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Environmental Assessment

Roundhill Fuel Reduction Project

Lake Tahoe Basin Management Unit
Douglas County, Nevada

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SUMMARY

The Lake Tahoe Basin Management Unit proposes to implement vegetation and fuels treatments to reduce stand densities to: improve forest health, reduce fire hazards from existing fuels and modify fire behavior to provide defensible space for adjoining developed private lands. Treatment options would include ground based mechanical treatments wherever slope and road access allow and hand treatments where slopes would not permit mechanical equipment or no road access exists. The project area extends from Kingsbury Grade (SR 207) to Logan Shoals on the east side of the Lake Tahoe Basin. The project is located within the Roundhill and Genoa Peak Management Areas in T. 13N, R. 18E, Sections 3, 10, 14, 15, 22, and 23; and T. 14N, R. 18E, Sections 22, 27, and 34 (see figure 1, proposed action, page 9).

This action is needed because the vegetative conditions in the Roundhill project area have been diverted from their historic forest structure and species composition due to fire suppression, and past forest management, in particular the Comstock logging era of the 1870's. Over the past 100 years the shift has been from the fewer larger diameter pines to more of smaller diameter pine and fir trees as well as an increase in surface fuels. The accumulation of surface and ladder fuels, especially the growth of dense, small-diameter suppressed trees, contributes to increased potential for crown fires. The overall changes in fuel conditions and fire behavior in the project area increases the risk of severe wildfire.

In addition to the proposed action, the Forest Service also evaluated the following alternatives:

- No-Action.

INTRODUCTION

Document Structure

The Forest Service has prepared this Environmental Assessment in compliance with the National Environmental Policy Act (NEPA) and other relevant Federal and State laws and regulations. This Environmental Assessment discloses the direct, indirect, and cumulative environmental impacts that would result from the proposed action and alternatives. The document is organized into four parts:

- *Introduction:* The section includes information on the history of the project proposal, the purpose of and need for the project, and the agency's proposal for achieving that purpose and need. This section also details how the Forest Service informed the public of the proposal and how the public responded.
- *Comparison of Alternatives, including the Proposed Action:* This section provides a more detailed description of the agency's proposed action as well as alternative methods for achieving the stated purpose. These alternatives were developed based on significant issues raised by the public and other agencies. This discussion also includes possible mitigation measures. Finally, this section provides a summary table of the environmental consequences associated with each alternative.
- *Environmental Consequences:* This section describes the environmental effects of implementing the proposed action and no action alternatives. This analysis is organized by significance factors. Within each section, the significance factors are discussed in reference to the effects of the No Action and the Proposed Action.
- *Agencies and Persons Consulted:* This section provides a list of preparers and agencies consulted during the development of the environmental assessment.
- *Appendices:* The appendices provide more detailed information to support the analyses presented in the environmental assessment.

Additional documentation, including more detailed analyses of project-area resources, may be found in the project planning record located at the Lake Tahoe Basin Management Unit Supervisors Office in South Lake Tahoe, California.

Background

In 2000, in response to a request by President Clinton, the Secretaries of Agriculture and of Interior developed an interagency approach to respond to severe wildland fires, reduce their impacts on rural communities, and ensure sufficient firefighting capacity in the future. A strategy was outlined to reduce wildland fire threats and restore ecosystem health in the interior West. The strategy built on the premise that within fire-adapted ecosystems, reducing fuel levels and using fire at appropriate intensities, frequencies, and time of year, is key to restoring healthy resilient forest conditions sustaining natural resources and providing for public safety. The strategy resulted in the development of the National Fire Plan. This plan addresses five key points that include the following: Firefighting; Rehabilitation and Restoration; Hazardous Fuels reduction; Community Assistance; and Accountability. Reduction of hazardous fuels in the WUI is the essential focus of the plan, particularly in dense forest stands resulting from decades of fire exclusion. The Roundhill Fuel Reduction Project is proposed in response to the fuel reduction element in the National Fire Plan and will reduce hazardous fuels in and around the communities of Round Hill, Zephyr Cove, Kingsbury, Chimney Rock, Skyland, Lakeridge, and Logan Shoals.

This project will apply only to National Forest Lands within the LTBMU within the project area. While the project reduces fuel loading in areas of WUI, the fire hazard would only be reduced up to private land boundaries, and cannot eliminate the threat to structures on private lands.

In the fall of 2007, the Ninth Circuit Court enjoined the USDA Forest Service from using categorical exclusion category 10. Previously, this project had used that category to issue a decision memo. Rather than postponing this project, the Forest Supervisor decided to document the NEPA process in an Environmental Assessment (EA) and re-issue a decision under a Decision Notice/Finding of No Significant Impact (DN/FONSI). The timing of the court injunction, the fire risk involved, and the non-controversial nature of this project (no substantive comments were received during the 30-Day comment period provided for the preliminary Decision Memo from July 20, 2007 to August 19, 2007) were all considered in this decision. The proposed action and project design features have not changed from the one outlined in the previously issued Decision Memo (Signed September 6, 2007, Exhibit A1, project record).

Purpose and Need for Action

Historic Forest Conditions - Fuel conditions in the Roundhill project area prior to the late 1800's consisted of forests dominated by widely spaced, large-diameter Jeffrey pine, sugar pine, incense cedar, white and red fir, and lodgepole pine. Trees per acre ranged from about 11 to 46 with average diameters of about 21 to 34 inches dbh (Taylor, 2004). The fire regime was typically that of frequent, low-intensity surface fires that reduced the amount of understory shrubs, shade tolerant tree species and dead fuel accumulations. The historic mean fire return interval for Jeffrey pine-white fir forests was 12 years with a range of 5 to 28 years between fires (Taylor, 2004).

Current Forest Conditions - The vegetative conditions in the Roundhill project area have been diverted from their historic forest structure and species composition due to fire suppression, and past forest management in particular the Comstock logging era of the 1870's. Over the past 100 years the shift has been from fewer larger diameter pines to more, smaller diameter pine and fir trees as well as an increase in surface fuel loading. The accumulation of surface and ladder fuels, especially the growth of dense, small-diameter suppressed trees, contributes to increased potential for crown fires. The overall fuel conditions and fire behavior in the project area poses an increased risk of a severe wildfire event.

Purpose and Desired Condition - The purpose of this project is to reduce fuel loading and tree densities to help shift the landscape toward the desired conditions identified in the Sierra Nevada Forest Plan Amendment (SNFPA) Record of Decision (ROD) (2004). The desired conditions for WUI defense zones as defined in the SNFPA ROD, 2004 are highlighted below:

- Stands in defense zones are fairly open and dominated primarily by larger, fire tolerant trees.
- Surface and ladder fuel conditions are such that crown fire ignition is highly unlikely.
- The openness and discontinuity of crown fuels, both horizontally and vertically, result in very low probability of sustained crown fire.

Need to Reduce Tree Densities and Surface Fuel Loads - There is a need to manage stand densities and reduce hazardous fuel loads in areas that pose considerable public safety risk, as well as to reduce the potential for high severity wildfires. The desired composition and structure

of the forest stands in the Roundhill project area would consist primarily of Jeffrey pine and sugar pine in the overstory with little understory reinitiation. Residual stand densities will range from about 80 to 120 ft^2 basal area per acre. The reduced densities will result in decreased probability of insect related mortality which coincides with competition related stress. Standing and surface mortality/fuels have accrued from two large bark beetle outbreaks (late 1980s and mid 1990s) in the project area. Since these outbreaks, stand basal areas have continued to increase thereby increasing current risk of an insect outbreak to a high or imminent level.

Surface Fuel Load Desired Conditions - The desired fuel conditions will be surface fuel loads less than 10 tons per acre, and less than 15 tons per acre within SEZs. This, as well as other factors such as reduced ladder fuels, would tend to cause wildfires to burn at lower intensities and slower rates of spread compared to untreated areas. The conditions will contribute to more effective fire suppression capabilities and fewer acres burned at higher severities.

Need to Improve Forest Health - There is a need to improve forest health and remove trees in areas where there are occurrences of dwarf mistletoe in order to minimize the spread to surrounding areas and uninfected understory. Infected trees are more susceptible to other diseases and insects, and as they die the forested area becomes a higher risk of more serious wildfire effects. The desired composition and structure of the forest stands in the Roundhill project area would include healthy residual trees that are more resilient to dwarf mistletoe.

Proposed Action

The Roundhill project proposes vegetation and fuels treatments to reduce stand densities to improve forest health, reduce fire hazards from existing fuels and modify fire behavior to provide defensible space for adjoining developed private lands. Treatment options will include ground based mechanical treatments wherever slope and road access allow and hand treatments where steep slopes and sensitive soils do not permit mechanical equipment or no road access exists. A detailed description of the proposed action is described in the Alternative section of this environmental assessment.

Decision Framework

Given the purpose and need, the deciding official reviews the proposed action and the other alternatives in order to make the following decisions:

The decision to be made is whether to: 1) implement the proposed action, or 2) take no action at this time.

Public Involvement

The LTBMU listed the proposed action on the Internet web page's Schedule of Proposed Actions (SOPA) beginning on July 1, 2006 and every quarter since. A Forest Service news release was distributed on March 19, 2007 to local media, individuals, and local agencies. In addition, copies of the Roundhill Fuel Reduction Project proposed action and maps have been posted on the LTBMU World Wide Website since March 19, 2007. A scoping letter and project area map was sent out to 45 residents, groups, and agencies on March 20, 2007. Six emails, letters and phone calls were received in response to this mailing. A meeting with TRPA, local Fire Safe Chapters, the League to Save Lake Tahoe and others occurred on April 5, 2007 at the Tahoe Douglas Fire Station to discuss the proposed action. A total of twelve individuals from the public along with

six members of the project interdisciplinary team attended. At the meeting and during the scoping period the project proposed action received a support from those that attended.

The Federal government has trust responsibilities to Tribes under a government-to-government relationship to insure that the Tribes reserved rights are protected. Consultation with tribes helps insure that these trust responsibilities are met. The government-to-government consultation was initiated (Scoping Letter, March, 2007, exhibit C2, project record) and no response was received. The intent of this consultation has been to remain informed about Tribal concerns. No traditional cultural properties concerns were identified for this project.

A scoping summary was prepared for this scoping process and is available in exhibit D of the project record. The scoping summary report summarizes the comments received during the public scoping process and presents LTBMU's responses to the comments. The scoping process identified public comments associated with the Proposed Action and was used by the LTBMU to determine areas where additional assessment, information, or clarification will be necessary to address public concerns.

A comment period was provided pursuant to the July 2, 2005 order issued by the U. S. District Court for the Eastern District of California in case *Earth Island Institute vs. Ruthenbeck*. The comment period started July 20, 2007 and ended August 19, 2007. No substantive comments were received during the comment period. Comments received are available in exhibit E of the project record.

Issues

Scoping comments were analyzed to identify both issues and project alternatives that should be considered. The Scoping Analysis for the Roundhill Fuel Reduction Project (Exhibit C1, project record) contains a record of the submitted comments and a determination of the significance of each.

The Forest Service identified no significant issues or alternatives to consider in detail during scoping.

ALTERNATIVES, INCLUDING THE PROPOSED ACTION

This chapter describes and compares the proposed action and the no-action alternatives. It includes a description and map of each alternative considered. This section also presents the alternatives in comparative form, sharply defining the differences between each alternative and providing a clear basis for choice among options by the decision maker and the public. Some of the information used to compare the alternatives is based upon the design of the alternative (i.e., helicopter logging versus the use of skid trails) and some of the information is based upon the environmental, social and economic effects of implementing each alternative (i.e., the amount of erosion or cost of helicopter logging versus skidding).

Alternatives

Alternative 1

The Proposed Action

The Roundhill project proposes vegetation and fuels treatments to reduce stand densities to improve forest health, reduce fire hazards from existing fuels and modify fire behavior to provide defensible space for adjoining developed private lands. Treatment options will include ground based mechanical treatments wherever slope and road access allow and hand treatments where steep slopes and sensitive soils do not permit mechanical equipment or no road access exists.

In order to meet the purpose and need for managing stand densities and reducing hazardous fuel loads in WUI defense zones, as well as to reduce the potential for high severity wildfires, the following combination of vegetation and fuels treatments are proposed:

- Mechanical and hand thinning of brush and trees.
- Mechanical and hand thinning, and fuels treatments within defined SEZs.
- Cutting, chipping, and removing infested, diseased, and dead standing and down trees.
- Sawlog and biomass removal, chipping and masticating of slash and brush.
- Prescribed pile burning and underburning subsequent to vegetation treatments.

The thinning operation used will be based on soil type, slope, and access of treatment stands. Hand thinning will be where slopes are greater than 30%, and ground-based mechanical thinning used primarily where slopes are less than 30%. Areas greater than 15% slope of the Cagwin-Rock soil type will also be hand thinned due to the high potential for soil erosion.

In order to meet the need to remove trees in areas where there are occurrences of dwarf mistletoe, all thinning prescriptions will favor the retention of healthy trees by utilizing Hawksworth's Dwarf Mistletoe Rating System (1977), generally removing trees that have ratings of 4 or higher. The two stands with higher levels of mistletoe, (X) and (Y), will have a heavier thinning treatment prescribed with a follow-up understory planting of dwarf mistletoe resistant species in the spring following vegetation and fuels treatments. The fuels treatment will include a prescribed underburn to also serve as site preparation for the planting. A release thinning of growing vegetation or brush species would occur using chainsaws or other hand tools approximately every 1-3 years. The release will allow these species to survive against competing vegetation or potential wildfire. No herbicides will be used for release.

Table 1 shows each stand in the project area and the treatments that will occur within the respective stand. Two stands (A and B) totaling 11 acres meet the desired tree density but do not meet desired surface fuels loading. These stands will receive surface hand pile and burning or chipping/mastication to reduce or re-arrange surface fuels. Overall, mechanical harvesting using ground-based equipment with follow-up biomass removal, chipping or mastication, and underburning will occur in 10 stands totaling 296 acres. Following thinning of mechanical treatment stands, underburning is the prescribed fuels treatment for 120 acres. Mechanical thinning will also include 3 acres in stand (S) as an SEZ treatment. Hand thinning with follow-up fuels treatments will occur on about 645 acres. Of these hand thinned stands 174 acres may receive underburning as a follow-up fuels treatment.

Table 1. Roundhill Fuel Reduction Project Proposed Treatments Grouped by Thinning Treatment Type.

Stand #	SubUnit	Acres	Thinning Treatment	Temp Roads New / Existing (ft)	Approximate No. of Landings	Fuels Treatment
(A) 0080012000	001	8	None	n/a	n/a	HPB
(B) 0080030000	001	3	None	n/a	n/a	HPB – C/M
(C) 0080028000	001	27	Hand	n/a	n/a	HPB – C/M
(D) 0080029000	000	65	Hand	n/a	n/a	HPB
(E) 0080016000	002	7	Hand	n/a	n/a	HPB
(F) 0170002000	002	9	Hand	n/a	n/a	HPB - C/M
(G) 0170003000	000	28	Hand	n/a	n/a	HPB
(H) 0170004000	004	15 / 15	Hand / CTL	n/a	n/a	HPB - C/M
(I) 0170008000	001	6	Hand	n/a	n/a	HPB – C/M
(J) 0170009000	001	20	Hand	n/a	n/a	HPB – C/M
(K) 0170010000	001	58	Hand	n/a	n/a	HPB - UB
(L) 0170011000	001	116	Hand	n/a	n/a	HPB – C/M - UB
(M) 0170011000	002	49	Hand	n/a	n/a	HPB
(N) 0170013000	001	107	Hand	n/a	n/a	HPB – C/M
(O) 0170014000	001	84	Hand	n/a	n/a	HPB – C/M
(P) 0170017000	000	18	Hand	n/a	n/a	HPB
(Q) 0170019000	000	14	Hand	n/a	n/a	HPB – C/M
(R) 0170006000	002	22	Hand	n/a	0	HPB – C/M - UB
(S) 0170006000	001	69 / 3	CTL / CTL_SEZ	0 / 4,450	3	C/M - UB
(T) 0170001000	001	18	CTL	0 / 400	2	C/M
(U) 0170002000	001	44	CTL	0 / 100	2	C/M
(V) 0170004000	002	17	CTL	0 / 0	0	C/M
(W) 0170016000	002	10	CTL	0 / 350	1	C/M
(X) 0170012000	000	36	CFS/CTL	0 / 1,000	2	C/M - UB
(Y) 0170016000	001	12	CFS/CTL	0 / 250	1	C/M - UB
(Z) 0170004000	003	13	WT	150 / 0	0	LBR
(AA) 0170004000	005	15	WT	150 / 450	1	LBR
(AB) 0170004000	001	44	WT	0 / 1,700	3	LBR
TOTAL		**952**		**300 / 8,700**	**15**	

CTL – Cut-To-Length
WT – Whole Tree
CFS – Commercial Fuelwood Sale
UB – Underburn
HPB – Hand Pile and Burn
C/M -- Chipping or Masticating
CTL_SEZ – Cut to Length thinning within Stream Environment Zone
LBR – Landing Pile Burning or Removal

New temporary and existing non-system roads are approximate lengths needed for hauling (transport) logs from the landing to a permanent road. There are 300 feet of new temporary roads required and this amount is split evenly in stands (Z) and (AA). There are also 8700 feet of non-system roads that will be used as temporary roads for the project. The numbers of landings are approximate estimations for thinning operations to occur safely and effectively. There are 11 landings allocated for Cut-to Length (CTL) and Commercial Fuel Wood Sale (CFS) treatments and 4 landings allocated for Whole Tree treatments. Refer to attached maps for transportation system and approximate landing location used for mechanical treatment stands.

Mechanical Thinning

The general prescription for ground-based mechanical treatments will be to remove understory trees between 3 and 24 inches DBH based on the desired residual stand density. Selection of trees to be thinned would begin with the smallest trees (suppressed and intermediate canopy class trees) and continue to remove trees of increasing diameter until the desired stand density is reached (80-120 ft^2 BA/ac). Jeffrey pine and sugar pine will be favored for retention. To achieve the desired conditions for fuel loads (< 10 tons/ac and <15 tons/ac within SEZs), snags and downed logs will be removed as needed retaining a minimum of approximately 3 snags and 3 down logs of the largest size class per acre for wildlife habitat. Embedded logs in stream channels will not be removed. The type of mechanical equipment used for thinning operations will depend on vegetation removal needs, operational feasibility, and cost efficiency. They include: whole tree yarding using mechanical harvesters and whole tree skidding, commercial fuelwood sales using small skidders, and cut-to-length harvest with log forwarding operations. Treated material will be removed either as sawlogs, fuelwood, or biomass. Treated material not removed will be either chipped or masticated and spread over the treatment area, or underburned. Unutilized material left in landings will be burned.

Existing landings will be used where available otherwise new landings will be constructed. New landings may average one to two acres in size in order to safely facilitate the handling and removal of biomass material. The created openings may require removal of trees larger than 24 inches DBH. Selected existing landings and new landings will minimize the removal of > 24 inch diameter trees. When operations have been completed rehabilitation of the landings will be implemented as determined by soil scientist or hydrologist (See Soils/Hydrology design features and list of BMPs in Appendix A). Rehabilitation will include measures to insure proper drainage and provision of sufficient ground cover.

There are approximately 8,700 feet of existing non-system roads that would be used as temporary roads and may require some reconstruction. The reconstruction needs vary between roads, but may include road widening for vehicle access and road surface stabilization. The road widening may include removing trees larger than 24 inches DBH. Approximately 300 feet of temporary roads will need to be constructed for thinning operations. The areas may require falling and removal of trees creating openings wide enough for vehicle access. This may require removal of trees larger than 24 inches DBH. When operations have been completed, temporary roads used for the project will be decommissioned and returned to their pre-existing condition. Waterbars or other drainage structures will be installed to provide proper drainage. Other temporary road decommissioning, including provision of sufficient ground cover, will be implemented. Refer to Appendix A and the Soils/ Hydrology design features for temporary road BMPs used in the project.

Mechanical SEZ treatment

There are four stands identified for mechanical treatment that have SEZs. Three of the stands will avoid the SEZ areas or will require directional hand falling of trees away from the stream and use end-lining for tree removal. The three stands that will avoid the SEZ and may utilize end-lining include stands (Y), (Z), and (AB). One stand, (S), contains an SEZ that will be treated by mechanical operations using a Cut to Length System. Stand (S) is approximately 3 acres and the SEZ within the stand is primarily restricted to the floodplain. The SEZ treatment for stand (S) includes a monitoring plan to aid in adaptive management. This monitoring plan was reviewed and approved by Tahoe Regional Planning Agency and can be found in Appendix B of this document. Design features for all SEZ treatments will be applied as described below in the Project Design Features section.

Hand Thinning

For hand thinning treatments, trees up to 14" DBH will be removed based on a desired residual tree per acre and basal area per acre (80-120 ft^2 BA/ac and 80-110 trees/ac). Jeffrey pine and sugar pine will be favored for retention. Hand thinned stand treatments include hand cutting of trees along with hand piling of material for burning, chipping, mastication, or underburning. In areas where access, soils, and slope allow, mechanical chipping or mastication will be used for post thinning fuels treatment. As a fuels treatment, a total of 416 acres over 11 stands may utilize chipping or mastication to reduce pile burning (see table 1). Mastication in-lieu of hand thinning may also be applied in some areas where access permits. Live trees removed will be less than 14 inches DBH; dead trees removed up to 20 inches DBH; and down logs removed in log decay classes 1 and 2 (Thomas 1979) will be less than 20 inches in diameter. Hand treatments may need future follow-up treatments (10 to 20 years) to remove a portion of the larger (greater than 14 inches DBH) understory trees in order to achieve the desired stand densities. There are approximately 14 stands with SEZs that will be hand thinned using the same general prescription as the uplands as described above.

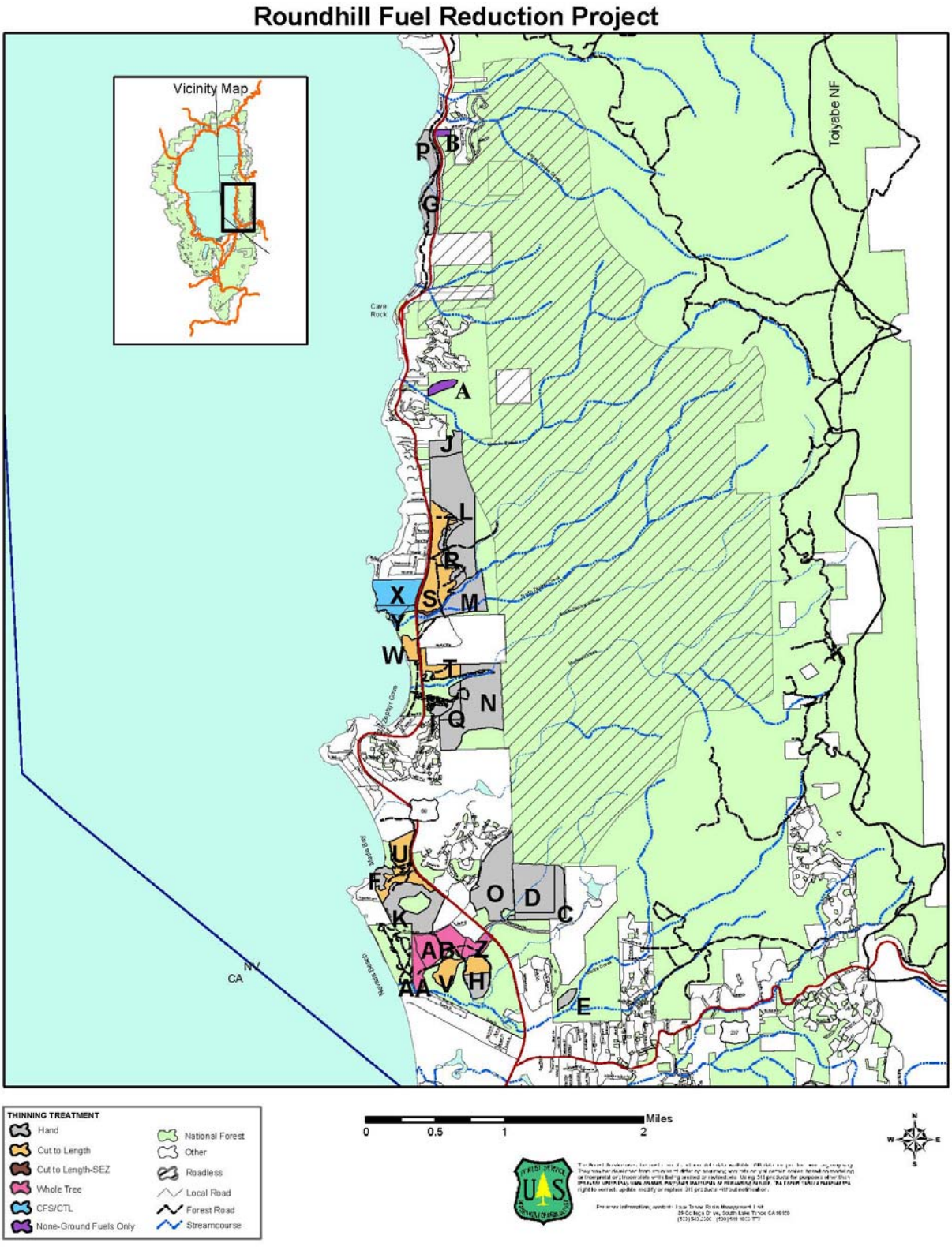


Figure 1. Proposed Action, Alternative 1.

Alternative 2

No Action

Under the No Action alternative, current management plans would continue to guide management of the project area. No mechanical or hand vegetation treatments nor prescribed burning would be implemented to accomplish fuels reduction treatments. The project area is primarily composed of Jeffery pine and white fir. Current condition of stands in the project area is highly variable. Trees per acre (TPA) range from few larger TPA (20 TPA) to many smaller TPA (about 3400 TPA); Basal areas range from 60 to 280 ft^2 basal area per acre (BA/Ac); surface fuels range from 3 to 29 tons per acre (tons/ac).

Project Design Features

Project design features are elements of the project design that are applied in treatment areas. These features were developed to reduce or avoid negative environmental effects of the proposed action on forest resources.

Air Quality

A burn plan will be prepared and reviewed by the Lake Tahoe Basin Management Unit Forest Fire Management Officer prior to implementation. This burn plan includes a Smoke Management Plan which is the basis for obtaining a burn permit from the Nevada Division of Environmental Protection. In order to minimize the effects of prescribed burning on air quality; monitoring, mitigation and contingency measures will be identified in the Smoke Management Plan. Desirable meteorological conditions such as favorable mixing layer and transport wind speeds are required in the Smoke Management Plan to facilitate venting and dispersion of smoke from populated areas.

Fire and Fuels

Prescribed Burning will take place when weather conditions identified in the burn plan are met. No pile burning would take place within 50 feet of any stream channel or standing water. However fire from prescribed underburns will be allowed to enter SEZs. The project will meet Riparian Conservation Objectives (RCOs) for management of Riparian Conservation Areas (RCAs) and will follow the RCA standards and guidelines. In preparation for pile burning, thinning slash will be piled and cured for at least one year prior to ignition.

Heritage Resources

Pre-field research indicated that 39 previously recorded heritage sites existed within the Area of Potential Effect (APE) or adjacent to the project area. Of these, 23 where determined to be not eligible for inclusion in the National Register of Historic Places, after consultation with the Nevada State Historic Preservation Officer. During the fall of 2006, Heritage Resource field surveys were conducted during which four new heritage sites were identified. A total of 20 heritage sites which are either unevaluated or determined eligible for the National Register, are located within the proposed undertaking's Area of Potential Effect (APE). These heritage resources will be flagged and avoided from any project related disturbing activities, therefore there is no effect to heritage resources. In the event that any new sites are discovered during

project implementation, the Forest Archaeologist will be notified and the procedures in accordance with the Advisory Council on Historic Preservation Regulations 36 CFR Part 800 would be implemented. Sites that are flammable (i.e. Comstock era stumps, wooden flumes, etc) would also be avoided and protected during slash piling and burning.

Threatened, Endangered, and Sensitive (TES) Plants

Based on surveys completed in the summer of 2006 and 2007, there are no known occurrences of threatened, endangered, or proposed plant species within the footprint of the Roundhill Fuel Reduction Project area. Tahoe yellow cress (TYC), a candidate species for listing, occurs in the vicinity of the project area and adjacent to treatment stands. In order to prevent direct effects to this species the following criteria will be implemented for treatment stands:

- (F) - Hand thinning and pile burning: Directional falling will occur away from the TYC locations and piles will be placed a minimum of 50 feet from TYC populations.
- (X) - Small tractor and underburn: Directional falling will occur away from TYC population; fuels will be pulled away from TYC and there will be a minimum of a 20 foot buffer between the underburn and the known TYC location.
- (W) - Cut To Length harvest: directional falling will occur away from the TYC population.
- If LTBMU TES or special interest species are newly discovered prior to or during project implementation flagging and avoidance of the area will occur.

Noxious Weeds

Locations of noxious weeds will be flagged and avoided or treated by hand pulling where feasible prior to (known locations) and during (new locations) project implementation (Refer to exhibit B1. Noxious Weed Risk Assessment, project record). Design features for noxious weeds include the following:

Noxious weed prevention practices will be implemented in compliance with State of Nevada and SNFPA (2004) standards. This will include utilizing weed-free equipment and material, and washing equipment that is coming from outside the forest or from areas of known weed infestations. Landings will not be created in areas with weed infestations. Stand (T) has heavy weed infestations in portions of the area and will be treated either mechanically using over the snow methods when feasible or hand treated if mechanical treatments cannot be implemented.

Terrestrial Wildlife

No threatened or endangered species are known or likely to occupy the project area. Several Forest Service sensitive species and management indicator species occur, or may occur, in the project area. (Refer to exhibit B2.Wildlife and Fisheries BE/BA, project record).

Design features include the following:

- Use limited operating periods for special status species following LRMP (1988), SNFPA (2004), and TRPA Code of Ordinances (2004) direction as described in the BE/BA.
    - Limited Operating Periods (LOPs) for bald eagle (Mar 1-Aug 31), northern goshawk (Feb 15-Sept 15), California spotted owl (Mar 1-Aug 15), willow flycatcher (June 1-Aug 31), and osprey (Mar 1-Aug 15) will apply in coordination

with the Forest Biologist in moderately to highly suitable habitat until surveys are completed and/or where these species occur in the project area.
    - LOPs for other focal wildlife species will not apply unless these species, and/or the criteria required for a LOP, are discovered prior to or during implementation.
- Follow TRPA Code of Ordinances (2004) for habitat disturbance within disturbance zones designated for special interest species (TRPA Code of Ordinances Ch. 78.3.A).
- Maintain an average of three of the largest, existing snags and downed logs more than 300 feet from private property per acre.
- All food trash associated with implementation of this project shall be removed daily from the work site to prevent inappropriate foraging by black bears and other animals.

Fisheries and Aquatic Habitat

No threatened or endangered species are known or likely to occupy the project area. Several Forest Service sensitive species and management indicator species occur, or may occur, in the project area (Exhibit B2).

Design features include the following:

- Use hand treatments in riparian conservation areas/stream environment zones needing fuels treatments or evaluate for the time of year for mechanical treatments to avoid impacts to fish migration and/or spawning.
- Allow mechanical ground disturbing fuel treatments within RCAs in stands (Y), (Z), and (AB) when the activity is consistent with RCOs (SNFPA 2004)
- Remove fuels in streamside zones and over streams with an overload of standing and down fuels, such as stream reaches that exceed 75% stream shading from dead and down or ladder fuels.
- Leave existing large woody debris in stream channels
- Maintain shaded banks conditions on rainbow trout streams by maintaining at least 50% of the stream bank site potential for herbaceous and shrub cover and at least 20% of the site potential tree cover. Where natural tree cover is less than 20%, 80% of the potential would be retained. Thirty-five to 70% of the stream should be shaded from 11 am to 4 pm (LRMP STD/GD 20).
- Implement Project specific BMPs, see appendix A.

Soil and Hydrology

Soils within the project area are coarse-textured and are derived from granitic rock. Slopes are variable, but most of the treatment units, approximately 63%, have slopes greater than 15%. Approximately one-third of treatment slopes are greater 30%. A description of treatment soil types is found in the project record. A Cumulative Watershed Affects analysis and Erosion Hazard Rating were performed for the project (Refer to exhibit B3, Hydrology Report, project record).

The CWE analysis based on the ERA methodology shows that the watershed Risk Ratio increases by variable amounts (0-67%) throughout the project area (Exhibit B3). Larger increases in Risk Ratio triggered site specific field evaluations to directly address the potential impacts of the proposed treatments. These evaluations indicate that south facing slopes above approximately 10% slope have the potential to experience an increase in Erosion Hazard Rating

(EHR). The proposed treatments, with the proper implementation of below design features are expected to result in no significant increase in erosion or negative impacts to soil and water resources in the project area. (Exhibit B3 and exhibit B4, Soil Resource Report, project record).

Design features include the following:

- Meet the Riparian Conservation Objectives of the forest plan, as amended by the SNFPA (2004).
- No construction of new permanent roads.
- Stabilize temporary roads, skid trails, and landings to provide drainage and prevent water accumulation on the roadbed and sedimentation into stream channels during and following operational activities.
- Where roads or trails exist within the project area, skid trails and forwarder/ harvester trails (in WT and CTL units, respectively) will be returned to the standard Forest Service road or trail width (approximately 10 ft and 4 ft, respectively) after operations are completed in the area. The methods for narrowing may include: ripping the soil to the desired width and/or installing physical barriers along the desired width to prevent user created access off the road or trail.
- Temporary roads will be restored to their pre-implementation condition, which may involve ripping the soil and/or providing ground cover such as slash, wood chip or masticated material.
- Implement Best Management Practices (BMPs) during and following activities. See appendix A for list of BMPs.
- Flag and avoid equipment use in and adjacent to special aquatic features such as springs, seeps, vernal pools, and marshes; use hand treatments in these areas.
- Hand piling and burning of slash would be located beyond 50 feet of any stream channel or standing water. Prescribed underburning would be designed to avoid adverse effect on soil and water resources. Flame heights would not exceed two feet within 50 feet of stream courses or on wetlands unless higher intensities are required to achieve specific objectives.
- Maintain a minimum of 10% ground cover on slopes under 30%.
- Maintain a minimum of 30% ground cover on slopes over 30%.

According to TRPA code of ordinances chapter 71.4C, tree cutting within SEZs would include the following features as summarized below:

- Work in SEZs would be limited to the time of year when soils are dry and stable or when snow conditions are suitable for over-snow operations as determined by a watershed specialist.
- All vehicles used for tree removal, except for “innovative technology” vehicles, would be restricted to areas outside SEZs or to existing roads within SEZs except during over-snow operations.
- Work in SEZs may include the use of “innovative technology” vehicles operating when soil conditions are dry enough so that the effects of these vehicles cause no greater soil or vegetation disturbance than over-snow tree removal.
- Felled trees would be kept out of intermittent and perennial streams.

Stand specific design features:

- Stand (V) – Equipment will operate over a slash mat when crossing the meadow for access to this stand and from the stand to the landing.

- Stands (W), (X), and (Y) – Equipment will not operate within 25 ft of the transition to upland soils and vegetation from the edge of Lake Tahoe.
- Stand (S), CTL_SEZ unit – The equipment will not operate within 20 ft of the stream channel. Equipment will operate over a slash mat in this unit, however the slash will be removed from the floodplain surfaces after operations are complete.

Recreation and Special Uses

Vegetation and fuels treatments will occur in the vicinity of several developed recreation sites and activity areas throughout the project zone. Recreation sites and activity areas include:

- Nevada Beach Campground and Day use Area
- Rabe Meadows
- Roundhill Resort
- Zephyr Cove Resort
- Zephyr Shoals
- Logan Shoals
- Trails 18E29 and 18E31 (Lam Watah Trail)

When applying treatments to these areas, care should be taken to minimize activities that may impact users. Ideally, operations should be avoided during the busy peak season.

Design features include the following:

- Visual – Use techniques that minimize evidence of treatments. This is especially applicable to the areas around Zephyr Shoals and in Rabe Meadows where visitors pass through the general forest areas on a regular basis.
- Noise – Before 8am or after 6pm do not allow chainsaw or heavy machinery use in project treatment stands unless otherwise agreed to by Forest Service and Contractor.
- Smoke- Notify neighbors and users in advance of burning operations.
- Limited operating periods (LOP) would occur in the project area in stands that are adjacent to highly used public areas and trails or developed recreation sites. An LOP means that no project treatments can occur during the specified time frame unless otherwise agreed to by the Forest Service and contractor. The purpose of the LOP is to provide for safety to the public when treatments occur and to reduce the amount of noise created from treatments near recreation sites. Project LOPs include the following:
    - From Memorial Day to Labor Day on the following hand treatment stands: (F), (G), (H), (I), (K), (N), (P), (Q), and (R).
    - From May 15 to September 15 on the following mechanical treatment stands: (W), (Z), (H), (AA), and (AB),
    - From May 1 to October 1 on the mechanical treatment stand (U)
    - From April 1 to November 31 on the mechanical treatment stand (T)
- Forest Order Area Closures – Area closures may be implemented in eight mechanical treatment stands to protect the public from accidents related to equipment, falling trees and other safety concerns related to the project being implemented (Refer to exhibit B5, Civil Rights Impact Analysis, project record). The eight stands that may require a forest order for closure are (U), (V), (W), (X), (Y), (Z), (H), (AA), and (AB). These stands will generally be closed to the public on Monday through Friday to allow for the contractor to

perform work. In agreement with the Forest Service and contractor, these stands may be open to public use on Saturdays, Sundays, and federal holidays.

- In closed areas a combination of signage and physical barriers will be placed to help prevent post-treatment establishment of user-created routes within treatment areas.

Visual Quality

Much of the project area has a designated Visual Quality Objective (VQO) of Retention that provides for management activities which are not visually evident when viewing the characteristic landscape. Two areas of proposed treatment, the areas just north of Elk Point and the area east of Nevada Beach, have designated VQO of Partial Retention. The Partial Retention VQO provides for management activities which are visually subordinate to the surrounding characteristic landscape. The proposed treatment units also parallel Hwy 50's "Lake Tahoe - East Shore Drive", a National Scenic Byway.

Fuel Treatments within 200 linear feet of travel routes should be sensitive to foreground views from these travel routes. Key locations, where the most sensitive foreground views are greater than 200 linear feet from a travel route, would be identified as the project design is refined. Proposed treatment prescriptions for these areas would include stumps cut to a maximum uphill height of 6 inches. As feasible, hand-piling should occur outside of the most sensitive foreground viewing zones, and any evidence of management activities should be restored as soon as work is complete.

The location of landing areas should not be visible from any travel route where possible; existing topography which blocks views from travel routes should be utilized as well as locating these landing zones at a distance which minimizes visibility. Hand piles, materials stockpiling, and evidence of management activities should be removed as soon as possible after work is complete. If hand piles are required to cure before being burned at a later date they should be located when feasible at a minimum of 200 linear feet from travel routes and be positioned for screening behind large remaining trees or brush. Any subsequent underburning should incorporate measures to minimize scorching effects on tree trunks within foreground views.

Comparison of Alternatives

This section provides a summary of the effects of implementing each alternative. Information in the table is focused on activities and effects where different levels of effects or outputs can be distinguished quantitatively or qualitatively among alternatives.

Table 2. Comparison of Alternatives.

	Alternative 1	Alternative 2
Mechanical Vegetation Treatments (acres)	296	0
Hand Vegetation Treatments (acres)	645	0
Fuels Treatments only, no hand or mechanical thinning (acres)	11	0
Dwarf mistletoe reduced (acres)	48	0
Underburning	294	0
Pile Burning	656	0

ENVIRONMENTAL CONSEQUENCES

Environmental consequences are organized by the 10 significance factors found in 40 CFR 1508.27 (b). When responding to each of the factors below, the following specialist reports hereby incorporated by reference are retained within the project file located at the Lake Tahoe Basin Management Unit Supervisor's Office:

Wildlife and Aquatic Species Input for Threatened, Endangered, and Sensitive Species, Management Indicator Species, and Tahoe Regional Planning Agency Special Interest Species, July 19, 2007; Aquatic and Terrestrial Species Review of Proposed Changes to the Roundhill Fuel Reduction Project, August 31, 2007 (Wildlife Report, Exhibit B2, project record). Biological Evaluation for Threatened, Endangered and Sensitive Plants and Fungi, July 12, 2007; Noxious Weed Risk Assessment for the Roundhill Fuel Reduction Project (Botany Report, Exhibit B1, project record).

Round Hill Fuel Reduction Project Hydrology Report, July 20, 2007 (Hydrology Report, Exhibit B3, project record).

Soils Resource Report, July 31, 2007 (Soils Report, Exhibit B4, project record).

This section summarizes the physical, biological, social and economic environments of the affected project area and the potential changes to those environments due to implementation of

the alternatives. It also presents the scientific and analytical basis for comparison of alternatives presented in the chart above.

1. Beneficial and adverse impacts_____

Alternative 1

Through the use of project design features, any potential adverse impacts have been minimized in the proposed action. Beneficial effects include the reduction of fuels in the WUI on NFS lands. Beneficial effects have not been used to offset or compensate for potential adverse effects. Most of the project acres will require activities extending over a period of three to five years to attain fuel reduction conditions that would remain within desired condition limits for a period of 15 to 20 years.

Alternative 2

The no-action alternative will not achieve desired conditions for surface fuels (<10 tons/ac, <15 ton/ac in SEZ). This would tend to cause wildfires to burn at higher intensities and rates of spread compared to treated areas. High-intensity wildfires will result in high tree mortality in forest stands, could result in extensive property loss, and could cause large amounts of erosion and sedimentation that would adversely affect water quality (Lake Tahoe Basin Multi-Jurisdictional Fuel Reduction and Wildfire Prevention Strategy, 2007).

2. The degree to which the alternatives affect public health and safety. _____

Alternative 1

Implementation of the proposed action would involve the use of mechanical equipment, falling of trees, hauling of timber on Forest Service and county roads, and the use of prescribed fire, all of which potentially pose risks to workers and/or the public. Such risks would remain at acceptable levels because: OSHA safety regulations would be implemented during harvesting operations, the public would be excluded from active treatment areas, haul routes would be signed to warn the public of project activities, and traffic would be monitored by FS inspectors to ensure the safety of the public.

Pile and underburning will produce smoke. This project includes project design features which will reduce the effects to the public of smoke (see project design features for air quality, page 10). A burn plan will be completed before any ignitions. This burn plan will include a Smoke Management Plan which is the basis for obtaining a burn permit from the Nevada Division of Environmental Protection. Adherence to the Smoke Management Plan for pile and understory burning would alleviate negative effects to communities. This project will not violate ambient air quality standards. Smoke and associated emissions would occur for a short duration during pile and understory burning. Public notification of prescribed burning activities will take place by notifying local television, radio and newspapers. A local fire activity hotline is also available by phone 24 hours a day with updates on when and where prescribed fire activities will be initiated. The number for the burning hotline is: (530)543-2600 ext 6.

The vegetation fuel treatments are designed to reduce the risk of wildfire on NFS lands around the communities of Round Hill, Zephyr Cove, Kingsbury, Chimney Rock, Skyland, Lakeridge, and Logan Shoals by creating surface and ladder fuel conditions such that crown fire ignition is reduced; and the openness and discontinuity of crown fuels, both horizontally and vertically, result in reduced probability of sustained crown fire (SNFPA, ROD (2004) pg. 45, Table 1).

Alternative 2

The no-action alternative will not achieve desired conditions for surface fuels (<10 tons/ac, <15 ton/ac in SEZ). This would tend to cause wildfires to burn at higher intensities and rates of spread compared to treated areas. High-intensity wildfires will result in high tree mortality in forest stands and could result in extensive property loss (Lake Tahoe Basin Multi-Jurisdictional Fuel Reduction and Wildfire Prevention Strategy, 2007).

3. Unique characteristics of the geographic area._____

Alternatives 1 and 2

The project area does not contain any potentially unique areas or characteristics such as Wild and Scenic Rivers, Research Natural Areas, Inventoried Roadless Areas, or ecologically critical areas so there will be no effects from either alternative to these areas.

Unique heritage resource features are discussed below in Significance Factor 8.

4. The degree to which the effects on the human environment are likely to be highly controversial. _____

Alternative 1

No anticipated project specific effects are likely to be considered highly controversial. Similar projects have been and are currently being implemented in the Lake Tahoe Basin.

Alternative 2

Effects from implementation of the no-action alternative would not likely be highly controversial.

5. The degree to which the possible effects on the human environment are highly uncertain or involve unique or unknown risks. _____

Alternative 1

Implementation of the proposed action would not pose highly uncertain, unique or unknown risks to the human environment. Similar fuel treatments have been implemented on the Lake Tahoe Basin Management Unit in recent years. Based on results of these projects, anticipated effects are not uncertain, unique or unknown. Project Design Features have been built into the proposed action to reduce or avoid any adverse effects to area resources.

Alternative 2

Effects of implementing the no-action alternative are uncertain in that it is not known when a fire could ignite or spread in these areas and threaten lives or property. Fuel loading in the project area is currently between 3-29 tons/acres. The no-action alternative will not achieve desired conditions for surface fuels (<10 tons/ac, <15 ton/ac in SEZ). This would tend to cause wildfires to burn at higher intensities and rates of spread compared to treated areas. High-intensity wildfires will result in high tree mortality in forest stands and could result in extensive property loss (Lake Tahoe Basin Multi-Jurisdictional Fuel Reduction and Wildfire Prevention Strategy, 2007).

6. The degree to which the action may establish a precedent for future actions with significant effects or represents a decision in principle about a future consideration. _____

Alternatives 1 and 2

Neither alternative would establish a precedent for future actions with significant effects or represent a decision in principle about a future consideration. Any future actions would undergo the NEPA process.

7. Whether the action is related to other actions with individually insignificant but cumulatively significant impacts. _____

Vegetation and Fuels

The project area is primarily composed of Jeffery pine and white fir. Current condition of stands in the project area is highly variable. Trees per acre (TPA) range from few larger TPA (20 TPA) to many smaller TPA (about 3400 TPA); Basal areas range from 60 to 280 ft^2 basal area per acre (BA/Ac); surface fuels range from 3 to 29 tons per acre (tons/ac). These conditions pose a risk to the surrounding communities should there be a fire start.

Desired conditions for the project area include a reduction of ladder fuels (brush, seedlings, saplings) crown and surface fuels (down woody material) to reduce the potential for crown fire and stand mortality, while providing a fuel break around the communities and facilities within the project area. Generally, the desired conditions are: 80-110 TPA, 80-120 ft^2 BA/Ac and surface fuels of 8-10 tons/ac.

Previous management direction that focused on protection of natural resources by suppressing wildfires removed a natural source of vegetation disturbance. Simulated fire behavior in the Basin and observed fire behavior in the Angora, Gondola, Showers, and Pioneer Fires demonstrates current fire behavior is characterized by high-intensity fires. Thus, the fire regime has changed from frequent, low-intensity fires to infrequent, high-intensity fires. High-intensity wildfires will result in high tree mortality in forest stands, could result in extensive property loss, and could cause large amounts of erosion and sedimentation that would adversely affect water quality (Lake Tahoe Basin Multi-Jurisdictional Fuel Reduction and Wildfire Prevention Strategy, 2007).

Alternative 1

The proposed action would achieve the desired conditions for this project area through hand and mechanical treatments followed by pile and understory burning as outlined above. Reduction in fuel loading and stand density, changes in species composition, and raising the canopy base height would reduce the potential for crown fires. As a result, direct wildfire attack and fire line production rates would improve. These changes, lower the potential of large-scale wildfire events. Implementation of the proposed action would also allow for ecological underburning to be used for vegetation and fuel management inside the project area in the future. An additional effect would be reduced tree mortality should a wildfire occur.

Alternative 2

The no-action alternative will not achieve desired conditions for surface fuels (<10 tons/ac, <15 ton/ac in SEZ). This would tend to cause wildfires to burn at higher intensities and rates of spread compared to treated areas. High-intensity wildfires will result in high tree mortality in forest stands and could result in extensive property loss (Lake Tahoe Basin Multi-Jurisdictional Fuel Reduction and Wildfire Prevention Strategy, 2007). Treatments on adjacent state and private land would be less effective at reducing landscape fire behavior if the no-action alternative were implemented and no fuels reduction activities take place. Stands in the project area are currently in either Moderate or High Condition Class. Stands in the Moderate Condition Class would continue to move toward the High range, while those in the High Condition Class will stay in the High Condition Class (Lake Tahoe Basin Multi-Jurisdictional Fuel Reduction and Wildfire Prevention Strategy, 2007).

Wildlife

Alternative 1

A review of the Forest Service Sensitive species list was conducted and Table 2 outlines the species considered in this analysis based on that review (Wildlife Report, Exhibit B2, project record). TES species not listed on the table were excluded from analysis because they are not known to occur on the LTBMU. Species were also not further considered if there are no known occurrences within or adjacent to the project area and suitable habitat is lacking within the area that would be affected by the project. Determinations for potentially affected species are summarized here. For a complete discussion of direct, indirect and cumulative effect of the proposed action on these species, see the Wildlife Report located in the project record (Exhibit B2).

See discussion under Significance Factor 9 for effects to Federally Threatened and Endangered Species and Management Indicator Species and Significance Factor 10 for effects to Management Indicator Species.

Table 2. Forest Service Sensitive Species.

Species	Status
Bald eagle	Forest Service Sensitive (FSS)
California spotted owl	FSS
Townsend's big-eared bat	FSS
American marten	FSS
Sierra Nevada red fox	FSS
Mountain yellow-legged frog	FSS
Northern leopard frog	FSS
Great gray owl	FSS
Northern goshawk	FSS
Willow flycatcher	FSS
Lahontan Lake tui chub	FSS
Great Basin rams-horn	FSS

Bald Eagle
Determination: The Roundhill Fuel Reduction project may affect individuals, but is not likely to result in a trend toward federal listing or loss of viability for the bald eagle.

Rationale for determination:
- Nearest nest is 7.4 miles
- No critical habitat designated on LTBMU
- Design features would minimize impacts to individual bald eagles
- Superior habitat suitability is expected over the long term

California Spotted Owl
Determination: The Roundhill Fuel Reduction project may affect individuals, but is not likely to result in a trend toward federal listing or loss of viability for the California spotted owl.

Rationale for determination:
- Individuals or populations are unlikely to be impacted
- Design features would minimize impacts to individual spotted owls
- Superior habitat suitability is expected over the long term

Townsend's big-eared bat
Determination: The Roundhill Fuel Reduction project will not affect the Townsend's big-eared bat.

Rationale for determination:
- This species is not known to occur in the Lake Tahoe basin
- No suitable roost, maternity, or hibernation habitat present
- Bats are nocturnal; project operations occur during the daytime
- Superior habitat suitability is expected

American Marten
Determination: The Roundhill Fuel Reduction project may affect individuals, but is not likely to result in a trend toward federal listing or loss of viability for the American marten.

Rationale for determination:

- Individual marten are likely to be impacted
- Marten reproduction is unlikely to be impacted
- Prey species are likely to be affected; but ample prey in adjacent areas, project design features, and the relatively quick recovery of early successional habitats should minimize the potential effect to marten
- Superior habitat suitability is expected over the long term

Sierra Nevada Red Fox
Determination: The Roundhill Fuel Reduction project will not affect Sierra Nevada red fox.

Rationale for determination:

- This species is not known to occur in the Lake Tahoe basin
- Sierra Nevada red fox reproduction will not be impacted
- Superior habitat suitability is expected over the long term

Mountain Yellow-Legged Frog
Determination: The Roundhill Fuel Reduction project may affect individuals, but is not likely to result in a trend toward federal listing or loss of viability for the mountain yellow-legged frog.

Rationale for determination:

- This species is not known to occur in the project area.
- Limited suitable habitat occurs in the project area.
- Historically known to occur in adjacent watersheds (Edgewood Creek).

Northern Leopard Frog
Determination: The Roundhill Fuel Reduction project may affect individuals, but is not likely to result in a trend toward federal listing or loss of viability for the northern leopard frog.

Rationale for determination:

- This species is not known to occur in the Lake Tahoe basin
- Moderate to high habitat suitability is expected over the long term

Great Gray Owl
Determination: The Roundhill Fuel Reduction project may affect individuals, but is not likely to result in a trend toward federal listing or loss of viability for the great gray owl.

Rationale for determination:

- This species is not known to occur in the Lake Tahoe basin
- Superior habitat suitability is expected over the long term

Northern Goshawk
Determination: The Roundhill Fuel Reduction project may affect individuals, but is not likely to result in a trend toward federal listing or loss of viability for the northern goshawk.

Rationale for determination:

- Individual goshawks may be impacted
- Goshawk reproduction is unlikely to be impacted

- Design features would minimize impacts to individual goshawks

Willow Flycatcher
Determination: The Roundhill Fuel Reduction project may affect individuals, but is not likely to result in a trend toward federal listing or loss of viability for the willow flycatcher.

Rationale for determination:
- Individual willow flycatchers may be affected
- Willow flycatchers reproduction is unlikely to be impacted
- Design features would minimize impacts to individual willow flycatchers
- Willow flycatcher habitat will not be altered

Lahontan Lake Tui Chub
Determination: The Roundhill Fuel Reduction project may affect individuals, but is not likely to result in a trend toward federal listing or loss of viability for the Lahontan Lake tui chub.

Rationale for determination:
- Potentially found in adjacent lake habitat, downstream of project area.
- Individuals or populations are unlikely to be impacted
- Design features would minimize impacts to individual Lahontan Lake tui chub
- Superior habitat suitability is expected over the long term

Great Basin Rams-Horn
Determination: The Roundhill Fuel Reduction project may affect individuals, but is not likely to result in a trend toward federal listing or loss of viability for the Great Basin rams-horn.

Rationale for determination:
- Individuals or populations are unlikely to be impacted
- Design features would minimize impacts to individual Great Basin rams-horn

Alternative 2

The No-Action alternative would not directly affect Forest Service Sensitive Species because no project activities would be implemented.

Botany

Alternative 1

For a detailed description of the direct, indirect and cumulative effects to botanical resources see Exhibit B1 in the project record.

Cumulative effects are not expected to impact the moonworts, Bolander's candle moss, subalpine fireweed, starved daisy, short-leaved hulsea, veined water lichen, or Kellogg's lewisia and Tahoe yellow cress. There will be no cumulative effects to these species, because no plants were found during 2006 and 2007 surveys within or in the vicinity of the project footprint, which means there will be no direct or indirect impacts to these species and therefore no cumulative effects.

Alternative 2

The no-action alternative is not expected to have any direct or indirect effects to botanical resources and will therefore not have any cumulative effects.

Heritage

Alternatives 1 and 2

No direct, indirect, or cumulative effects are expected for heritage resources (Exhibit C2, project record). Refer to Significance Factor 8 below.

Recreation/Resources

Alternative 1

Project design features, including avoiding operations during peak use days and seasons; notification of closures prior to operations; and signage as well as physical barriers would be in place to reduce effects to recreationists. LOPs will be implemented in some hand thinning and all but one mechanically thinned stands that are adjacent to highly used public areas and trails or developed recreation sites (See project design features for Recreation and Special Uses). Recreation sites and activity areas include:

- Nevada Beach Campground and Day use Area
- Rabe Meadows
- Roundhill Resort
- Zephyr Cove Resort
- Zephyr Shoals
- Logan Shoals
- Trails 18E29 and 18E31 (Lam Watah Trail)

Alternative 2

The no-action alternative would have no direct or indirect affects to recreation and would therefore have no cumulative effects.

Hydrology

Alternative 1

A cumulative watershed effects (CWE) analysis was conducted for the 5 sub-watersheds potentially affected by project implementation. 4 of the watersheds resulted in a Risk Ratio (Risk Ratio = Equivalent Roaded Acres/Threshold of Concern) over 100%, with the majority of the impacts coming from Impervious Coverage associated with urban development. In one of the 4 watersheds (Logan House Frontal) treatments were considered negligible because they only included ½ acre of hand treatment, which contributed to an increase in Risk Ratio of less than 1%. The other 3 watersheds showed an increase in watershed risk ratio between 14% - 67% and triggered more detailed analysis and field evaluations. Site specific field evaluations have indicated that south facing slopes with greater than 10% slope have the potential to experience an increase in Erosion Hazard Rating (EHR). However, project design features have been developed to maintain ground cover at a minimum of 10% for slopes under 30%, and a minimum

of 30% for slopes greater than 30%. With proper implementation of project design features and applicable BMP's as described in the proposed action, there should be no increase in EHR and no negative impacts to soil and water resources is expected (Hydrology Report, Exhibit B3, project record).

Alternative 2

Simulated fire behavior in the Basin and observed fire behavior in the Angora, Gondola, Showers, and Pioneer Fires demonstrates current fire behavior is characterized by high-intensity fires. Thus, the fire regime has changed from frequent, low-intensity fires to infrequent, high-intensity fires. High-intensity wildfires will result in high tree mortality in forest stands and could cause large amounts of erosion and sedimentation that would adversely affect water quality (Lake Tahoe Basin Multi-Jurisdictional Fuel Reduction and Wildfire Prevention Strategy, 2007).

8. The degree to which the action may adversely affect districts, sites, highways, structures, or objects listed in or eligible for listing in the National Register of Historic Places, or may cause loss or destruction of significant scientific, cultural, or historical resources.

Alternative 1

Pre-field research indicated that 39 previously recorded heritage sites existed within the Area of Potential Effect (APE) or adjacent to the project area. Of these, 23 where determined to be not eligible for inclusion in the National Register of Historic Places, after consultation with the Nevada State Historic Preservation Officer. During the fall of 2006, Heritage Resource field surveys were conducted during which four new heritage sites were identified. A total of 20 heritage sites which are either unevaluated or determined eligible for the National Register, are located within the proposed undertaking's Area of Potential Effect (APE). These heritage resources will be flagged and avoided from any project related disturbing activities, therefore there is no effect to heritage resources. In the event that any new sites are discovered during project implementation, the Forest Archaeologist will be notified and the procedures in accordance with the Advisory Council on Historic Preservation Regulations 36 CFR Part 800 would be implemented. Sites that are flammable (i.e. Comstock era stumps, wooden flumes, etc) would also be avoided and protected during slash piling and burning.

Alternative 2

The No-Action alternative would not affect districts, sites, highways, structures, or objects listed in or eligible for listing in the National Register of Historic Places, or cause loss or destruction of significant scientific, cultural, or historical resources because no ground disturbing activities would occur.

9. The degree to which the action may adversely affect an endangered or threatened species or its habitat that has been determined to be critical under the Endangered Species Act of 1973. _____

Alternative 1

Wildlife: There are no habitat or known occurrences of any threatened or endangered species with the project area. This project will not affect any federally listed species or critical habitat (Wildlife Report, Exhibit B2, project record).

Aquatics: This project will not affect the threatened Delta smelt and the Central Valley steelhead because the LTBMU is outside the historical and current range of these species. This project will not affect the Lahontan cutthroat trout because; there are no known populations in the project area, no critical habitat has been designated on LTBMU, and Project Design features (see above section) would minimize impacts to potential habitat (Wildlife Report, Exhibit B2, project record).

Botany: There will be no direct or indirect effect to Tahoe yellow cress (candidate for listing) from implementation of this project because appropriate project design features have been incorporated into the proposed action (see project design features for TES plants and Noxious weeds).

Alternative 2

The no-action alternative would not implement any project activities and would therefore not affect any endangered or threatened species or their habitat.

10. Whether the action threatens a violation of Federal, State, or local law or other requirements imposed for the protection of the environment._____

Alternative 1

Forest Plan Consistency (National Forest Management Act) - This Act requires the development of long-range land and resource management plans (Plans). The Lake Tahoe Basin Management Unit Land and Resource Management Plan was approved in 1988 as required by this Act. It has been amended several times, including the Sierra Nevada Forest Plan Amendment, (2004). The amended plan provides for guidance for all natural resource management activities. The Act requires all projects and activities are consistent with the Plan. The Plan has been reviewed in consideration of this project. This decision is responsive to guiding direction contained in the Plan, as summarized in Background section of this document. This decision is consistent with

the standards and guidelines contained in the Plan (Forest Plan Consistency, Exhibit F1, project record).

Management Indicator Species (MIS) – As a part of Forest Plan Consistency, the Forest MIS list was reviewed to determine species applicable for this project. A MIS report was completed for this project, which analyzed effects to MIS species (Wildlife Report, Exhibit B2, project record).

Vegetation Manipulation (National Forest Management Act) – Proposed actions often carry out management prescriptions selected and scheduled during land and resource management plan development (Land and Resource Management Plan, LTBMU, 1988 (as amended). This decision is consistent with the requirements for management prescriptions. The regulations found at 36 CFR 219.27 require that "Management prescriptions that involve vegetative manipulation of tree cover for any purpose shall" comply with the following seven requirements:

- *Be best suited to the goals in the Forest Plan.* The applicable goals are stated in the Background and Purpose and Need sections of this document. This decision is responsive to those goals and is best suited to meet those goals.

- *Assure that technology and knowledge exists to adequately restock lands within five years after final harvest when trees are cut to achieve timber production.*
Restocking is not required; Trees are being cut to achieve fuels reduction goals, not timber production.

- *Not to be chosen primarily because they give the greatest dollar return or the greatest output of timber (although these factors shall be considered).* This decision is not based on output of timber or a dollar return, it is to meet fuels reduction goals.

- *Be chosen after considering potential effects on residual trees and adjacent stands.* The effects on residual trees and adjacent stands were considered in development of the proposed action. The decision, including adherence to applicable Plan Standards and Guidelines, is designed to provide the desired effects of management practices on the resource values. This decision is consistent with the Plan and provides the desired effect on residual trees and adjacent stands.

- *Be selected to avoid permanent impairment of site productivity and to ensure conservation of soil and water resources.* This decision avoids impairment of site productivity. The nature of the decision and use of Best Management Practices will protect soil and water resources.

- *Be selected to provide the desired effects on water quality and quantity, wildlife and fish habitat, regeneration of desired tree species, forage production, recreation users, aesthetic values, and other resource yields.* The decision, including adherence to applicable Plan Standards and Guidelines, is designed to provide the desired effects of management practices on the resource values. This decision is consistent with the Plan and provides the desired effect on the above resources.

- *Be practical in terms of transportation and harvesting requirements and total costs of preparation, logging, and administration.* The main goal of this project is to achieve fuels reduction goals, not timber production. The project area is adequately roaded; no new permanent roads are necessary to implement this decision. New temporary roads will be needed, however,

minimized by utilizing existing roads when possible. The treatment in this decision is appropriate to accomplish project objectives.

Endangered Species Act - In accordance with Section 7(c) of the Endangered Species Act, a list of the listed and proposed, threatened or endangered species that may be present in the project area was requested from the U.S Fish and Wildlife Service (Exhibit B2). As a result of the recent de-listing of the bald eagle, there are no proposed, threatened or endangered species within the project area.

Sensitive Species (Forest Service Manual 2670) - This Manual direction requires analysis of potential impacts to sensitive species, those species for which the Regional Forester has identified population viability is a concern; the project biological review contains the sensitive species list. Potential effects have been analyzed and documented in a Biological Evaluation (Exhibit B1 and B2).

Clean Water Act - This Act is to restore and maintain the integrity of waters. The Forest Service complies with this Act and the TRPA Water Quality Management Plan for the Tahoe Basin through the use of Best Management Practices (see appendix A). This decision incorporates Best Management Practices to ensure protection of soil and water resources. In addition, a cumulative watershed effects analysis (CWE) was completed along with an Erosion Hazard Rating (FSH 2509.22) in order to determine project specific protection measures. This project also includes, as a component a monitoring plan (Appendix B, Roundhill Fuel Reduction Project SEZ Monitoring Plan, 2007) for SEZ treatments which has been reviewed by TRPA.

Wetlands (Executive Order 11990) - Executive Order 11990 is to avoid adverse impacts associated with destruction or modification of wetlands. Wetlands are defined by this order as, "areas inundated by surface or ground water with a frequency sufficient to support and under normal circumstances does or will support a prevalence of vegetative or aquatic life that requires saturated or seasonally saturated soil conditions for growth and reproduction. Wetlands generally include swamps, marshes, bogs, and similar areas such as sloughs, potholes, wet meadows, river overflows, mud flats, and natural ponds."

The project area does support some wetland habitat with a seasonally high water table. This has been validated by map and site-review. To ensure that wetland-related impacts are minimized, Best Management Practices will be incorporated. These include but are not limited to operating when soils are dry, and monitoring to ensure soil moisture standards are met (Appendix B, Roundhill Fuel Reduction Project SEZ Monitoring Plan, 2007). The potential effects from the proposed action have been evaluated and will not result in significant impacts.

Floodplains (Executive Order 11988) - Executive Order 11988 is to avoid adverse impacts associated with the occupancy and modification of floodplains. Floodplains are defined by this order as, ". . . the lowland and relatively flat areas adjoining inland and coastal waters include flood prone areas of offshore islands, including at a minimum, that area subject to a one percent [100-year recurrence] or greater chance of flooding in any one year."

The project area contains floodplains. This has been validated by map and site-review. To ensure that floodplains-related impacts are minimized, Best Management Practices will be incorporated. The potential effects from the proposed action have been evaluated and will not result in significant impacts.

Clean Air Act - Under this Act areas of the country were designated as Class I, II, or III air sheds for Prevention of Significant Deterioration purposes. Impacts to air quality have been considered for this decision. Class I areas generally include national parks and wilderness areas. Class I provides the most protection to pristine lands by severely limiting the amount of additional human-caused air pollution that can be added to these areas. The Desolation Wilderness (8.5 miles west of the project) is a Class I airshed. The remainder of the Forest is classified as Class II airsheds. A greater amount of additional human-caused air pollution may be added to these areas. No areas on the Forest have been designated as Class III at this time. Nevada Division of Environmental Protection regulates prescribed burning in the state in accordance with the State Implementation Plan (SIP). Prescribed burning in this decision will coordinate with the State and follow the SIP to protect air resources; including obtaining and following air quality permits.

National Historic Preservation Act - Section 106 of the National Historic Preservation Act requires federal agencies to take into account the effect of a project on any district, site, building, structure, or object that is included in, or eligible for inclusion in the National Register. Section 106 of the National Historic Preservation Act (P.L. 89.665, as amended) also requires federal agencies to afford the State Historic Preservation Officer a reasonable opportunity to comment. Surveys were conducted for Native American religious or cultural sites, archaeological sites, and historic properties or areas that may be affected by this decision (Refer to exhibit B6, Heritage Resources Report, project record). Results of the surveys have been submitted to the State Historic Preservation Officer and a report with their findings of eligibility will be provided in the project record prior to implementation as well as concurrence with the determination from Nevada State Historical Preservation Office.

Archaeological Resources Protection Act - The Archaeological Resources Protection Act covers the discovery and protection of historic properties (prehistoric and historic) that are excavated or discovered in federal lands. It affords lawful protection of archaeological resources and sites that are on public and Indian lands. Surveys were conducted for Native American religious or cultural sites, archaeological sites, and historic properties or areas that may be affected by this decision (Exhibit B6). Results of the surveys have been submitted to the State Historic Preservation Officer and a report with their findings of eligibility will be provided in the project record prior to implementation as well as concurrence with the determination from Nevada State Historical Preservation Office. In the event that any new sites are discovered during project implementation, the Forest Archaeologist will be notified and the procedures in accordance with the Advisory Council on Historic Preservation Regulation's 36 CFR Part 800 will be implemented.

Native American Graves Protection and Repatriation Act - The Native American Graves Protection and Repatriation Act (NAGPRA) covers the discovery and protection of Native American human remains and objects that are discovered in federal lands. It encourages avoidance of archaeological sites that contain burials or portions of sites that contain graves through "in situ" preservation, but may encompass other actions to preserve these remains and items. Surveys were conducted for Native American religious or cultural sites, archaeological sites, and historic properties or areas that may be affected by this decision (Exhibit B6). Results of the surveys have been submitted to the State Historic Preservation Officer and a report with their findings of eligibility will be provided in the project record prior to implementation as well as concurrence with the determination from Nevada State Historical Preservation Office. In the event that any new sites are discovered during project implementation, the Forest Archaeologist

would be notified and the procedures in accordance with the Advisory Council on Historic Preservation Regulation's 36 CFR Part 800 would be implemented.

Wild and Scenic Rivers Act – There are no Wild and Scenic Rivers in the project area.

National Environmental Policy Act - This Act requires public involvement and consideration of potential environmental effects. The entirety of documentation for this decision supports compliance with this Act.

Prescribed fuel and silvicultural treatments are consistent with the goals and objectives outlined in the Forest Plan as amended. The thinning prescriptions, fuel treatments, and resource protection measures have been developed to avoid permanent impairment of site productivity and ensure conservation of soil and water resources. The vegetation fuel treatments are designed to reduce the risk of wildfire on NFS lands around the communities of Roundhill, Zephyr Cove, Cave Rock and Logan Shoals, by creating surface and ladder fuel conditions such that crown fire ignition is reduced; and the openness and discontinuity of crown fuels, both horizontally and vertically, result in reduced probability of sustained crown fire (SNFPA, ROD (2004) pg. 45, Table 1). The project has been developed to be practical in terms of planning, preparation and administration costs.

Alternative 2
The No-Action alternative would not violate any Federal, State, or local law or other requirement imposed for the protection of the environment because no project activities would take place.

CONSULTATION AND COORDINATION

The Forest Service consulted the following individuals, Federal, State, and local agencies, tribes and non-Forest Service persons during the development of this environmental assessment:

ID TEAM MEMBERS:

Rita Mustatia – IDT Leader, Silviculturist
Scott Parsons – Vegetation Management
Victor Lyon – Wildlife
John Washington – Fire/Fuels
John Maher – Heritage Resources
Stuart Osbrack – Botany
Brian Hansen – Lands
Wes Christensen – Hydrology/Soils
Cecilia Reed – Special Uses
Bob Becker – Recreation
Daniel Cressy – Landscape Architect
Duncan Leao – Planning Forester (NEPA)
Matt Dickinson – Environmental Coordinator (NEPA)

FEDERAL, STATE, AND LOCAL AGENCIES:

Tahoe Regional Planning Agency, Douglas County, Nevada Department of Environmental Protection, Nevada Division of Forestry, Nevada Tahoe Resource Team, Skyland Fire Safe Council, Lake Village Fire Safe Council, Roundhill Fire Safe Council, Logan Creek, Cave Rock Fire Safe Council, Tahoe Region Nevada Fire Safe Council, Nevada Fire Safe Council, Hidden Woods Fire Safe Council, Tahoe Douglas Fire Protection District, Tahoe Douglas Fire Department, Nevada Tahoe Conservation District, Roundhill General Improvement District, Skyland General Improvement District.

TRIBES:

Washoe Tribe of California and Nevada.

OTHERS:

League to Save Lake Tahoe, Tahoe Area Sierra Club, Sierra Forest Legacy, Sierra Pacific Industries, California Land Management, Zephyr Cove Resort, Pinewild Home Owners Association, Castle Rock Home Owners Association, Hidden Woods Home Owners Association, Lakeridge Home Owners Association and other interested individuals.

APPENDICES

Appendix A.

Summary of Roundhill Fuel Reduction Project Best Management Practices (BMP) USFS Pacific Southwest Region (2000)

Best Management Practice	Description
BMP 1-1: Timber Sale Planning Process (TSPP)	Earth scientists or other trained individuals will evaluate onsite watershed characteristics and the potential environmental consequences of activities related to the proposed timber harvest activities. They will design the timber sale to include site-specific prescriptions for each area of water quality concern.
PSW Region BMP 1-2: Timber Harvest Unit Design	Earth scientists or qualified specialists will conduct a hydrologic and geologic survey of the area affected by proposed harvest activities. Mitigations or changes needed to stabilize slopes or improve streamcourses will be incorporated into the harvest unit design.
PSW Region BMP 1-3: Determination of Erosion Hazard Rating (EHR) for Timber Harvest Unit Design	Use the EHR System developed by the California Soil Survey Committee to estimate the potential erosion hazard of proposed timber harvest units during the pre-sale planning process, and use this information to help design the timber sale and to select appropriate erosion control measures.
PSW Region BMP 1-4: Use of Sale Area Maps (SAMs) for Designating Water Quality Protection Needs	The Interdisciplinary Team (IDT) will identify and delineate water quality protection features, such as the location of streamcourses and riparian zones to be protected, wetlands to be protected, boundaries of harvest units, and roads where log hauling is prohibited or restricted, as part of the environmental documentation process. The Sale Preparation Forester will include them on the SAM at the time of contract preparation.
PSW Region BMP 1-5: Limiting the Operating Period of Timber Sale Activities	Limited operating periods will be identified and recommended during the TSPP by the IDT.
PSW Region BMP 1-8: Streamside Management Zone Designation	Roads, skid trails, landings and other timber harvesting facilities will be kept at a prescribed distance from designated stream courses. Factors such as stream class, channel aspect, channel stability, sideslope steepness, and slope stability will be considered in determining the activities limited within Streamside Management Zones (SMZs). Aquatic and riparian habitat, beneficial riparian zone function, and their condition and estimated response to the proposed timber sale will also be evaluated in designating the SMZ.

PSW Region BMP 1-9: Determine Tractor Loggable Ground**	Minimizes soil erosion and subsequent sedimentation and water quality degradation.
PSW Region BMP 1-10: Tractor Skidding Design**	Watershed factors such as slope, soil stability, SMZs, meadows, and other factors that may affect surface water runoff and sediment yield potential will be considered when designing skidding patterns. The careful control of skidding patterns serves to avoid onsite and downstream channel instability, build-up of destructive runoff flows, and erosion in sensitive watershed areas such as meadows and SMZs.
PSW Region BMP 1-12: Log Landing Location	Landing locations proposed by the purchaser or their representatives must be agreed to by the Sales Administrator (SA). An acceptable landing will be evaluated according to a set of criteria that includes the following: the excavated size of landings should not exceed that needed for safe and efficient skidding and loading operations; to the extent feasible, landing locations that involve the least amount of excavation and erosion potential will be selected; and where feasible, landings will be located near ridges away from headwater swales, in areas that will allow skidding without crossing stream channels or causing direct deposit of soil and debris to the stream.
PSW Region BMP 1-13: Erosion Prevention & Control Measures During Timber Sale Operations	Equipment will not be operated when ground conditions are such that excessive damage will result. Erosion control measures will be kept current, which means daily, if precipitation is likely, or at least weekly, when precipitation is predicted.
PSW Region BMP 1-14: Special Erosion Prevention Measures on Disturbed Lands	When required by the contract, the purchaser will give adequate treatment by spreading slash, mulch, wood chips, or some other treatment (if agreed upon) on portions of tractor roads, skid trails, landings, cable corridors, or temporary road fills. This provision is to be used only for timber sales that contain special soil stabilization problems that are not adequately treated by normal methods.
PSW Region BMP 1-16: Log Landing Erosion Prevention and Control	Timber Sale Contract (TSC) requirements provide for erosion prevention and control measures on all landings, which will include provisions for proper drainage. After landings have served purchaser's purpose, the purchaser will ditch or slope the landings and may be required to rip or subsoil and make provisions for revegetation to permit the drainage and dispersal of water.

PSW Region BMP 1-17: Erosion Control on Skid Trails	Erosion control measures are required on a skid trails, tractor roads, and temporary roads. Normally, such measures involve constructing cross ditches and water spreading ditches; other measure such as backblading will be acceptable in lieu of cross drains.
PSW Region BMP 1-18: Meadow Protection	As a minimum, meadow protection requirements contained in Forest Land and Resource Management Plans must be identified and implemented. Unauthorized operation of vehicular or skidding equipment in meadows or in protection zones is prohibited by the TSC. Damage to designated meadows and/or their associated protection zones will be repaired by the purchaser in a timely manner, as agreed to by the SA. Damage to a streamcourse or streamside management zone (SMZ) caused by unauthorized purchaser operations will be repaired by the purchaser in a timely manner and agreed upon manner.
PSW Region BMP 1-19: Streamcourse Protection (Implementation and Enforcement)	Streamcourse protection principles including but not limited to the following will be carried out: location and method of streamcourse crossings must be agreed to by the SA prior to construction; all damage to streamcourses, including banks and channels, must be repaired to the extent practicable; and equipment use in designated SMZs will be limited or excluded.
PSW Region BMP 1-20: Erosion Control Structure Maintenance	During the period of the TSC, the purchaser will provide maintenance of soil erosion structures constructed by purchaser until they become stabilized, but not for more than 1 year after their construction. After 1 year, needed erosion control maintenance will be accomplished using other funding sources under TSC provisions B6.6 and B6.66.
PSW Region BMP 1-21: Acceptance of Timber Sale Erosion Control Measures Before Sale Closure	"Acceptable" erosion control means only minor deviation from established objectives, so long as no major or lasting damage is caused to soil or water. SAs will not accept erosion control measures that fail to meet these criteria.
PSW Region BMP 1-22: Slash Treatment in Sensitive Areas	Special slash treatment site preparation will be prescribed in sensitive areas to facilitate slash disposal without the use of mechanized equipment. Meadows, wetlands, SMZs, and landslide areas are typical sensitive areas where equipment use is normally prohibited.

PSW Region BMP 1-25: Modification of Timber Sale Contract	Once timber sales are sold, they are harvested as planned in the TSC. Occasionally, however, it will be necessary to modify a TSC due to new concerns about the potential affects of land disturbance on a water resource. Where the project is determined to unacceptably affect watershed values, the appropriate Line Officer will take corrective actions, which may include contract modification.
PSW Region BMP 2-1: General Guidelines for the Location and Design of Roads	To locate and design roads with minimal resource damage. The contractor and Forest Service will agree to temporary road locations prior to re-use or construction.
PSW Region BMP 2-2: Erosion Control Plan	Within a specified period after the award of a contract (currently 60 days prior to the first operating season), the purchaser will submit a general plan that, among other things, establishes erosion control measures. Operations cannot begin until the Forest Service has approved the plan in writing
PSW Region BMP 2-3: Timing of Construction Activities	Temporary road activities will be conducted when weather and ground conditions are such that impacts to soils and water quality will be minimal.
PSW Region BMP 2-7: Control of Road Drainage	Used alone or in combination, methods such as the construction of properly spaced cross drains, water bars, or rolling dips; installation of energy dissipaters, aprons, downspouts, gabions, or flumes; and armoring of ditches and drain inlets and outlets can be used to control unacceptable effects of drainage.
PSW Region BMP 2-12: Servicing and Refueling Equipment	If the volume of fuel exceeds 660 gallons in a single container, or if total storage at a site exceeds 1,320 gallons, project Spill Prevention, Containment, and Counter Measures (SPCC) plans are required. The Engineering Representative (ER), Contracting Officer Representative (COR), Construction Inspector, or Timber Sales Administrator is authorized to designate the location, size, and allowable uses of service and refueling areas. Operators are required to remove service residues, waste oil, and other materials from National Forest land and be prepared to take responsive actions in case of a hazardous substance spill, according to the SPCC plan.
PSW Region BMP 2-22: Maintenance of Roads	Provide the basic maintenance required to protect the road and to ensure that damage to adjacent land and resources is prevented. This is the normal prescription for roads closed to traffic and often requires an annual inspection to determine what work is needed. At a minimum, maintenance must protect drainage facilities and runoff patterns. Additional maintenance includes surfacing and resurfacing, outsloping, clearing debris, etc.
PSW Region BMP 2-23: Road Surface Treatment to Prevent Loss of Materials	When necessary, contractors, purchasers, special users, and Forest Service project leaders will undertake road surface treatment measures such as watering, dust oiling, sealing, or paving to minimized loss of road materials.

PSW Region BMP 2-24: Traffic Control during Wet Periods	Roads that must be used during wet periods should have a stable surface and sufficient drainage to allow use while also maintaining water quality. Rocking, oiling, paving, and armoring are measures that protect the road surface and reduce soil loss. Where wet season field operations are planned, roads may need to be upgraded or maintenance intensified to handle the traffic without creating excessive erosion and damaging the road surface.
PSW Region BMP 2-25: Snow Removal Controls to Avoid Resource Damage	The contractor will be responsible for snow removal that will protect roads and adjacent resources. Rocking or other special surfacing will be necessary before the operator is allowed to use the roads. Snow berms will be installed in places that will preclude concentration of snowmelt runoff and that will serve to rapidly dissipate melt water.
PSW Region BMP 2-26: Decommission of roads	Temporary roads will be obliterated or decommissioned following their intended use.
PSW Region BMP 5-2: Slope Limitations for Mechanical Equipment Operations	Mechanical equipment will not be operated on slopes greater than 30% to reduce gully and sheet erosion and associated sediment production by limiting tractor use.
PSW Region BMP 5-6: Soil Moisture Limitations for Tractor Operation	Ground based equipment may operate when soils are dry. A soil is considered dry when squeezed in your hand and it does not meld and cannot be rolled to form a ropelike (ribbon) shape. Winter logging will be allowed as long as wet weather/winter operating guidelines are agreed to prior to operations.
PSW Region BMP 6-1: Fire and Fuel Management Activities	To reduce public and private losses and environmental impacts that result from wildfires and/or subsequent flooding and erosion, measures including the use of prescribed fire or mechanical methods will be used to achieve defensive fuel profile zones; fuel reduction units; and fire suppression activities.
PSW Region BMP 6-2: Consideration of Water Quality in Formulating Fire Prescriptions	To ensure water quality protection while achieving management objectives through the use prescribed fires, prescription elements will include, but not be limited to, factors such as fire weather, slope, aspect, soil moisture, and fuel moisture. The prescription will include at the watershed and subwatershed level the optimum and maximum burn block size, aggregated burned area, and acceptable disturbance for the riparian/SMZ.
PSW Region BMP 6-3: Protection of Water Quality from Prescribed Burning Effects	Implementation of techniques to prevent water quality degradation maintain soil productivity, and minimize erosion from prescribed burning.
PSW Region BMP 2-25: Snow Removal Controls to Avoid Resource Damage	The contractor will be responsible for snow removal that will protect roads and adjacent resources. Rocking or other special surfacing will be necessary before the operator is allowed to use the roads. Snow berms will

	be installed in places that will preclude concentration of snowmelt runoff and that will serve to rapidly dissipate melt water.
PSW Region BMP 7-3: Protection of Wetlands	Activities and new construction in wetlands will not be permitted whenever there is a practical alternative. Factors relevant to the survival and quality of the wetlands, such as water supply, water quality, recharge areas, and habitat diversity and stability, will be considered when evaluating proposed actions in wetlands. Replacement in kind of lost wetlands should be evaluated to apply a "no net loss" perspective to wetland preservation.
PSW Region BMP 7-4: Forest and Hazardous Substance Spill Prevention Control	Equipment operators shall have tools and materials necessary to clean up small and large spills on site at all times. Necessary tools and materials will vary depending on volume of hazardous materials on site. Mitigation of spills is described in the LTBMU spill plan.
PSW Region BMP 7-7: Management by Closure to Use	Thinning units (hand and mechanical) may be closed to public use during the time equipment is operating in a unit.
PSW Region BMP 7-8: Cumulative Off-Site Watershed Effects	A Cumulative Watershed Effects (CWE) analysis will be completed for each project as part of the environmental analysis. To protect identified beneficial uses of water from the combined effects of multiple management activities.

Appendix B.

USDA Forest Service Lake Tahoe Basin Management Unit Roundhill Fuel Reduction Project SEZ Monitoring Plan

By: Theresa Loupe, Hydrologist
July 2007

I. Project Background

The Roundhill Fuel Reduction Project area is located within National Forest land on the east shore of Lake Tahoe, between Kingsbury Grade (SR207) and Logan Shoals. The dense forest stands and heavy fuel loads present within this project area pose a wildfire threat, and encroaching conifer vegetation continues to impact non-conifer riparian vegetation communities within the Stream Environment Zones (SEZs). There are 18 stands with known SEZs within the overall project area, of which 14 stands would be hand thinned, or the SEZs within those stands would be flagged and avoided according to buffers identified in the LTBMU Forest Plan, 3 would be hand treated with directional falling and end-lining of the vegetative material for removal, and 1 would be mechanically thinned. This single stand has been chosen as an area to demonstrate vegetation and fuels reduction treatments within SEZs using low impact mechanical techniques.

The proposed SEZ Mechanical Treatment unit is approximately 3 acres in size, and is located within a larger treatment stand (S) totaling 72 acres. The SEZ unit surrounds the Zephyr Creek channel, between the George Whittel High School and the Skyland subdivision, upstream from the Hwy 50 road crossing (Figure 1). This SEZ was delineated using both the stream buffer criteria set forth in the LTBMU Forest Plan (1988), and visual estimation of the extent of riparian vegetation communities. The stream buffer width ranged from 50 to 100 ft, and was based on the stream order at that particular location along the channel. It is anticipated that harvest operations along with required monitoring during implementation will be completed in 1 field season, the summer of 2008.

The purpose of fuels reduction in this unit is to reduce accumulations of hazardous fuels and restore conifer and riparian vegetation to a healthy, diverse, fire resilient structure that provides desired habitat conditions. Treatments will include: 1) mechanical thinning and removal within dense conifer stands; 2) cutting and removing accumulations of dead standing and downed trees; and 3) conifer removal to promote non-conifer SEZ vegetation such as willow and aspen. For purposes of environmental analysis, the innovative technology proposed for this project would be a Rottne Rapid six-wheel drive harvester (cut-to-length harvester) and a Rottne Rapid six-wheel drive forwarder.

- The harvester has a service weight of 31,300 pounds with a ground pressure of six pounds per square inch without tracks and four pounds per square inch with tracks on the paired drive axles.
- The forwarder has a service weight of 26,000 pounds and a payload capacity of 26,000 pounds with a ground pressure of six pounds per square inch unloaded and 13 pounds per square inch fully loaded.

If other ground based technology is proposed through the contract process (at low bid), that is considered to be of equal or lesser impact, this technology will be considered for contract award, and subsequent monitoring.

Another project within the LTBMU has been approved for similar mechanical harvest treatments within an SEZ, and is called the Heavenly Creek SEZ Demonstration Project. The treatment area for the Heavenly Demo project includes several different soil types than are present within the Roundhill SEZ unit just described. Because different soils are found in the 2 project areas, and the results of the Heavenly Demo project are not yet available, an independent analysis of soil impacts will need to be conducted for each. Nonetheless, the monitoring design approved for the Heavenly Demo project was used to develop this Monitoring Plan.

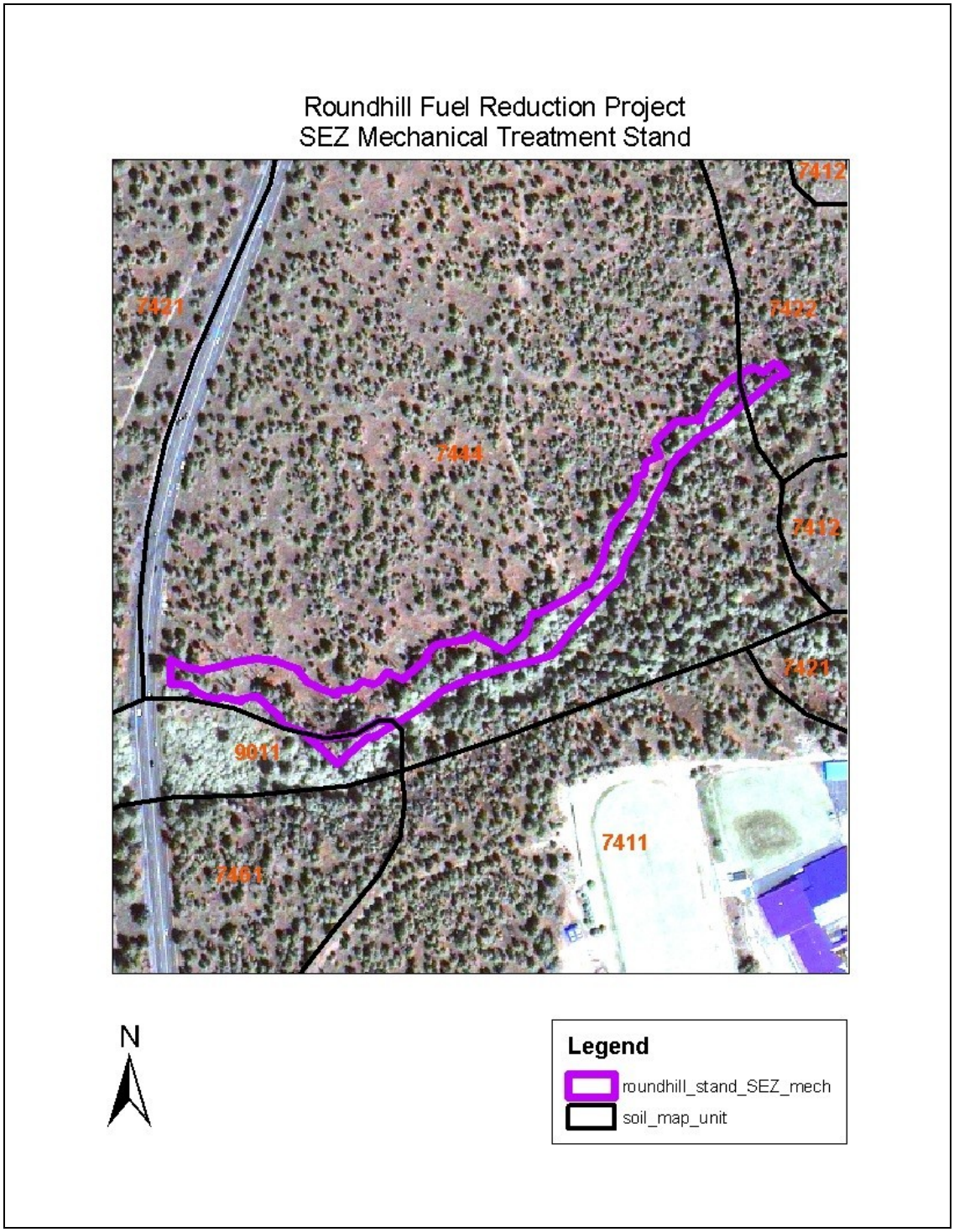


Figure 1. Roundhill Fuel Reduction SEZ Mechanical Treatment Stand

II. Management Questions and Monitoring Objectives

The following management question will be addressed with the monitoring effort.

1) Can innovative technology systems be used in SEZs without causing significant adverse impact to soils or water quality? Can any potential impacts be mitigated utilizing accepted soil restoration techniques (i.e. subsoiling, replacement of soil organic matter, and effective soil cover)?

Monitoring objectives to determine whether significant adverse impacts have occurred are listed below.

- Determine if soil infiltration capacity as measured by saturated hydraulic conductivity (Ksat) has been reduced within the SEZ treatment area to a set threshold.
  - The threshold for Ksat will be determined utilizing the WEPP model, and is the point that average annual erosion is predicted to increase from the treatment area by the Watershed Erosion Prediction Project (WEPP) model for a 50 year precipitation record assuming 40% canopy and 50% cover conditions. This model was developed by the USFS Rocky Mountain Research Station in Moscow, ID to predict erosion from rangeland and forestland. The model allows the user to input various parameters related to soils, vegetation, soil cover, slope and climate and produces estimated levels of runoff, erosion, and sediment yield. If any soils within the treatment units exhibit pre-project Ksat measurements at or below that threshold, no mechanical treatment will be utilized. If monitoring during project operations determines that this threshold is being reached, operations will be halted, and appropriate mitigations implemented as needed.

- Determine if major forwarder/harvester routes are developing the characteristics of a forest service road through either visible signs of rutting or depressions, or Ksat measurements approaching 0.15 in/hr.
  - This threshold for Ksat was established by WEPP: Road model developers for native surface forest roads on sandy loam soils. If any forwarder/harvester trail segments are identified through visual observations and/or Ksat measurements to exhibit the characteristics of a native surface road, WEPP:Road will be used to evaluate erosion and sediment yield potential, and appropriate mitigations will be implemented as needed.

- Determine if surface organic matter is present as fine organic matter that occurs over at least 50% of the area, and is well distributed. Fine organic matter includes plant litter, duff, and woody material less than 3 inches in diameter. The 50% general soil cover threshold was established in Regional USFS soil quality standards contained in the Sierra Nevada Forest Plan Amendment.

- Determine if there is an increase in the evidence of erosion based on visual observations of rills, gullies, and sediment deposition. Determine if soil and water protection BMPs have been implemented correctly and are effective.

III. Soil and SEZ Characterization

Three major soil map units fall within the proposed project area and reflect a granitic geology. The majority (>90%) of the SEZ treatment stand is underlain by soil map unit #7444, which corresponds to the Christopher-Gefo complex, on 0-5% slopes. The remainder of this stand is

underlain by map unit #7422, the Cassenai gravelly loamy coarse sand, very stony, on 15-30% slopes; and map unit #9011, the Oxyaquic Cryorthents – Aquic Xerorthents – Tahoe complex, on 0-15% slopes. These soil map units were determined using the *NRCS Soil Survey of Tahoe Basin Area California and Nevada* (2006), and the corresponding estimated infiltration capacities from the soil survey data are presented in Table 1. Approximately 45% of the 9011 soil map unit and one component (5%) of the 7444 map unit are characterized as hydric soils, indicating that these areas might exhibit SEZ soil characteristics. The geographic distribution of soil types within this SEZ treatment stand can be found in Figure 2.

Table 1: Soil types and estimated infiltration rates for map units within the SEZ treatment stand. (From 2006 NRCS Soil Survey)

Soil Map Unit Number	% of stand in soil type	Soil Description	Hazard of off-road or off-trail erosion	Saturated Hydraulic Conductivity -below 1 inch depth (µm/sec)
7444	~90%	Christopher (loamy coarse sand)-Gefo (gravelly loamy coarse sand) complex, on 0-5% slopes	Slight	42-141 (6.0-20.0 in/hr)
7422	~5%	Cassenai gravelly loamy coarse sand, 15-30% slopes, very stony	Moderate	14-42 (2.0-6.0 in/hr)
9011	~5%	Oxyaquic Cryorthents (gravelly loamy coarse sand) – Aquic Xerorthents (sandy loam) – Tahoe (gravelly loam) complex, on 0-15% slopes	Slight	10-100 (1.4-14.0 in/hr)

Because most of the project area is underlain by Christopher-Gefo complex soils, most of the data collected will occur within this soil type. However, an attempt will be made to gather enough data points to characterize response for the other soil types present.

IV. Methodology

Soils and BMPs

Parameters

The soil parameters to be collected will include soil moisture content, saturated hydraulic conductivity (Ksat), soil cover, soil disturbance class, and bulk density. Sampling protocols are utilized to collect both quantitative and qualitative data. These protocols are available in the project record.

BMP implementation and effectiveness will be monitored using established Region 5 protocols for the Best Management Practices Evaluation Program, which can be referenced in the *Best Management Practices Evaluation Program (BMPEP) User's Guide* (USDA 2002). Specific onsite evaluations will be conducted for Streamside Management Zones (T01) within this treatment unit, which incorporates 3 BMPs: 1) Practice 1-8, streamside management zone designation; 2) Practice 1-19, streamcourse and aquatic protection; and 3) Practice 1-22, slash treatment in sensitive areas. In addition, any timber harvest soil and water protection BMPs

prescribed in the NEPA documents and timber sale contract for this treatment unit will be evaluated for implementation and effectiveness.

Frequency

Soil parameters will be measured within two weeks prior to project implementation. However, since pre-project Ksat is not dependent on soil moisture conditions and is assumed to remain constant, Ksat data may be collected earlier than two weeks before implementation. In addition, a primary concern when working in SEZs will be ensuring that soil moisture content values are acceptable for mechanical operations. Pre-project soil moisture tests will consist of coupled qualitative field estimates of soil moisture (Table 2) and quantitative measurements using oven dried samples in order to ensure consistency between the methods. The qualitative soil moisture estimates will be determined by digging up the soils from the 6 to 12 inch layer, and trying to form a ball by squeezing a handful of soil very firmly and comparing it to the criteria appropriate for Tahoe Basin soils presented in Table 2. Soils will not be operated on if they exhibit criteria in bold print. Pre- project soil moisture samples will be taken periodically through July and August of 2008 to determine whether soils appear to be drying out within the SEZ treatment stand to inform project planning. The qualitative soil moisture assessments will be repeated again within 24 hours before scheduled implementation and after any major storm event during project implementation.

Table 2: Criteria for Soil Moisture

Soil Moisture % Increases Downward	*Loamy sands, fine sand loam, very fine sands, coarse sands Fine sandy loams, sandy loams, very fine sandy loam*
Dry soils	Dry, loose, single grained flows thru fingers, will not form a ball with pressure
Moist soil	Tends to stick together slightly, sometimes forms a very weak ball, but will shatter into single grains easily when tossed to a few inches height and caught in the hand
Very moist soil	**Forms a weak ball, when tossed in the air may break into smaller chunks but will not shatter easily into single grains.**
Wet soils	**Upon squeezing, free water may appear. Wet outline is left on hand. Nonplastic.**

Soil moisture conditions will also be measured prior to implementation utilizing gravimetric soil moisture measurement techniques to help characterize the soil moisture conditions during project operations, and possible correlation to measured changes in Ksat. A minimum of 3 samples will be collected prior to implementation. Pre-project bulk density measurements will also be taken at this time, since the same sample can be used for both tests.

During implementation, post-project Ksat, soil cover, and soil disturbance class will be collected within 1 week after project implementation. A minimum number of sample points will be collected within this SEZ treatment stand, which will be determined based on a sample size analysis test as described below in the Sample Points section. The final boundaries of this

treatment area will be defined immediately prior to project implementation, based on the most recent pre-project soil moisture sampling.

Post-project bulk density testing will be conducted within two weeks of project completion. In addition, once all the snow has melted the following spring, and after the first major summer or fall rain storm event, BMP effectiveness monitoring will be conducted (with photos) to determine whether visible signs of erosion, sediment transport, or deposition has occurred as a result of project activities. Appropriate actions will be taken if any BMP failures are observed. Ksat, bulk density, and soil cover data will be scheduled for collection again in 2013 to evaluate the recovery rates in these parameters.

Equipment

Data forms, protocol, clipboard, unit maps with scale or graticule, spades, core sampler, soil auger, soil knife, sample bags and tags, cleaning rags, GPS, clinometer, compass, phone or radio, camera, and a constant head permeameter (measures saturated hydraulic conductivity).

Sample Points

A sample size analysis test will be conducted in SigmaStat to determine the number of sample points needed to predict whether the Ksat thresholds are being exceeded within the treatment area, at the 85 % C.I, assuming that the data will demonstrate a log normal distribution (Christensen and Norman, 2007). For pre-project monitoring, stratified random samples will be collected throughout the project area, in order to capture the variability in slope, soil type, and vegetation. The post-project sampling will be stratified based on the level of disturbance. An adequate number of samples will be collected in each of a variety of disturbance types, such as: 1) light use tracks (1-3 passes); 2) heavy use tracks (>4 passes); 3) between tracks; and 4) other. This sampling design also requires estimating the percent of each disturbance type within the sampled area after implementation, so that a post-project area weighted condition can be determined.

Pre-project data will be analyzed prior to project implementation to determine whether the number of sample points is adequate to give a statistically valid representative sample. Sample points will be added prior to project implementation if the pre-project analysis determines it is needed.

V. Data Analysis

Following data collection, data will be transferred from data sheets and stored in EXCEL spreadsheets located internally at: k:ws/monitoring/soils/soilsmonitoring. Saturated hydraulic conductivity and other quantitative soils data will be analyzed using SigmaStat. Differences between sample sets will be statistically evaluated at the 85% C.I.

The WEPP model will be utilized to predict the cumulative runoff and sediment loading response from harvest units based on hydraulic conductivity values, and other physical site characteristics. The Windows WEPP model can be found at: http://topsoil.nserl.perdue.edu/nserlweb/weppmain/wepphtml. In addition, if segments of major forwarding trails start developing the appearance of a road with visible signs of rutting, and/or

infiltration capacities approaching 0.15 in/hr, a version of WEPP developed specifically for roads will be used to determine if direct runoff and erosion is predicted from these road segments.

VI. Reporting and Adaptive Management

Pre- and immediate post-project data will be collected in fall of 2008. A final monitoring report for the Roundhill SEZ Demonstration Project analyzing pre- and post-project data will be published in the of winter 2008/2009. Addendums to this report will be published as additional data is collected on BMP effectiveness in 2009, and all parameters in 2013.

If data collected in the treatment areas after project implementation indicates that median Ksat and soil cover has been reduced below the stated thresholds, a winged subsoiler will be used to reduce compaction in forwarder/harvester trails and soil cover applied as needed from appropriate sources of native materials.

VII. References

Christensen, Wes, and Sue Norman. 2007. 2006 Ward Unit 5 Soil Monitoring Report, Lake Tahoe Basin Management Unit, USDA Forest Service.

USDA Natural Resource Conservation Service. 2007. Web Soil Survey. Online at http://websoilsurvey.nrcs.usda.gov/app/.

USDA Forest Service. June 2002. Investigating Water Quality in the pacific Southwest Region: Best Management Practices Evaluation Program (BMPEP) User's Guide. USDA Forest Service, Pacific Southwest Region, Vallejo, CA.

Appendix C.

USDA Forest Service Lake Tahoe Basin Management Unit Best Management Practices Evaluation Program Summary June 2007

I. Introduction

Each year, the Lake Tahoe Basin Management Unit (LTBMU) completes evaluations for the Best Management Practices Evaluation Program (BMPEP), as part of the Pacific Southwest Region's effort to evaluate the implementation and effectiveness of BMPs created for protecting soil and water resources associated with timber, engineering, recreation, grazing, and revegetation activities.

The objectives of the Forest Service (USFS) BMPEP for the LTBMU are to: 1) fulfill USFS monitoring commitments to the State Water Resources Control Board (SWRCB), as described in the SWRCB/USFS Management Agency Agreement and *Water Quality Management for National Forest System Lands in California (USDA Forest Service, 2000)*; 2) assess and document the efficacy of the USFS water quality management program, specifically the implementation and effectiveness of BMPs; and 3) facilitate adaptive management by identifying program shortcomings and recommending improvements. Additional details on the BMPs, protocols, and site selection can be found in *Investigating Water Quality in the Pacific Southwest Region, Best Management Practices Evaluation Program (BMPEP) User's Guide (USDA Forest Service, 2002)* and *Water Quality Management for National Forest System Lands in California (USDA Forest Service, 2000).*

II. Methodology

Onsite evaluations are used to assess both BMP implementation and effectiveness. Implementation evaluations determine the extent to which planned, prescribed and/or required water quality protection measures were actually put in place on project sites. Effectiveness evaluations gage the extent to which the practices met their water quality protection objectives. For sites with poor implementation or effectiveness scores, observers are asked to identify the reasons and suggest corrective actions. For those sites with poor effectiveness, evaluators estimate the degree, duration and magnitude of any existing or potential impacts to water quality, based on published Region 5 guidelines. This type of "hillslope monitoring" uses indirect measures to evaluate BMP effectiveness; poor scores represent potential, rather than actual, impairment of beneficial uses by a given activity.

For BMP implementation, evaluators' answer a variety of specific questions intended to determine whether the project was executed on the ground, as planned and described in project documents. A range of possible scores are allocated to each question, depending on its relative importance and the degree to which a particular requirement is met (e.g., whether the project exceeds, meets, departs immaterially, or departs substantially from requirements). Scores for all implementation questions are then summed and compared to a pre-determined threshold to conclude whether a given suite of BMPs were implemented. BMP effectiveness is determined through evaluation of indirect measures of water quality protection, including observations (e.g., evidence of sediment delivery to channels) and quantitative measurements (e.g., amount of ground cover, percent of stream shade). A scoring system similar to that used for BMP implementation is used to determine BMP effectiveness.

IIa. Sampling Design

BMPEP protocols are applied to both randomly and non-randomly selected project sites. The number of random evaluations to be completed each year is assigned to the National Forests by the Regional Office based on: 1) the relative importance of the BMP in protecting water quality in the Region; and 2) those management activities most common on the individual Forest. The USFS Region 5 target for the LTBMU for BMPEP is typically between 40 and 45 evaluations for 29 different types of BMPs, approximately half of which apply to timber projects. Forests can supplement these randomly selected sites with additional sites based on local monitoring needs, such as those prescribed in an environmental document. The combination of random BMP evaluations and those specific to a given project provide valuable information about implementation and effectiveness of BMPS across the LTBMU. The assumption is that the random selection of BMPs evaluated will be representative of the implementation and effectiveness of BMPs forest-wide.

The list of BMPs evaluated with this Program that are associated with timber harvest activities include:

- T01: Streamside management zones
- T02: Skid trails
- T03: Suspended yarding
- T04: Landings
- T05: Timber sale administration
- T06: Special erosion control and revegetation
- T07: Meadow protection
- E08: Road surface and slope protection
- E09: Stream crossings
- E10: Road decommissioning
- E11: Control of sidecast material
- E12: Servicing and re-fueling
- E13: In-channel construction practices
- E14: Temporary roads
- E15: Rip rap composition
- E16: Water source development
- E17: Snow removal
- E18: Pioneer road construction
- E19: Restoration of borrow pits and quarries
- E20: Management of roads during wet periods
- F25: Prescribed fire
- V28: Vegetation manipulation
- V29: Revegetation of surface disturbed areas

Appendix D.

USDA Forest Service Lake Tahoe Basin Management Unit Soil Quality Monitoring Summary, June 2007

I. Introduction

The primary goals of soil quality monitoring at the Lake Tahoe Basin Management Unit (LTBMU) are to: 1) evaluate the impacts of mechanical fuels reduction treatment methods on soil compaction and saturated hydraulic conductivity (Ksat); 2) apply hydraulic conductivity, bulk density, soil cover measurements, and topographic data to the Water Erosion Prediction Project (WEPP) model to estimate anticipated runoff and sediment transport effects from management activities; and 3) determine whether Regional soil quality thresholds are being achieved within vegetation management units for soil porosity, soil cover and in limited cases, soil organic matter.

Measurement of key soil parameters (soil cover, Ksat, bulk density), in conjunction with WEPP model simulations will allow conclusions to be made concerning the level of disturbance and the effects of management activities on hydrologic response at the hillslope scale.

II. Methodology

Monitoring will be performed prior to and as soon as possible following the mechanical treatment of a timber unit. Any historic disturbances within these units should be noted and may need to be addressed depending on the severity of the disturbance and the degree of recovery. Samples will be taken in heavily disturbed areas (landings, etc), along transects that intersect areas of varying degrees of disturbance (forwarder/harvester trails and haul routes, etc), and in "undisturbed" areas. This distribution of samples will allow comparisons to be made between areas within the unit ranging from heavily disturbed to relatively undisturbed.

The data collected will consist of disturbance class, soil bulk density, Ksat, soil moisture, and soil cover. In some areas a more comprehensive effort may be made to collect soil organic matter data and cone penetrometer data. Bulk density, penetrometer, soil moisture, and Ksat measurements will be used to establish correlations between these various methods to determine how to most cost effectively obtain useful soil compaction data. However, the coarse, rocky nature of the soil in many project areas makes collecting reliable bulk density samples and penetrometer readings difficult.

Bulk density samples will be taken immediately before and after mechanical activity in an attempt to assess the direct affects of operating the equipment with varying amounts of soil moisture. Soil moisture can be calculated from the bulk density sample with little extra effort. The bulk density samples will be taken between 4-8" and 8-12" at each location. In the event that reliable bulk density samples cannot be collected due to the loose, rocky nature of the soil, a soil moisture sample will be taken.

In general, Ksat will be measured as a substitute for other measures of soil compaction. Ksat is a direct measure of soil infiltration capacity, and can be used as a parameter in the WEPP model to predict runoff and erosion response. Furthermore, Ksat is not affected by variations in soil

moisture which allows meaningful comparisons to be made between pre- and post-treatment values despite potential differences in soil moisture.

Ocular estimates of the percent and type of soil cover will also be made, and this variable will be utilized as an input parameter into the WEPP model. In some areas a more intensive evaluation of soil organic matter will be evaluated by measuring the difference in weight between the dried field sample and the sample after burning off the organic matter in a muffle furnace. This is only anticipated in areas that receive underburn treatments. Soil disturbance will be evaluated by classifying the levels of disturbance (displacement is only a yes or no with potential measurements of rills).

II.a. Sampling Design

Location/Schedule

Each year, the fuel reduction projects planned for implementation are reviewed for soil type, treatment type, and geographic location in order to determine which (if any) of the proposed treatments should be monitored using these protocols to provide us with currently unavailable monitoring information. Where a specific treatment type and soil type have already been monitored in this way, those combinations will not be monitored again. Sampling will be focused on areas that contain soil types and/or treatment methods that have not been monitored in previous efforts.

Sample Points

A total of 40-60 sample points will be monitored per project, both before and after disturbance, which should give us an adequate sample size to detect changes (see 2005 Pre-Project Crag Report, 2006). With this in mind, sampling for each unique treatment method/soil type combination will consist of a minimum of 3 transects, each approximately 500 feet in length, and each consisting of 20 equally spaced sample points. The number of transects, actual length, orientation, and sample spacing will vary depending on the dimensions of the unit being measured, the number of soil types, and the pattern of disturbance expected. Transects will ideally follow contour, perpendicular to forwarder/harvester trails, and will be located to give the best representative sample of the unit being measured. The data will be collected as soon as possible before and after disturbance and care will be taken to avoid taking measurements in locations that have been disturbed by data collection in previous years.

III. Data Analysis

The values for saturated hydraulic conductivity will be stratified by disturbance class and soil type. Data will be analyzed using SigmaStat software to conduct pre and post project comparison and develop descriptive statistics.

The values for Ksat, bulk density, soil cover, estimated canopy cover, and other physical site characteristics will be used in conjunction with the Disturbed WEPP model to evaluate any significant differences in runoff and sediment loading response between pre- and post-disturbance conditions.

IV. Reporting

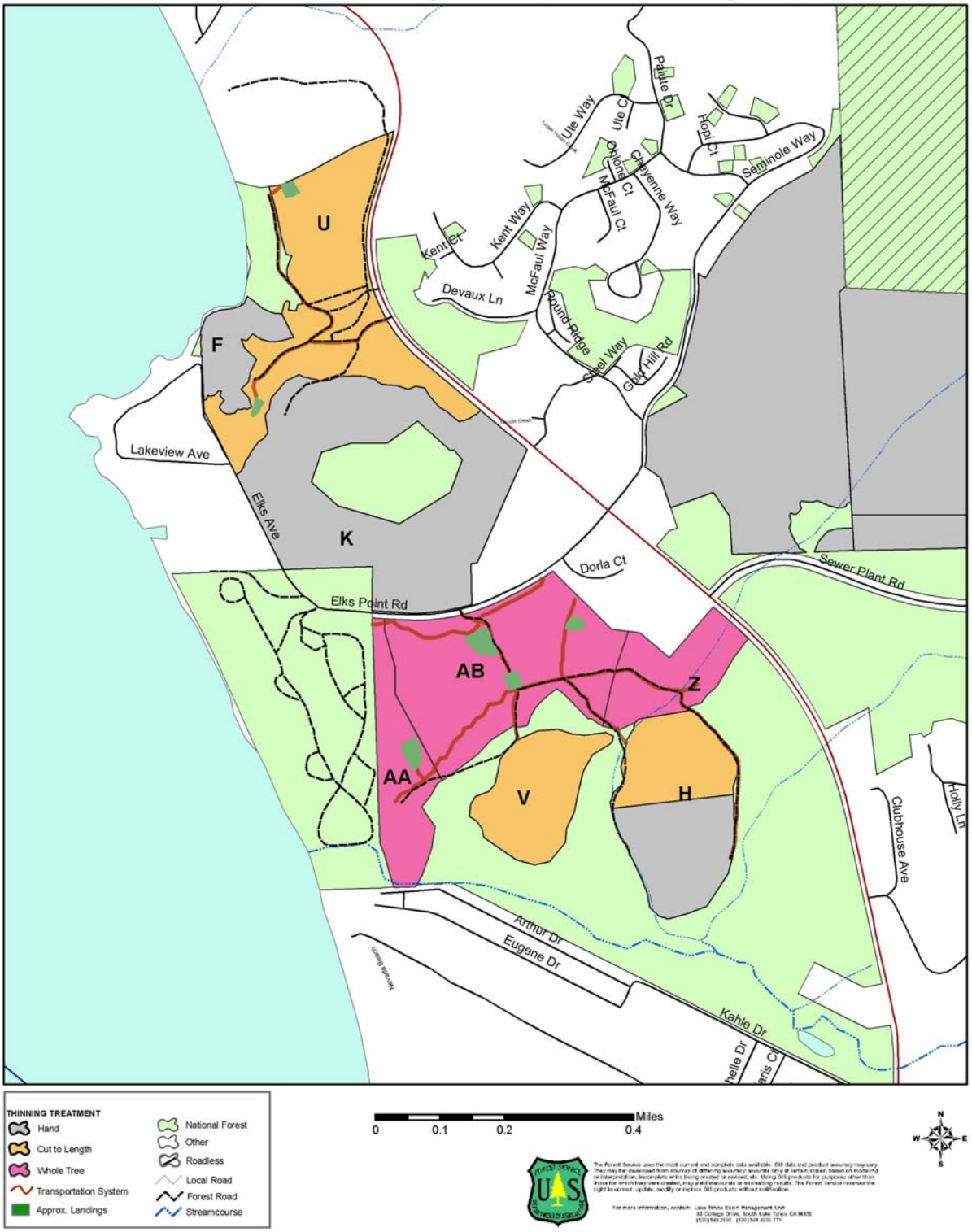
Annual reports will be compiled every winter following treatment to assess the adequacy of the monitoring plan including sample size and design, and to evaluate the impacts of vegetation management activities. In addition, a comprehensive soil quality monitoring report will be compiled every three to five years summarizing the impacts of fuels reduction management activities on soil quality parameters.

One pre and post project data collection and reporting effort has been completed to date for the Ward Fuels Reduction Project located on the west shore. This pre and post comparison will be available on our website at http://www.fs.fed.us/r5/ltbmu/publications/ by early July, 2007. Sampling efforts for 2007 and 2008 are expected to be focused on the east shore (Roundhill Fuel Reduction Project) and south shore (South Shore Fuels Reduction Project).

APPENDIX E.

Roundhill Fuel Reduction Project Transportation & Landing Maps.

Roundhill Fuel Reduction Project Transportation/Landings Map 1.



Roundhill Fuel Reduction Project Transportation/Landings Map 2.