorized routes that are created or discovered subsequent to this decision. However, NEPA is not required to decommission these routes. Because there is such a high density of unauthorized routes in the Elkhorn project area, we felt it was logical to consider these in the TAP. Per FSM7700, Ch. 10, 'Travel analysis is not required to advise decisions to decommission unauthorized routes, including those discovered through monitoring'.

COMMENT: …***whenever possible, utilize the roads proposed for decommissioning as access for treatments, and provide credits against stumpage for road closures. When possible, look at using methods of closing these roads whereby they can be reopened as needed during wildfire events or utilized for access for future treatments.***
RESPONSE: When developing this project proposal, the overlay of unauthorized routes and vegetation treatment units was considered. Many of the roads planned for decommissioning are within vegetation treatment units. These would be used for the vegetation work and closed as part of the contract. The goal of decommissioning is obliteration of roads and their resource impacts from the landscape. Road decommissioning would be done in such a way that reopening would be difficult. Maintenance level 1 roads (ML1), in contrast, are roads that are not routinely used or maintained and could be opened for future activities.

COMMENT: ***We trust the district has made an economic analysis that indicates the FS will have the funds to do these mitigations. Re the "mitigate/maintain" category, we trust that even though the proposed action has chosen to "mitigate/maintain" routes with high resource risks, rather than close them altogether, this is because the Forest Service believes there is a fair chance of mitigating the soils and watershed impacts of these routes.***
RESPONSE: The Forest Service receives funding through Congressional allocations and partnerships to address watershed concerns, including road-related watershed issues. The TAP does identify the roads at highest priority for maintenance or mitigation with the 'mitigate/maintain' designation with the acknowledgement that funds are often limited.

COMMENT: ***We note that a couple of routes are being retained that have low benefits, yet high risks but assume that was for good reason.***
RESPONSE: We do not believe the TAP has assessed any system roads with high risk, low benefit and are proposed to be maintained. There are several unauthorized routes that were assessed to have high risk and low benefit and these are proposed for decommissioning.

COMMENT: ***We request that the techniques used <for road decommissioning> should result in complete ecological restoration of the travel way and prevent motorized vehicles from illegally driving on the route.***
RESPONSE: Thank you for providing the literature. See Roads and Soil/Water/Fish design criteria for our road decommissioning guidance (pages 31-33).

COMMENT: ***It appears education about the environmental impacts and illegality of constructing roads and trails is necessary (I see little to no education on this from the Forest Service and they are everywhere). Enforcement will be necessary.***
RESPONSE: We agree that enforcement will be necessary. The Motor Vehicle Use Map (MVUM) is provided to any interested public free of charge. The MVUM denotes all system routes open to the public. We also provide information about the road and trails system on our forest website and in the visitor information services office. Furthermore, law enforcement and forest protection officers patrol high recreation use areas and educate the public as feasible. Road decommissioning is designed to restore ecosystem function and reclaim the disturbed areas. See also roads design criteria (pages 30-31).

VEGETATION TREATMENTS
COMMENT: ***We recommend that this type of treatment strategy [large clearcut units] be replicated in non Wildland-Urban Interface areas. We also recommend that, whenever possible, the borders of these treatment areas be made undulating. This may decrease the harsh "clearcut" look that many members of the public do not like.***
RESPONSE: As the proposed action details, we are proposing clearcuts as part of the proposed action. The FS landscape architect reviews layout design prior to implementation and typically recommends the undulating type of boundaries that you suggest. See visual resource design criteria for further information (pages 33-34).

COMMENT: ***We encourage you to look for opportunities to expand aspen stands by clearcutting surrounding conifer stands, as this component of the forest is often lacking on the Front Range and is so valuable from the wildlife and aesthetic standpoints, and is an important natural barrier to the spread of wildfires. When managing for ponderosa pine, we encourage you to utilize forest restoration techniques that develop very open stands with numerous openings.***
RESPONSE: Within vegetation treatment units, we do plan to remove encroaching conifers from aspen stands for the purpose of aspen stand enhancement. This should have been specified in the proposed action. It is expected that as a result of high levels of mountain pine beetle mortality, Front Range aspen populations will expand. We agree that aspen serve as a barrier to wildfire spread and are important habitat for plants and wildlife. We are currently employing restoration prescriptions in some of our ponderosa pine treatments and expect these types of treatments could be used in the Elkhorn units as well. See description of prescriptions for more information, Appendix 2 (page 163).

COMMENT: ***We realize that Roadless Areas are problematic, but utilize and apply all the authorities that exist that allow for treatments within the large Roadless Area in the southern portion of the planning area.***
RESPONSE: For the most part, we excluded the Roadless Area from proposed treatments except for the prescribed burn for reasons described in the 'Alternatives considered but excluded from analysis section' (page 12). While some types of vegetation treatments are allowed in Roadless Areas, much of this terrain is not accessible by vehicle, nor adjacent to communities-at-risk where we would consider fuels reduction proposals.

COMMENT: ***There are large areas within the interior of the planning area with no proposed treatments. Utilize the road that is proposed for decommissioning as a jump off point for conducting***

treatments in these areas prior to the decommissioning. Treatments in this large area would seem prudent from a watershed protection standpoint.
RESPONSE: The area to which you refer is designated as a 1.3 Backcountry Recreation Management Area (MA) in the ARP Forest Plan (see Map 2, page 18). In this MA: "Timber harvest is not allowed. Accept insect and disease losses. Allow natural processes to be the primary actions that affect the vegetation mix and structure."

COMMENT: ***…plan now for future silvicultural treatments, particularly in lodgepole pine stands. Early pre-commercial thinning is necessary for regenerated stands to grow properly. So often, under the pressure of programs and budgets, this critical treatment need gets lost or delayed and the significant investment made in the regeneration harvest is lost.***
RESPONSE: Pre-commercial thinning, also referred to as timber stand improvement, is planned for regenerated stands of trees when they reach the age where they will respond to that kind of treatment (usually 10-20 year post harvest). A separate NEPA analysis and decision is periodically done for multiple areas of the district where those conditions exist. The silviculture section discusses future treatment of regenerated stands of trees.

COMMENT: ***We recommend that the Forest Service look for opportunities to place or expand units that allow for cross-boundary treatments on adjacent BLM, State or private lands. Begin now coordinating with the Colorado State Forest Service to explore and plan for (including funding) for Good Neighbor and Stevens projects.***
RESPONSE: The Forest Service works closely with our agency partners, communities and private landowners to maximize funding opportunities and coordinate cross-boundary treatments. For this project, the proposed prescribed broadcast burn is an example of collaboration with Colorado Parks and Wildlife. However, based on the location, the remainder of the Elkhorn project area very few other opportunities to combine vegetation treatments where FS and BLM, state or private lands intermix exist.

COMMENT: ***From an industry standpoint, consistent supply of product input is essential. Therefore, I suggest that implementation projects be provided as consistently over the years of the project as possible and wood quality allows. Or, if projects are let quickly, ensure that they have a long period within which they can be harvested. In addition, maximize mechanical treatment opportunities whenever there is a choice between hand treatments or mechanical.***
RESPONSE: The proposed action does not specify timing of implementation of this project with the exception of vegetation treatments in the Christmas tree area (where implementation should be phased over at least a ten year period. Currently, we expect implementation of Elkhorn vegetation treatments to begin no earlier than 2014. If treatments are implemented through contracts such as a timber sale or stewardship contract, the time period allowed will be based on project size, complexity and the rate of product deterioration. Terrain, resource and Forest Plan constraints typically determine whether hand treatments will be employed over mechanical treatments.

COMMENT: ***Treatment areas shown are at the extreme edge of this facility's [Eagle Valley Clean Energy electrical generating facility in Gypsum, CO) "working circle." When treatments are finally designed, laid out, and offered, please include opportunities for utilization of biomass. This requires larger landing sizes to allow the use of chipping/grinding equipment and use of chip vans. Some widening of corners to allow use of chip vans may also be required. (Please understand, however, that***

West Range is investigating different designs of chip vans that would allow their use on traditional logging roads.) Because of the opportunity to support this energy facility, maximize opportunities for mechanical thinning as opposed to manual thinning. Also, when considering methods for reducing surface fuels, consider the biomass utilization option.
RESPONSE: Where product removal is proposed, utilization of all forms of wood products is one of the goals of the Forest Service. The district has the experience and understands the infrastructure needed for chipping/grinding and transport of biomass material and would support the utilization of biomass where feasible.

COMMENT: ***I want you to remove the mere dead ponderosa and lodgepole – soon – they are starting to blow down!***
RESPONSE: The proposed vegetation treatments in the Elkhorn project address the mortality in lodgepole and ponderosa pine stands. Many treatments will emphasize salvage of dead and dying trees.

WILDLIFE
COMMENT: ***They [bighorn sheep] are not wild. They don't belong there. They have red and blue collars, some have bells on them – ear tags and tattoos.***
RESPONSE: The bighorn sheep populations in the Elkhorn project area are wild sheep as a result of reintroductions by CPW in their historic native range, known as the Upper Poudre Canyon herd. Some sheep are marked with radio collars and ear tags for the purpose of monitoring by CPW.

COMMENT: ***Your map shows you are going to burn the north slope side too – the sheep never go there, ever. Why burn the north side? If the fire got away you couldn't get to it – no access because the ATVS have destroyed the road up 7 mile.***
RESPONSE: We agree that the northern portion of the proposed burn unit is not typically used by bighorn sheep. However, elk and mule deer habitat does exist in the open meadow areas in the northern portion of the burn unit. The burn unit boundaries were chosen based on topographic and other control features that would allow the broadcast prescribed burn to be implemented by the safest and most efficient means possible. The Seven Mile road would be used as the northern control line so that fire personnel and engines could access this area. We anticipate that some improvements to this road will be necessary for passage by fire engines. This was also the most practical location to for control since the other option would have been hand constructed fireline on a ridgetop with no engine access.

COMMENT: ***To burn that mountain means no more buck brush and that's the deers main food supply in the winter – sheep too – it takes many years for buck brush to grow.***
RESPONSE: We are assuming that the term 'buckbrush' is in reference to *Purshia tridentada*, a shrub commonly called antelope bitterbrush. We agree that this shrub is an important browse species for deer and sheep. Although one purpose of the broadcast prescribed burn is to reduce the overall cover provided by trees and shrubs to reduce hiding cover for bighorn sheep predators, the intent is not to cause widespread mortality in shrub species. The broadcast prescribed burn would be implemented outside of the growing season when mortality would be expected to be lower and it is expected to result in a mosaic burn pattern. Some areas will experience higher or lower intensity fire, while other areas will not burn. Additionally, we believe the species found within the proposed burn perimeter are fire adapted since these sites regularly burned historically. According to the FS Fire Effects Information System, following fire, some bitterbrush ecotypes resprout readily, while others are more susceptible to

post-fire kill. Resprouting success is highly dependent upon fire severity and season. Because this species is found throughout the Poudre Canyon wildlife corridor, we believe that species such as deer and bighorn sheep will move to appropriate food source centers following prescribed burning.

COMMENT: ***There is no excess fuel supply on those south facing ridges.***
RESPONSE: We believe the area inside of the proposed broadcast burn unit to be outside of the natural fire return interval due to fire suppression. Evidence of fire exclusion can be found in the current vegetation structure: junipers are growing underneath mature ponderosa pine stands, thick litter layers exist in some areas, significant numbers of ground juniper are growing under aspen in the upper ridges of the burn unit, heavy pockets of dead and down material on steep slopes that would have been consumed in natural fires and the area, in general, is not as open as some other areas in the Poudre Canyon corridor that have experienced fire in recent years. The noticeable amount of litter and ladder fuels within the proposed burn area, the existence of relatively heavy concentrations of juniper and shrubs and the lodgepole pine stand in the far west portion of the burn unit would all contribute to a high potential for wildfire spread in this area. Furthermore, there is a large potential for human-caused wildfire starts in the Sevenmile and Poudre Canyons due to high human use in these areas.

Appendix 2. Elkhorn Project description of vegetation treatment prescriptions

TREATMENT	DESCRIPTION	TREATMENT METHOD(S)	SLASH TREATMENT	ANTICIPATED FOREST STRUCTURAL CHANGES	PRODUCT REMOVAL
Broadcast Prescribed Burn	Use of prescribed burning by applying fire, under specified environmental conditions, which allows the fire to be confined to a predetermined area and, at the same time to produce the fireline intensity and severity required to reduce hazardous fuels and improve Big Horn Sheep habitat. Pre-Burn Treatment consists of thinning and creating a "black line" along some sections of the perimeter to prepare for the ignition of larger areas within the burn. Thinning consists of the removal of ladder fuels and piling of existing and created slash. Typically thinning occurs 60 to 100 feet inside the fire treatment unit from the edge of the perimeter. Any piles created are burned prior to the main ignition.	Thinning and piling to be completed by hand crews using chainsaws. Fire ignition by various methods specified in the Burn Plan.	Not applicable.	- Reduction of surface and ladder fuels and continuity of the upper canopy broken up. - Creation of a mosaic of densities through varying burn intensities. - Removal of a significant portion of the shrub component to reduce bighorn sheep predator cover and to enhance sheep forage opportunities.	Not applicable.
Clearcut, Clearcut with Reserves, Patch Clearcut	Cutting of essentially all trees, producing a fully exposed microclimate for the development of a new age class regeneration is expected from natural seeding, or advance reproduction. The management unit or stand in which regeneration, growth, and yield are regulated consists of the individual clearcut stand.	Standard logging equipment.	Slash may be treated by concentrating into piles by skidding the whole tree to the landing and delimbing at the landing or by lopping and	All trees are cut with only a minor number of patches of advanced regeneration (seedlings or saplings) remaining. In clearcuts with reserves all trees are cut except mature reserves trees retained as individual trees or patches.	Sawtimber and POL size trees would be utilized as product.

TREATMENT	DESCRIPTION	TREATMENT METHOD(S)	SLASH TREATMENT	ANTICIPATED FOREST STRUCTURAL CHANGES	PRODUCT REMOVAL
	A minor component of the stand may be retained as reserves. Reserves can be individual trees or patches of trees of varying sizes. Reserves provide wildlife habitat, meet visual objectives, break-up wind patterns and if live trees, seed cast.		scattering throughout the unit.	Clearcut stand size will generally not exceed 40 acres in size but due to the MPB epidemic openings can exceed the 40 acre limit.	
Group Selection	A silvicultural system in which the canopy is opened, by group cuttings, so as to create fairly evenly distributed gaps that are enlarged by subsequent cuttings as the groups of regeneration develop; regeneration is mainly natural, though young seedlings may be planted and the resultant crop is more or less uneven-aged.	Standard logging equipment.	Slash that is created by the treatment or exists prior to the operation is piled or moved to the landing in the skidding operation when mechanical treatment is employed. Piles are disposed of by burning during the winter months when adequate snow cover exists and suitable conditions provide for smoke dispersion.	Stand structure following treatment includes representation of all size classes. This structure is created by removing a portion of the mature trees in openings that are about two acres in size. The size of the opening creates conditions suitable for shade intolerant species such as lodgepole pine to regenerate. Once tree regeneration establishes in the openings and grow to sapling or pole size trees another series of openings are created. Eventually the stand is comprised of an aggregation of groups ranging from seedlings to mature trees.	Sawtimber and POL size trees would be utilized as product.
Salvage	Removal of dead, dying or damaged trees due to injurious agents other	Standard logging equipment.	Same as above.	All dead and dying trees are removed.	Salvage implies utilization of dead

TREATMENT	DESCRIPTION	TREATMENT METHOD(S)	SLASH TREATMENT	ANTICIPATED FOREST STRUCTURAL CHANGES	PRODUCT REMOVAL
	than competition, to recover economic value that would otherwise be lost. Synonyms: salvage felling, salvage logging. The definition of a salvage sale (harvest) is "a timber sale where the primary reason for entry is that most of the trees are insect-infested, are dying or damaged, or are dead standing or down and they can still be useful as logs, firewood and other wood products." A component of the volume recovered will be live and uninfested trees because salvage sales may include an incidental amount of non-salvage timber for access and safety. Funds generated from stumpage on timber sales classified as a salvage sale can be deposited into the salvage sale fund.			<u>Even aged Stands:</u> Where extensive tree mortality has occurred post treatment units will closely resemble a clearcut. Where moderate tree mortality has occurred post treatment units may resemble Clearcuts with reserves. These are considered regeneration harvests where natural regeneration is expected. <u>Uneven aged Stands:</u> Where tree mortality is light post treatment may resembles group selections. Extremely light mortality may resemble a selection harvest. Where tree mortality is moderate or extensive, post treatment units may resemble Overstory Removal (with reserves). Two age classes may be present post-harvest with one age class represented by the mature surviving trees and the other age class represented by seedlings (regeneration). Solitary lodgepole trees that are live and retained after	trees which are removed from the logging site.

TREATMENT	DESCRIPTION	TREATMENT METHOD(S)	SLASH TREATMENT	ANTICIPATED FOREST STRUCTURAL CHANGES	PRODUCT REMOVAL
				treatment are likely to topple from wind. Groups of live trees may maintain some integrity and hold-up with some loss of trees from wind along the edges of the groups. Windthrow is not as prevalent in ponderosa pine as in lodgepole pine stands.	
Sanitation	Sanitation treatments involve the removal of trees infested with insects or disease and would be utilized where heavy infestations of dwarf mistletoe exist and tree cutting would help to impede the spread of this disease	Standard logging equipment. Hand Crews with chain saws for TSI operations.	Same as above.	Sanitation is applicable where heavy infestations of dwarf mistletoe (DMT) exist. Many of the overstory trees infested by DMT may be killed by MPB but infested trees that survive would be harvested for sanitation purposes. Understory trees infested by DMT would be targeted for cutting during the TSI operation.	Sawtimber and POL size trees would be utilized as product. It is not likely that trees <5” DBH would be utilized.
Thinning	Removing some of the trees in a stand to meet desired conditions. Pre-commercial thinning (TSI) removes trees that are too small to make merchantable product. Commercial thinning involves the removal of trees that have reached sufficient size to be manufactured into product and to improve tree spacing and to promote more rapid growth.	Thinning and piling can be completed by hand crews using chainsaws or completed using standard logging equipment. Sometimes thinning can be completed using mastication machinery.	Same as above.	Depending upon stand condition at time of implementation and species, thinning treatments would range from low thinning to mosaic thinning, as described below. In all cases, dead trees would be removed (salvaged if possible) with exception of snag retention.	In low thinning operations generally the cut trees are not utilized. In thinned areas that include trees killed by MPB salvage may occur.

TREATMENT	DESCRIPTION	TREATMENT METHOD(S)	SLASH TREATMENT	ANTICIPATED FOREST STRUCTURAL CHANGES	PRODUCT REMOVAL
	Thinning is conducted to reduce stand density or the number of trees per acre. The healthiest trees are retained while undesirable (poorly shaped, diseased or insect infested) trees are removed. Preferred species are retained. Types of thinning that are applicable include the following: • Free thinning the removal of trees to control stand spacing and favor desired trees, using a combination of thinning criteria without regard to crown position • Low thinning the removal of trees from the lower crown classes to favor those in the upper crown classes — *synonym* thinning from below • Geometric thinning: the thinning of trees by using fixed spacing intervals Thinning for fuel reduction targets removal of ladder fuels to raise the average crown height and sometimes dominant trees are removed to break-up canopy continuity and reduce canopy bulk density.			Low thinning: Primarily would entail the removal of smaller diameter trees in the understory and removal of ladder fuels. Some smaller diameter trees (younger) would be retained when not functioning as a ladder fuel. This prescription would not be strictly a diameter-based thin. Target basal area would be 40-60sq ft/ac Mosaic thinning: This prescription would create a mosaic of patches including (1) openings of up to 2 acres in size, (2) uncut areas with mostly mature trees with some interlocking crowns, (3) and areas where individual trees or clumps of trees would be thinned to create gaps of 5-10 feet between crowns. Some larger diameter trees would be removed to create breaks in the canopy and reduce crown bulk density.	

TREATMENT	DESCRIPTION	TREATMENT METHOD(S)	SLASH TREATMENT	ANTICIPATED FOREST STRUCTURAL CHANGES	PRODUCT REMOVAL
Overstory Removal (OSR)	The cutting of trees constituting an upper canopy layer to release trees or other vegetation in an understory. When the primary source of regeneration in a multistory stand is advance reproduction, the preferred method to release the understory is overstory removal. Stands are not considered an OSR unless it is anticipated that minimum stocking standards are met post-harvest (taking into consideration damage to the advanced regeneration from the logging operation)	Standard logging equipment. A cleaning operation is generally a standard practice since it is inevitable that a portion of the understory will be damaged when the overstory is removed. Cleaning is usually completed with hand-crews using chainsaws.	Same as above.	The overstory is removed leaving a stocked understory.	Sawtimber and POL size trees would be utilized as product. It is not likely that trees <5” DBH would be utilized.