Proposal for the Spooner Hazardous Fuels Reduction & Healthy Forest Restoration Project

USDA Forest Service Pacific Southwest Region
Lake Tahoe Basin Management Unit

BACKGROUND

The Lake Tahoe Basin Management Unit (LTBMU) is proposing the Spooner Hazardous Fuels Reduction and Healthy Forest Restoration Project (Spooner project) along the eastern side of Lake Tahoe in portions of T14N, R18E; T15N, R18E; and, T14N, R19E, MDM. This project is in portions of Washoe, Carson City, and Douglas Counties in the State of Nevada.

The Spooner project incorporates the communities around Logan Shoals and Glenbrook for fuel treatments as described in the Fuel Reduction and Forest Restoration Plan for the Lake Tahoe Basin Wildland Urban Interface (TRPA WUI Plan) (TRPA 2007). This plan combines all Lake Tahoe Basin at risk communities that have developed Community Wildfire Protection Plans (CWPPs) and includes treatment areas that are prioritized within the Tahoe-Douglas Fire Protection District. The LTBMU collaborated with the Tahoe-Douglas Fire Protection District to identify fuel reduction activities that coordinate with the CWPP and provide the defensible space identified in the CWPP where it occurs on National Forest System lands. The project is also consistent with the Healthy Forest Restoration Act of 2003 (HFRA) which authorizes fuel reduction projects on federal lands and provides a foundation to work collaboratively with at-risk communities to reduce wildfire hazards within the Wildland Urban Interface (WUI).

Tiering off of the efforts of the TRPA WUI Plan, a multi-agency cadre (17 agencies represented) developed the Lake Tahoe Basin Multi-Jurisdictional Fuel Reduction and Wildfire Prevention Strategy (Fuels Strategy) (2007) that includes proposed vegetation and fuel treatments in the project area within the next ten years. According to the Fuels Strategy, the proposed treatments are priority-based to reduce the risk of a catastrophic fire and its impacts to commercial, private, and public infrastructure, as well as the ecological values along the East Shore of the Lake Tahoe Basin.

General Project Information

The project is located on both sides of portions of Highway 50 and Nevada State Route 28, between Lincoln Park (to the south) and Sand Harbor State Recreation Area (to the north). The project area includes approximately 16,900 acres of mixed conifer, Jeffrey pine, and patches of mixed brush species at elevations from approximately 6200 to 7900 feet above sea level. The project area encompasses non-National Forest System lands (including small communities near the shoreline), developed recreation areas, and Forest and non-Forest Service facilities. Land allocations, per the Sierra Nevada Forest Plan Amendment (SNFPA 2004), include Wildland WUI defense and threat zones, four northern goshawk (*Accipiter gentiles*) protected activity centers (PACs), Riparian Conservation Areas (RCA), general forest, and old forest emphasis. In addition, a portion of the Lincoln Creek Roadless area is within the Project Area. Figure 1 provides a map of many of these land allocations. The WUI contains two primary sub-classifications, with the

Defense Zone extending approximately ¼ mile from capital improvements, and the Threat Zone extending approximately 1¼ miles beyond the Defense Zone. Consistent with SNFPA (ROD, p. 40), in the Spooner project area, refinements were made to the WUI threat zone boundaries based upon site-specific topography and other features that provide logical fireline placement during suppression, such as slope breaks, roads, and streams.

Perennial streams in the project area include (from north to south) Marlette Creek, Secret Harbor Creek, Skunk Harbor Creek, Slaughterhouse Creek, Glenbrook Creek, North Logan House Creek, and Logan House Creek. Several of these streams support fish populations. Marlette Creek contains the Lahontan cutthroat trout (*Oncorhynchus clarkia henshawi*), a threatened species.

Proposed treatment for this project would only occur on National Forest System (NFS) lands within the WUI and total approximately 3,500 acres within the project area. The majority of the treatment area is greater than 30 percent slope. Approximately 870 acres of treatment are inside Lincoln Creek Roadless Area, of which only 47 acres encompass treatment using mechanical equipment.

Historic Forest Conditions – A detailed study of pre-Euro-American settlement forest structure and fire regime in the Spooner Fuels Treatment Project area was carried out by collecting data on remnant tree stumps cut in the 19th century (Taylor (2004). The following information on historic conditions is taken from that report.

Forest conditions in the Spooner project area prior to the late 1800's consisted of forests dominated by widely spaced, large-diameter Jeffrey pine (*Pinus jeffreyi*), western white pine (*Pinus monticola*), sugar pine (*Pinus lambertiana*), incense cedar (*Calocedrus decurrens*), white (*Abies concolor*) and red fir (*Abies magnifica*), and lodgepole pine (*Pinus contorta*). The fire regime was typically that of frequent, low to moderate severity surface fires that reduced the amount of understory seedling and pole-sized trees, shrubs, shade tolerant tree species and dead fuel accumulations. Jeffrey pine-white fir stands ranged from 11 to 46 trees per acre, with average diameters ranging from 21 to 34 inches diameter at breast height (dbh)[1]. Basal area during this time averaged 111 square feet per acre. The historic mean fire return interval for Jeffrey pine-white fir forests was 11.4 years, with 92 percent of the fires occurring during the dormant season (late summer or fall). Red fir-western white pine forests ranged from 48 to 84 trees per acre with average diameters of 22 to 30 inches dbh. Basal area during this time averaged 243 square feet per acre. The historic mean fire return interval for higher elevation red fir-western white pine forests was found to be 76 years which is notably longer than Jeffrey pine-white fir forests in this area, but similar to the mean fire return interval for this forest type found elsewhere in the Sierra Nevada.

[1]dbh is diameter at breast height. This is a standard measurement of tree diameter taken at 4.5 feet above ground level.

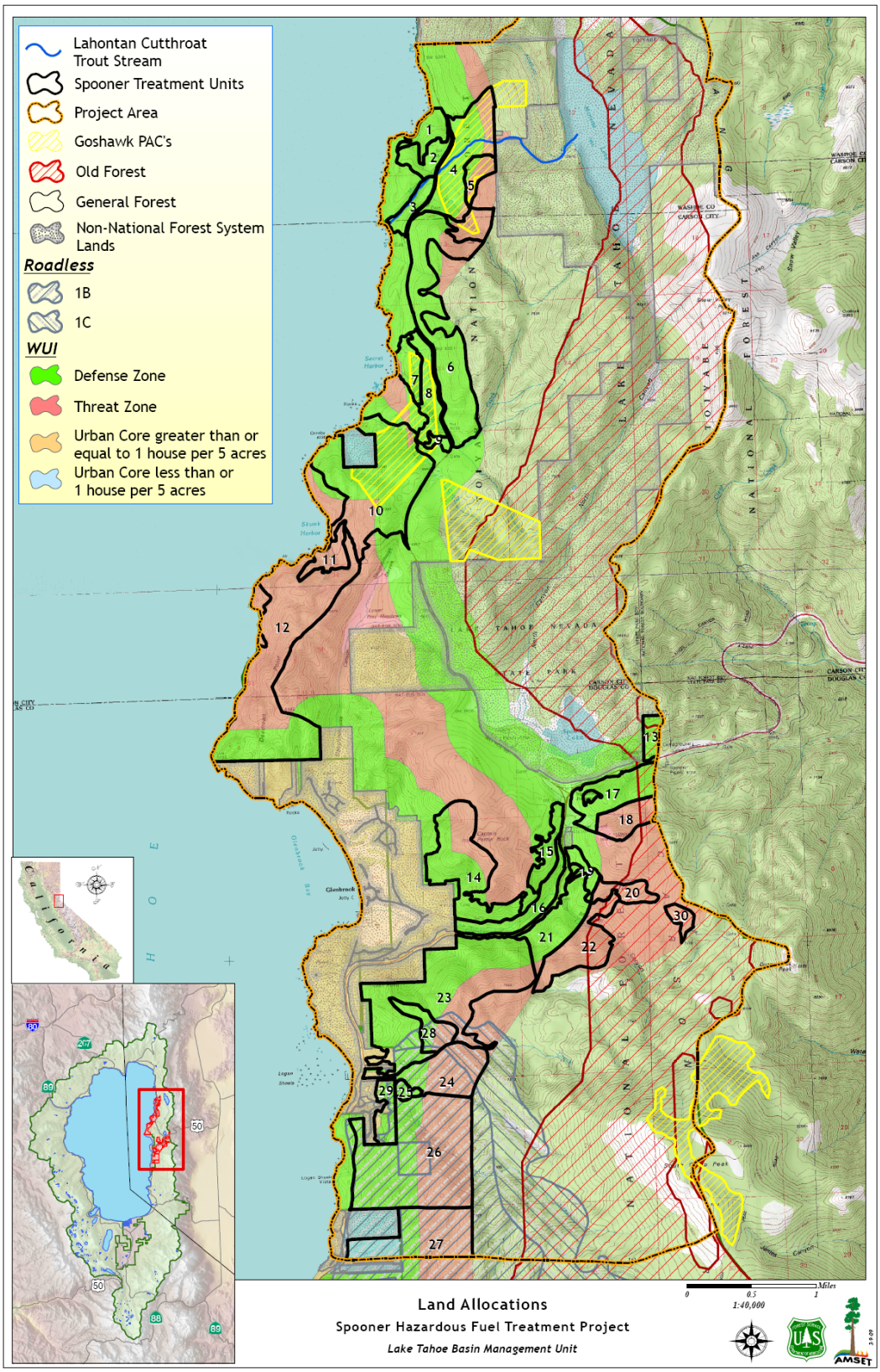

Figure 1. Major Land Allocations within the Spooner Project Area

Current Forest Conditions - The vegetation conditions in the Spooner project area have been diverted from their historic forest structure and species composition due to fire suppression and past forest management, in particular, during the Comstock logging era of the 1870's. Since intensive logging during the Comstock era, stands have shifted from fewer, more widely spaced larger diameter pines, to an increased number of smaller diameter fir trees mixed with pine and incense-cedar. Conifer encroachment in streamside riparian areas and an increase in surface fuel loading have occurred in most areas. The accumulation of surface and ladder fuels, especially the growth of dense, small-diameter suppressed trees, contributes to increased potential for crown fires. In addition, there have been two insect outbreaks in the project area (1980's and 1990's) where many of the insect-killed trees are on the ground, adding to the dead and down fuel load. The overall fuel conditions and associated predicted fire behavior show that a wildland fire could escape initial attack in the area and could induce high rates of tree mortality. In addition, the excessive fuel loads place stands at increased risk for more extreme fire.

The LTBMU is proposing 30 treatment units within the project area (see Figure 2). The proposed treatment units currently have an average of approximately 300 trees per acre with a range from approximately 120 to over 560 trees per acre. Proposed treatment units average 190 square feet of basal area per acre and range from roughly 60 to 390 square feet of basal area per acre. The average quadratic mean diameter of live trees is 11 inches at dbh. Table 1 provides a summary of forest vegetation data by proposed treatment unit.

The current dead and down surface fuels for the proposed treatment stands average approximately 34 tons to the acre and range from 5 to over 100 tons to the acre. As noted in Table 2, stands with little dead and down surface fuels still contain sufficient understory vegetation and ladder fuels to create crown fire conditions under 90th percentile weather conditions[2]. Based on the fire behavior modeling in the Fire and Fuels Extension (FFE) of the Forest Vegetation Simulator (FVS), using 90th percentile weather conditions, some form of crown fire is expected to occur in all but one treatment unit. Treatment Unit 14 is projected to burn as a surface fire; however, there are undesirable patches of surface and ladder fuels where overstory torching would likely occur. Table 2 provides a summary of surface fuel loads, average crown base height and projected fire behavior by proposed treatment unit.

Live understory vegetation consisting of herbaceous and shrub species currently average 43 percent surface area cover, with unit averages ranging from 3 to 97 percent. Eleven of the 30 treatment units exceed 50 percent cover of surface vegetation. This high density of understory vegetation is a significant component of the surface and ladder fuels that are capable of creating crown fire conditions. The high density of understory vegetation, also contributes to difficulty in constructing fireline necessary for fire suppression.

The Aspen Mapping and Condition Assessment Project (2002-2007) identified that approximately 64 percent of aspen stands on the forest are currently at moderate, high, or highest risk of loss. This risk of loss is an assessment of the probability that an aspen stand may not persist on the landscape based on stand conditions, such as conifer encroachment and reduced aspen regeneration. Small aspen stands are scattered throughout the analysis area. Many of the aspen stands in the project area are slowly declining in size and vigor due to lack of disturbance, which can stimulate aspen regeneration. Another symptom of fire exclusion is aggressive conifer

[2] Weather percentiles are the weather conditions that occur for a given percent of fire season or defined length of time. 90th percentile weather occurs during 10 percent of the defined length of time. For fire seasons, this weather is considered high with hotter temperatures, drier air but usually not as great of winds. The weather conditions used in this model included 83°F, 16% relative humidity, 12 mile per hour winds

encroachment. As conifers encroach upon aspen stands, the diversity of suitable wildlife habitat and generally, water yields are decreased.

Desired Forest Conditions – The Sierra Nevada Forest Plan Amendment Record of Decision (2004) goals related to fuels management are for treatments to reduce threats to communities and wildlife habitat from large, severe wildfires and re-introduce fire into fire-adapted ecosystems. Prescriptions for treatment areas may also address increasing stand resistance to mortality from insects and disease. In WUI defense zones, the desired conditions are:

- Stands 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 overstory trees result in very low probability of sustained crown fire.

In WUI threat zones, under high fire weather conditions, the desired conditions for wildland fire behavior in treated areas are:

- Flame lengths at the head of the fire are less than 4 feet.
- The rate of spread at the head of the fire is reduced at least 50 percent of pre-treatment levels.
- Hazards to firefighter are reduced by managing snag levels in locations likely to be used for control of prescribed fire and fire suppression consistent with safe practices guidelines.
- Production rates for fire line construction are doubled from pre-treatment levels.
- Tree density has been reduced to a level consistent with the site's ability to sustain forest health during drought conditions.

In addition, a desired condition is to retain the aspen stands at risk which would benefit the biological diversity and ecological condition of the forest.

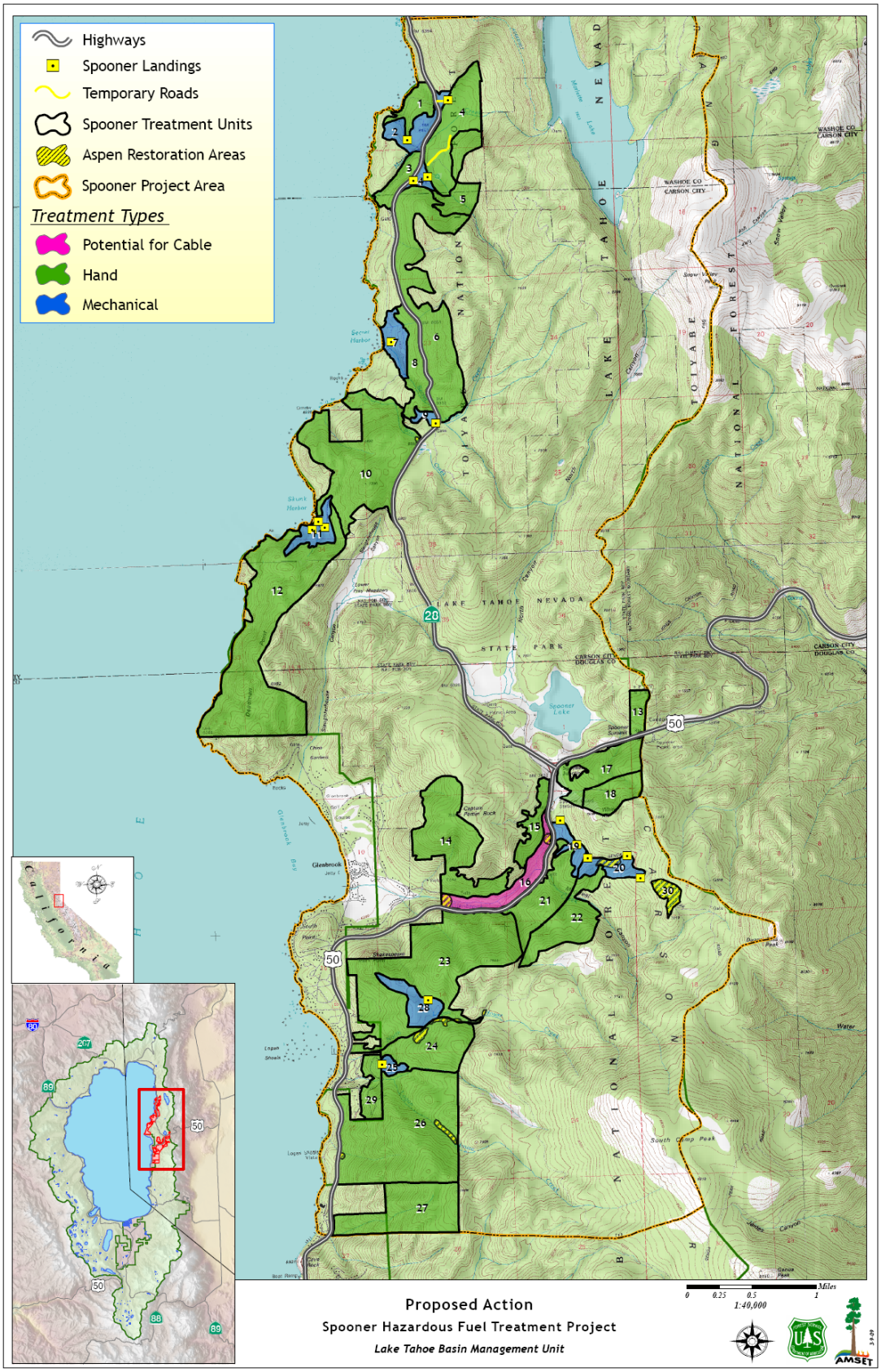

Figure 2. Proposed Action Map

Table 1. Vegetation characteristics in proposed treatment units, based on stand exams.

Treatment Unit Number	Acres	Basal Area (ft^2/acre)	Canopy Closure (%)	Mean Trees per Acre	Mean dbh	Mean Snags / Acre ≥20" DBH
1	42	109	43	315	8	0
2	46	145	47	236	11	0
3	36	173	62	565	8	0
4	165	389	75	469	12	10.7
5	75	132	40	240	10	12.0
6	280	182	58	523	8	2.7
7	43	218	54	250	13	0
8	70	63	30	160	8	0
9	10	131	43	180	12	0
10	335	169	58	468	8	2.4
11	41	186	58	235	12	10.0
12	168	148	49	290	10	1.0
13	27	234	63	253	13	6.7
14	208	376	76	242	17	2.0
15	48	108	36	124	13	0
16	75	327	67	184	18	0
17	105	178	54	351	10	2.9
18	62	139	41	191	12	2.9
19	27	223	70	320	11	0
20	40	270	67	214	15	0
21	112	200	62	466	9	2.9
22	116	119	46	300	9	1.8
23	444	166	53	306	10	0.8
24	126	200	58	391	10	5.5
25	13	197	60	393	10	0
26	442	215	46	189	14	9.0
27	180	206	62	478	9	2.2
28	51	133	42	146	13	0
29[3]	46	215	46	189	14	9.0
30[3]	32	270	67	214	15	0

[3] Interpolated data

Table 2. Fuels characteristics and expected fire type in proposed treatment units, based on stand exams.

Unit Number	Ave. Tons per Acre of Dead/Down Fuels	Surface Flame Length[4]	Crown Bulk Density[5]	Canopy Base Height[6]	Fire Type	Resistance to Control[7]	Percent Mortality Expected [8]
1	9	5	0.34	5	ACTIVE[9]	High	92%
2	45	6	0.11	1	PASSIVE[10]	High	67%
3	5	1	0.35	3	COND_CRN[11]	High	58%
4	78	7	0.16	3	PASSIVE	Extreme	25%
5	39	6	0.09	5	PASSIVE	Extreme	72%
6	20	4	0.24	5	ACTIVE	High	55%
7	108	9	0.13	1	PASSIVE	Extreme	45%
8	20	5	0.04	5	PASSIVE	High	100%
9	6	4	0.06	6	PASSIVE	High	41%
10	37	5	0.23	2	PASSIVE	High	59%
11	72	8	0.10	1	PASSIVE	Extreme	51%
12	27	4	0.15	5	PASSIVE	High	65%
13	39	5	0.12	3	PASSIVE	High	41%
14	10	2	0.16	5	SURFACE	High	2%
15	41	6	0.04	9	PASSIVE	Extreme	67%
16	1	4	0.09	1	PASSIVE	High	27%
17	21	3	0.19	3	PASSIVE	High	55%
18	27	5	0.14	1	PASSIVE	High	71%
19	60	6	0.10	8	PASSIVE	High	43%
20	30	5	0.12	5	PASSIVE	Extreme	36%
21	16	2	0.26	4	COND_CRN	High	50%
22	15	4	0.17	5	PASSIVE	High	82%
23	42	6	0.11	4	PASSIVE	Extreme	58%
24	17	3	0.11	2	PASSIVE	High	44%
25	30	4	0.16	4	PASSIVE	High	49%
26	52	7	0.12	1	PASSIVE	Extreme	45%
27	85	1	0.35	1	COND_CRN	Extreme	48%
28	40	6	0.12	6	PASSIVE	High	72%
29[12]	52	7	0.12	1	PASSIVE	High	45%

[4] Surface Flame Length is the distance between the flame tip and the midpoint of the flame depth at the base of the flame (generally the ground surface), an indicator of fire intensity.
[5] Crown Bulk Density is the total oven dry mass of crown fuel per unit volume of canopy, expressed in (kg/m^3)
[6] Canopy Base Height is the lowest height above the ground where there is sufficient canopy fuel to propagate fire (Van Wagner 1993)
[7] Resistance to control is an estimate of the difficulty in constructing an effective fireline based on characteristics including: ground and surface fuel loads, slope, expected flamelength, vegetation density, and understory density.
[8] Percent Mortality is based on percent basal area loss for trees in all size classes including seedlings, pole, and overstory sized trees (it is not the percent of tree count). It can be presumed that smallest trees would make up the greatest representation of tree mortality from fire. However, note that the largest trees are the greatest contributor to basal area.
[9] Active Crown Fire is a crown fire in which the entire fuel complex is involved in flame, but the crowning phase remains dependent on heat released from the surface fuel for continued spread (Scott and Reinhardt 2001)
[10] Passive Crown Fire is a type of crown fire in which the crowns of individual trees or small groups of trees burn, but solid flaming in the canopy cannot be maintained except for short periods (Scott and Reinhardt 2001)
[11] Conditional Crown Fire is a hypothetical type of fire in which the conditions required for sustained active crown fire are met but conditions required for crown fire initiation are not. If the fire begins as a surface fire, then it is expected to remain so because conditions required for crown fire initiation are not met. If a crown fire has already initiated (in an adjacent stand, for example), then it may be able to spread as an active crown fire
[12] Interpolated data

30[12]	30	5	0.12	5	PASSIVE	High	36%

DECISION FRAMEWORK

The decision to be made by the responsible official is whether to implement the proposed action, meet the purpose and need for action through another combination of activities, or take no action at this time.

PURPOSE AND NEED FOR ACTION

This project's main focus is to meet the desired condition of reducing wildfire risk and creating healthier forest conditions by proposing fuel reduction treatments in the WUI.

The needs for this project include:

- To treat areas in WUI defense and threat zones to reduce the potential for a catastrophic wildland fire in the area (by reducing wildland fire intensity, rate of spread, and crown fire potential).
- To move the project area toward a pre-fire suppression vegetative condition related to stand density, tree size class, and species composition to provide for healthy forest conditions. This is intended to decrease the risk for widespread mortality in dominant and co-dominant trees during drought conditions and insect outbreaks.
- To create conditions that enables the reintroduction of fire into these fire-adapted ecosystems.
- To provide for fire fighter and public safety while restoring the health and vigor of the forest.

In meeting these needs, the following purposes would be achieved. Measurement indicators are included to provide measurement(s) to determine effectiveness for meeting these purposes:

- In proposed treatment areas within the WUI Defense Zones: (1) have stands fairly open and dominated primarily by larger, fire tolerant trees (measurement indicator basal area, mean trees per acre, and mean dbh); (2) surface and ladder fuel conditions are such that crown fire ignition is highly unlikely (measurement indicator is modeled fire type); and, (3) have open and discontinuity of crown fuels both horizontally and vertically (measurement indicators are ladder fuel loadings, and overstory tree spacing), resulting in very low probability of a sustained crown fire (measurement indicator is modeled fire type) (SNFPA ROD 2004, p. 40).
- In the WUI threat zones, under 90th percentile fire weather conditions, wildland fire behavior in treated areas is characterized as follows: (1) flame lengths at the head of the fire are less than four feet (measurement indicator is modeled surface flame lengths); (2) hazards to firefighters are reduced by managing snag levels in locations likely to be used for control in prescribed fire and fire suppression, consistent with safe practice guidelines (measurement indicator is number of snags per acre); and, (3) production rates for fire line construction are doubled from pre-treatment levels (measurement indicator is fire resistance to control) (SNFPA ROD 2004, p. 41).
- In the two northern goshawk PACs within the WUI Defense Zone: remove only material needed to meet the fuels objectives, or at a minimum, move the area towards the objective for the WUI defense zones (e.g. treatments should be designed to maintain habitat structure and function of the PAC) (SNFPA ROD 2004, p. 60). Treatment would

only occur where crown fire is expected based on fire behavior models (measurement indicator is modeled fire type).

- Treatment in the northern goshawk PAC, within the WUI threat zone, would be allowed in areas where avoiding the PAC would significantly compromise the overall effectiveness of the landscape fire and fuels strategy. Treatments should be designed to maintain habitat structure and function of the PAC (measurement indicators are canopy layers, canopy cover, snags per acre, and tons per acre of large woody debris) (SNFPA ROD 2004, p. 60).
- In the RCAs: (1) Water quality meets the goals of the Clean Water Act and Safe Drinking Water Act; (2) Species composition and structural diversity of plant and animal communities in riparian areas provide desired habitat conditions and ecological functions (measurement indicators are changes in presence and abundance of invasive species and riparian vegetation ground and canopy cover) SNFPA ROD 2004, pp. 42-43); and, (3) management activities within RCAs enhance or maintain physical and biological characteristics associated with aquatic- and riparian-dependent species (measurement indicator are tons per acre of large woody debris, changes in riparian vegetation and canopy cover, and water temperature and turbidity) (Riparian Conservation Objective #4, SNFMA ROD 2004, p. 33).
- In the Roadless Areas: mechanical and/or hand treat (e.g. masticate and underburn or cut, pile and burn, and/or removal of) generally small diameter conifer trees and/or brush species to maintain or restore the characteristics of the ecosystem composition and structure and reduce the risk of catastrophic wildfire effects in the area (measurement indicator are size of trees removed, modeled fire type) (36 CFR 294.13(b)(1)(ii)).

Due to the treatment units existing conditions, these objectives would likely be met near the end of the implementation timeframe (i.e., 10 years).

PROPOSED ACTION

The LTBMU Forest Supervisor is proposing hazardous fuel treatment and healthy forest restoration in the Spooner project area in response to the purpose and need. As noted earlier, Figure 2 is a map of the Spooner project proposed action in which 30 treatment units, totaling approximately 3,500 acres, are located within the project area WUI. Approximately 3,020 acres are proposed for hand treatment, 317 acres are proposed for mechanical treatment, and 68 acres are proposed for cable yarding. Within eight of these units are aspen restoration areas (totaling approximately 60 acres). All treatment units would likely receive some form of pile burning and/or jackpot burning and all but six units would receive a broadcast underburn. A total of 16 landings are proposed within nine of the treatment units and a total of 0.43 miles of temporary road are proposed to increase access to two units. Table 3 provides a summary of the proposed action, by unit, of the main treatment systems, type of prescribed fire proposed, approximate miles of proposed temporary roads, and the number of landings. When laying out the project, there could be minor changes based on more detailed field review, operational feasibility, and cost efficiency.

Table 3. Summary of Proposed Treatment by Unit.

Unit #	Acre	Maximum No. of Entries Expected by Main Treatment System			No. of Entries Pile Burn/ Jackpot [13] Burn	No. of Entries Under-burn	Aspen Restor-ation acres [14]	Approx. Miles of Proposed Temp. Roads	Approx No. of Land-ings
		Hand	Mech-anical [15]	Cable					
1	42	2			2	1	0	0	0
2	46		2		2	1	0	0	1
3	36	4			4	1	0.1	0	0
4	165	3	1 [16]		3	1	0	0.4	3
5	75	2			3	2	0	0	0
6	280	4			4	2	0	0	0
7	43		1		2	1	0	0	1
8	70	1			1	2	0	0	0
9	10		1		1	1	0	0	1
10	335	4			4	1	0.75	0	0
11	41		1		2	1	0	.03	3
12	168	2			2	1	0	0	0
13	27	1			1	1	0	0	0
14	208	1			1	1	0	0	0
15	48	1	1 [17]		1	1	0	0	0
16	75			1	1	1	7.0	0	0
17	105	2			2	1	0	0	0
18	62	1			1	1	0	0	0
19	27		1		1	1	0	0	2
20	40		1		1	1	5.5	0	3
21	112	3			3	1	0	0	0
22	116	2			2	1	0	0	0
23	444	2			2	2	1.5	0	0
24	126	2			2	1	7.75	0	0
25	13		2		2	1	0	0	1
26	442	2			2	1	6.0	0	0
27	180	4			4	1	0	0	0
28	51		1		1	1	0	0	1
29	46	2			2	2	0	0	0
30	32	1			1	1	32	0	0
TOT	**3,466**	**3,020 ac**	**317 ac.**	**68 ac.**	**All units**	**All units**	**60.6 ac**	**0.43**	**16**

[13] Jackpot burning involves igniting concentrations of fuels on the forest floor, whether they are natural fuels or fuels resulting from a silvicultural cutting treatment (also referred to as activity fuels).
[14] All aspen restoration acres would be completed through hand treatments.
[15] Mechanical treatments might include any combination of the following: removal for commercial purposes, chipping, mastication, or piled for burning.
[16] Unit 4 would include approximately 32 acres of mechanical treatment. The remaining acres would be hand treated.
[17] Unit 15 includes a plantation approximately 20 acres with slopes less than 30%. This area would be mechanically treated by mastication.

Treatment Prescriptions

To address the purpose and need, the Lake Tahoe Basin Management Unit developed six treatment prescriptions for the units within the project area WUI.

1. Within all treatment units, if applicable:
   - All trees 30 inches dbh and larger would be retained. Exceptions would be allowed for equipment operability.
   - All healthy sugar pine trees showing no indication of white pine blister rust disease (*Cronartium ribicola*) would be retained and protected during treatment operations, as feasible.
   - Where feasible, live conifers less than 30 inches dbh that are heavily infected with dwarf mistletoe (*Arceuthobium* sp.), where the infection is of a Hawksworth rating 4 or greater, would be removed.
   - Healthy shade intolerant conifer species would be favorably retained over shade tolerant species in mixed conifer stands. Shade intolerant species include, Jeffrey pine, sugar pine.
   - At least 10 percent of the existing shrub cover would be retained following hand or mechanical thinning.
   - Hand pruning of branches on remaining trees, up to 8 feet, would be performed, as necessary, to remove ladder fuels.
   - Stumps from live conifer trees, with the exception of incense-cedar, greater than 14 inches in diameter, only within mechanical treatment areas, would be treated with an EPA registered borax compound, such as Sporax®, for the prevention of the spread of annosus root disease (*Fomes annosus*). Sporax® would be applied by hand in an approved granular form to cut stumps within the effective timeframe.
   - Treated material would be removed either as saw logs (whole tree or cut-to-length), biomass, fuelwood, or material that would be burned off site. Treated material not removed would be treated on site through prescribed burning (i.e., pile or broadcast burning), chipping, mastication, or lop and scatter.
   - Piled material for burning and jackpot burning would be located and designed to minimize tree scorch and mortality with the trees retained after treatment.

2. Treatment units within the WUI Defense Zone:
   - Thinning would occur to remove ladder fuels and break up tree crown continuity:
     - Existing basal area of approximately 108 to 389 square feet per acre would be reduced by thinning from below would occur; removing predominantly small (suppressed crown class) understory and intermediate crown class trees in hand treated units. Where mechanical treatments can occur, some intermediate and co-dominant trees would be removed to create crown separation and provide growing space for healthy residual overstory (dominant) trees. Stand basal area would generally be reduced by 10 to 30 percent depending on existing tree size distribution and treatment method (hand versus mechanical). Because stand densities and tree size distribution varies widely between treatment units, residual target basal area varies as well. Existing and projected post-thin stand conditions are displayed in table 4 by treatment unit..

- In hand treated stands, trees would be thinned up to an average of 30 to 40 foot spacing (25 to 45 trees per acre) from tree bole on live trees up to 14 inch dbh.

- Average tons per acre of dead and down fuels of approximately 20 to 108 tons per acre would be reduced to generally near or below 10 tons per acre.
- Within 300 feet of developed areas (homes and other infrastructure), up to 90 percent of the area would have the brush treated and what remaining brush is retained would meet defensible space criteria.
- Snags would be removed in areas which are most likely to be used for control of prescribed fire and fire suppression.

3. Treatment units within the WUI Threat Zone:
   - Thinning would occur to remove ladder fuels and break up tree crown continuity:
     - Existing basal area of approximately 119 to 376 square feet per acre would be reduced by thinning from below; removing predominantly small understory trees. Where mechanical treatments can occur, some midstory and overstory trees would be removed to create crown separation and provide growing space for healthy residual overstory trees. Stand basal area would generally be reduced by 15 to 30 percent depending on existing tree size distribution and treatment method (hand versus mechanical). Because stand densities and tree size distribution varies widely between treatment units, residual target basal area varies as well. Existing and projected post-thin stand conditions are displayed in table 4 by treatment unit.
     - In hand treated stands, trees would be thinned up to an average of 25 foot spacing (70 trees per acre) from tree bole on live trees up to 16 inch dbh.
   - Average tons per acre of dead and down fuels of approximately 20 to 85 tons per acre would be reduced to generally near or below 10 tons per acre.
   - Snags would be removed in areas which are most likely to be used for control of prescribed fire and fire suppression.

4. Treatment units within the Northern goshawk PACs (and where crown fire is expected based on fire behavior models):
   - Understory trees 12-inch dbh and less would be hand thinned where they serve as ladder fuels to overstory trees.
   - Overstory trees would be retained as well as smaller mid- and understory trees that can be isolated from serving as ladder fuels. Where possible residual canopy cover would average at least 60 percent.
   - Hand thinning would be confined to trees 6-inch dbh or less within 500 feet of known goshawk nest locations.
   - A limited operating period would apply from February 15th to September 15th unless current year surveys indicate that no nesting is occurring.
   - An average of 5 large snags per acre (20-inch dbh or larger) would be retained where they exist.
   - Large down wood (20 inches diameter at the large end) would be retained at 15 tons per acre where it exists.

- Prescribed burning, including hand pile burning and broadcast underburning would be allowed within the PAC, including within 500 feet of known goshawk nest locations.

5. Where stands within the treatment units meet the treatment prescriptions noted above, additional treatment would reintroduce fire through underburn prescribed fire, bringing the stand back toward the fire return interval described under historic conditions.

6. Treatment units for aspen (*Populus* sp.) enhancement:
   - Treatment would include primarily hand thinning, removing live conifers up to 18 inches dbh and dead and down trees up to 20 inches dbh.
   - Live conifers larger than 18 inches dbh may be felled, but may not be removed due to practical constraints of moving trees with hand crews; branch wood from trees larger than 18 inches dbh may be removed to reduce potential fuel hazards.
   - To promote aspen regeneration, tree removal would not be constrained by an upper diameter limit. In most cases, trees marked for removal would be smaller than 20 inches dbh. The retention of large, late seral trees that existed prior to Comstock-era logging and/or wildland fire suppression in the Lake Tahoe Basin will be evaluated as follows:
     - Tree species exhibiting resistance to White Pine Blister would be retained.
     - Trees exhibiting old tree characteristics would be retained. Old tree characteristics are defined as follows: 1) mature to over-mature age class; 2) the tree crown is round to flat in shape; 3) tree bark plates are very wide or long; and 4) branches are drooping, gnarled, and crooked. These characteristics are equivalent to Dunnings tree classes 4, 5, and 7.
     - Trees not exhibiting old tree characteristics may be removed unless a silviculturist or similarly qualified staff identifies that:
       i. The species of tree to be removed is under-represented within the surrounding stand (e.g. the tree to be removed is one of very few or the only representative of a desired species, such as sugar pine, in the area of the treatment stand).
       ii. Old trees are absent or under-represented and would have occurred in the stand naturally, necessitating retention of the tree(s) in question to develop an old tree cohort.
     - Individual trees may be cored to determine tree-age when necessary to help determine old tree characteristics, although utilization of this more costly and labor-intensive approach is expected to occur as an exception rather than the rule.
     - Site-specific treatment prescriptions would be developed for each aspen stand prior to implementation.
   - Thinning treatments may extend beyond the perimeter of an aspen stand up to (1) one and one half (1.5) times the height of aspen trees in the stand (the maximum extent of lateral aspen roots), (2) the distance required to prevent remaining, adjacent conifers from shading the aspen stand and suppressing aspen regeneration, or (3) up to 100 feet (to conduct thinning operations), whichever is greater. The additional spatial extent of vegetation treatments would allow more sunlight to reach the forest floor, stimulate aspen regeneration, promote expansion of aspen stands, and provide space to operate and process materials (e.g. trees and slash) outside of the stream environment zone (SEZ).

- Thinned materials would be removed (i.e., for commercial processing or other uses) or processed (e.g. chipped, masticated, lop-and-scattered, or piled for burning) on or adjacent to aspen stands.
- All material to be processed would be removed from the aspen stand.
- The treated aspen stands would be treated with a prescribed underburn 2 to 5 years following the thinning treatment as long as the following conditions occur: prescribed fire would be permitted to back into aspen stands as a surface fire only and fire intensity would be light to moderate and residence time would be limited
- Where possible, the vegetation treatments proposed within aspen stands would result in:
  - Average conifer crown closure less than 25 percent of the canopy for the next 20 years.
  - An upper canopy that is dominated by aspen for the next 20 years.
  - Aspen regeneration that is vigorous (greater than 500 stems per acre) within 3 years after last treatment.
  - Aspen stand expansion that is initiated within 3 years after last treatment.

Table 4. Existing and projected post-thin stand conditions (FVS modeling) by treatment unit.

Unit #	Hand / Mech	threat / defense / aspen	Forest Type[18]	Pre Thin Basal Area (ft^2/acre)	Post Thin Basal Area (ft^2/acre)	% Basal Area Removed (ft^2/acre)	Post Thin Average Canopy Cover (%)	Pre Thin Average Stand Diameter (in inches) (QMD)	Post Thin Average Stand Diameter (in inches) (QMD)	Post Thin Average Crown Base Height (in feet)	Post Thin Average Crown Bulk Density
1	H	D	JPN	115	88	23	28	8	13	7	0.065
2	M	D	JPN	148	98	34	31	11	16	9	0.064
3	H	D	JPN	177	125	30	39	8	16	9	0.091
4	H/M	D/T	JPN	359	321	11[19]	60	12	26	8	0.079
5	H	T	JPN,SMC	135	129	4[19]	36	10	16	6	0.073
6	H	D	JPN,SMC	185	147	21	41	8	19	9	0.074
7	M	D	JPN	220	186	15	42	13	21	9	0.068
8	H	D	JPN,SMC	65	61	5[19]	26	9	11	6	0.028
9	M	D	SMC	133	128	4[19]	42	12	13	6	0.056
10	H	D/T	SMC/JPN	173	122	29	36	8	15	7	0.098
11	M	T	JPN	188	124	34	35	12	25	10	0.029
12	H	T/D	JPN,SMC	151	135	10[1]	41	10	15	7	0.088
13	H	D	JPN,SMC	235	217	8[19]	55	13	20	16	0.102
14	H	D/T	JPN,SMC	375	349	7[19]	72	17	23	7	0.119
15	H/M	D	SMC	110	109	1[19]	35	13	16	10	0.041
16	H	D	SMC,JPN	327	322	2[19]	64	18	29	3[20]	0.053

[18] Forest Types: JPN = Jeffrey Pine, SMC = Sierran Mixed Conifer

[19] Majority of stand basal area is in larger overstory trees, small tree thinning removes ladder fuels but does not greatly reduce average basal area.

Unit #	Hand / Mech	threat / defense / aspen	Forest Type[18]	Pre Thin Basal Area (ft^2/acre)	Post Thin Basal Area (ft^2/acre)	% Basal Area Removed (ft^2/acre)	Post Thin Average Canopy Cover (%)	Pre Thin Average Stand Diameter (in inches) (QMD)	Post Thin Average Stand Diameter (in inches) (QMD)	Post Thin Average Crown Base Height (in feet)	Post Thin Average Crown Bulk Density
17	H	D	SMC,JPN	181	151	17	42	10	17	8	0.099
18	H	T	SMC	141	120	15	32	12	16	2[20]	0.095
19	M	D	JPN	225	148	34	42	11	20	12	0.063
20	M	T	JPN	268	177	34	51	15	19	26	0.059
21	H	D	JPN,SMC	203	150	26	40	9	17	8	0.078
22	H	T	SMC	122	109	10	37	9	14	7	0.089
23	H	D/T	SMC/JPN	169	138	19	41	10	18	12	0.055
24	H	D/T	JPN,SMC	203	137	32	39	10	18	11	0.059
25	M	D	JPN	200	132	34	39	10	19	16	0.047
26	H	D/T	SMC/JPN	217	200	8[19]	38	15	24	1[20]	0.063
27	H	D/T	SMC/JPN	209	169	19	43	9	21	2[20]	0.058
28	M	D/T	SMC/JPN	135	129	5[19]	38	13	16	12	0.064
29	H	D	SMC/JPN	217	200	8[19]	38	15	24	1[20]	0.063
30	H	T aspen	JPN	268	121	55	38	15	21	40	0.037

[20] Open-grown overstory trees with low crowns contribute to average crown base height; pruning treatment not reflected in this average crown base height. Pruning will raise average to 8 feet or greater.

Treatment Systems

The type of mechanical equipment used for thinning operations on slopes less than 30 percent would depend on vegetation removal needs, operational feasibility, and cost efficiency. They could include whole tree yarding using mechanical harvesters and whole tree skidding, and cut-to-length harvest with log-forwarding operations. For non-commercial sized trees and brush, masticators and/or chippers could be used, or the material could be removed as biomass or be piled and burned. For those hand treatment units with roads adjacent to or within the units, mechanical equipment could be used so long as the equipment remains on the road(s), landings, and/or turnouts. A portion of Unit 15 has slopes less than 30 percent where a plantation is located. A masticator would be used in this plantation to thin the stand. In addition, Unit 4 has two treatment systems, with approximately 20 acres mechanically treated and the remaining hand treated. Table 3 acknowledges the two treatment systems would be used in these two units.

Treatment systems on the steeper slopes (greater than 30 percent and sensitive areas (e.g. stream environment zones) would also depend on vegetation removal needs, operational feasibility, and cost efficiency. The majority of these areas are proposed for hand treatment with chainsaws. Unit 16 may be partially treated through cable yarding (partial or full suspension of logs), using equipment such as a Yoader yarder. If monitoring results are favorable using this system, adaptive management would be applied and other units could receive this method of treatment given access feasibility and meeting prescribed project design features. In addition, some of the proposed mechanized treatment units have isolated portions on slopes greater than 30 percent. In those areas, hand treatment would be required if equipment is unable to reach or endline from outside. Material could be removed from site and/or piled and burned.

Road Maintenance and Temporary Improvements

Road maintenance would include grading and shaping classified forest roads[21] to provide a suitable surface for equipment to travel (e.g. removing ruts, shoulder and slough repairs).

The native surface roads would be maintained during the implementation of the project by abating dust using water.

Due to gullying from overland flow from a cut-slope along Road 1451 (also known as Old Highway 50), a new culvert is proposed just above the Glenbrook Creek crossing approximately half a mile southwest of the intersection of Road 1451 and Interstate Highway 50. In addition, two existing culverts would be replaced (i.e., along Genoa Peak Road (Road 14N32) between Units 19 and 20 and along the south fork of Marlette Creek in the southern portion of Unit 4 along Road 1509A).

The 2001 Forest Service Roadless Rule is the current management direction for roadless areas. Lincoln Creek Roadless Area has two roadless classifications within the project area: Category 1b which does not allow road construction or reconstruction and Category 1c which does allow road construction and reconstruction. For the project, existing classified forest roads would be maintained within the Lincoln Creek Roadless Area to facilitate access. No new temporary roads, road reconstruction, or road construction are proposed in the roadless area.

[21] Classified roads and trails are under Forest Service jurisdiction and are required to protect, administer, and use the National Forest for administrative and public access. All other roads and trails are unclassified. They have features that appear to be that of a classified road or trail. These are generally characterized as non-system and user created. Further they have no other jurisdiction such as an easement tied to them.

Existing landings would be used where available. Where existing landings are not available, new landings would be constructed. New landings would average one acre or less in size and would be no larger than two acres in order to safely facilitate the handling and removal of material (e.g. logs, biomass) in compliance with Occupational Safety & Health Administration (OSHA) requirements. Constructed landings may require removal of trees larger than 30 inches dbh, but removal would be minimized with choice location of landings.

The project is proposing a total of approximately 0.43 mile of temporary (or unclassified) roads. The temporary road into Unit 11 (0.03 mile) would be used to access a landing. The temporary roads into Unit 4 (0.4 mile) would be used to chip material along side the road and allow equipment to complete minimal treatment along the roads. Two of these temporary roads (approximately 0.3 mile in Unit 4; 0.03 mile in Unit 11) are remnants of past roads in the project area. A portion of a temporary road (also in Unit 4 and approximately 0.1 mile) would be new construction.

Public and contractor safety would be provided adjacent to roads and trails by: posting signs, maintaining truck traffic communications, keeping primary roads open, and issuing temporary Forest Closure Orders where contractor operations (thinning, chipping, mastication, and log hauling) pose a safety hazard to the public and the contractor. Forest Closures include closing public use of specific areas where project work is occurring.

Project Duration

The anticipated timeframe to complete the project is ten years, depending on funding and staffing availability. Project implementation may begin with mechanical and hand thinning as early as the Fall of 2009 based on completion of NEPA analysis and decision. Once initial thinning treatments are complete prescribed pile and understory broadcast burning would occur.

Due to the terrain (majority of the treatment areas have no vehicle access and are located in steep areas greater than 30 percent slope), density of live vegetation, and amount of dead and down material, the majority of the hand treatment areas would require more than one entry to bring the areas into the desired conditions, noted earlier. This means that in hand treated units, where no road access is available for fuels removal and existing surface fuel loading in combination with live fuel ladders would not allow prescribed pile burning to occur safely and effectively, more than one entry is needed. This could include a combination of hand piling of surface fuels followed by pile or jackpot burning, and then thinning and piling of understory trees followed by additional pile burning. Table 3 shows the number of entries by treatment type expected by unit during the implementation term of this project.

Design Features (Mitigation Measures)

The following design features (mitigation measures) are included as part of this project to minimize adverse environment impacts and ensure Forest Plan consistency:

Invasive Plant Species

1. All off-road equipment used on this project would be washed before moving into the project area to ensure that the equipment is free of soil, seeds, vegetative material, or other debris that could contain or hold seeds of noxious weeds. “Off-road equipment” includes all logging and construction equipment and such brushing equipment as brush hogs, masticators, and chippers; it does not include log trucks, chip vans,

2. When working in known weed infested areas equipment would be cleaned before moving to other NFS lands which do not contain noxious weeds.

3. The two design features above will be addressed in contract language and provisions.

4. All earth-moving equipment, gravel, fill, or other materials are required to be weed-free. Use onsite sand, gravel, rock, or organic matter when possible. Otherwise, obtain weed-free materials from gravel pits and fill sources that have been surveyed and approved by Nevada Department of Agriculture or by a LTBMU botanist, noxious weed coordinator, or ecologist.

5. When use of landings and staging areas is completed, if needed, native vegetation will be reestablished through planting native seeds to minimize weed establishment and infestation.

6. Use weed-free mulches, and seed sources. All activities that require seeding or planting must utilize locally collected native seed sources when possible. Plant and seed material should be collected from or near the project area, from within the same watershed, and at a similar elevation when possible. Persistent non-natives such as *Phleum pratense* (cultivated timothy), *Dactylis glomerata* (orchard grass), *Lolium* spp. (ryegrass) or *Eltrygia* sp. (quackgrass) will not be used. Seed mixes must be approved by a LTBMU botanist, noxious weed coordinator, or ecologist.

7. Staging areas for equipment, materials, or crews will be prohibited in areas with weed infestations.

8. Fuel piling and pile burning will be prohibited in areas with weed infestations.

9. Weed infestation areas identified before or during project implementation, within the project area or along travel routes near the project area, would be hand treated or "flagged and avoided" in consultation with LTBMU botanist. LTBMU botanical staff would be notified prior to project implementation in these areas to assure flagging is in place.

10. All cheat grass (*Bromus tectorum*) locations will be flagged and avoided up to a 100-foot buffer. This means that no persons or equipment will be allowed and treatment will not occur within the flagged area.

11. All known bull thistle (*Cirsium vulgare*) populations within treatment areas would be manually pulled prior to project implementation before individuals flower, or flagged and avoided by mechanical treatment with a 50-foot buffer. If avoidance within the buffer is not possible, pretreatment of weeds will be required.

12. Russian knapweed (*Acroptilon repens*) and globe-prodded hoary cress (*Cardaria pubescens*) populations will be flagged and avoided up to a 100-foot buffer. If

Forest Service Sensitive Plant Species

13. Flag and avoid *Botrychium ascendens* populations with up to a 100-foot buffer. Where feasible trees will be felled out and away from the buffer zone. LTBMU botanical staff will be notified prior to project implementation in these areas to assure flagging is in place.

14. Flag and avoid current and historically occupied *Rorippa subumbellata* populations, with up to a 100-foot buffer. LTBMU botanical staff will be notified prior to project implementation in these areas to assure flagging is in place.

15. To limit possible effects of fuels reductions treatments on known special interest mosses (i.e., *Orthotrichum* sp. mosses) present in the project area, granitic rock outcrops 5 feet and taller within LTBMU botanist designated areas will be avoided during treatments. These include, but are not limited to, the use of outcrops for piling and burning brush on or next to outcrops, and storage of materials used for implementation or erosion control on rock outcrops.

16. To prevent scorching and/or overheating of known special interest mosses present on the rocks, pile burning activities would not occur within 30 feet from rock outcrops. During prescribed fire under-burn operations, shrubs next to the rock outcrops may be removed. LTBMU botanical staff will be notified prior to project implementation in these areas to assure flagging is in place.

17. Extend protection to any newly discovered populations of sensitive or special interest plants (after completion of the Biological Evaluation or Environmental Assessment) found before or during project implementation.

Special Status Wildlife & Fisheries

18. During project implementation, any detections of threatened, endangered, sensitive or special interest animal species, or nests or dens of these species, shall be reported to the Forest wildlife biologist. Known nests or dens will be protected in accordance with the Forest Plan and Tahoe Regional Planning Agency (TRPA) Environmental Threshold Carrying Capacities (ETCCs) for the Lake Tahoe Region. Contract provision, Protection of Habitat of Endangered Species, will be included in the contract.

19. Habitat for osprey (*Pandion haliaetus*) and northern goshawk (*Accipiter gentiles*) will be protected through avoidance of known occupied nesting areas, by limiting operating periods (LOPs) during sensitive nesting times in protected activity centers (PACs), and through limited treatments. A LOP constitutes a period during which activities will not occur and is enforced in implementation contracts and/or project implementation management (for non-contract work). A Fuel Hazard Reduction Project PAC generally constitutes a buffer centered on the territory or nest of a particular species that has been identified as present in a given area; PAC size varies

20. The LOP for osprey is March 1 through August 15 - no tree thinning, prescribed fire, restoration projects, or temporary road construction will occur during this period within 0.5 mile of active nest sites (TRPA regulations, Chapter 78, Code of Ordinances).

21. A northern goshawk PAC is defined as an area generally 200 acres in size that includes the best available forested habitat around known or suspected nest sites (or, if the nest cannot be located, the location of territorial adults or recently fledged juveniles during the fledgling dependency period) in the largest contiguous blocks possible. Adherence to a LOP and prohibition of the project activities within approximately 0.25 miles of a known nest site during the breeding season (February 15 through September 15) unless surveys confirm that northern goshawks are not nesting. If the nest stand within a protected activity center (PAC) is unknown, either apply the LOP to a 0.25 mile area surrounding the PAC, or survey to determine the nest stand location (SNFPA ROD 2004, p. 60, #76).

22. Breeding season LOP restrictions may be waived, where necessary, to allow for use of early season prescribed fire in up to 5 percent of northern goshawk PACs per year on a forest. (SNFPA ROD 2004, p. 61, #79).

23. For northern goshawk, mechanical treatments in PACs located within the wildland urban interface threat zone, and in some cases, defense zone will be prohibited within a 500-foot radius buffer around nest trees. Prescribed burning will be allowed within the 500-foot buffer. Prior to burning, hand treatments, including handline construction, shrub thinning, tree pruning, and cutting of small trees (less than 6 inches dbh) will be conducted within the 500-foot buffer . The remaining area of the PAC may be mechanically treated to achieve the fuels reduction. (SNFPA ROD 2004, p. 60, #73).

24. A 100-foot buffer shall be maintained on either side of Marlette Creek to protect the habitat of Lahontan cutthroat trout. Hand and prescribed fire treatments may be allowed. The buffer has the same restrictions as the stream environment zones noted in the Hydrology/Water Quality/Soils design features noted below.

25. LOPs or protection zones for American marten (*Martes Americana*) will be implemented if den sites for these species are detected in the treatment areas prior to or during project implementation.

26. Where available, a minimum of two pieces per acre of decay class 1 down woody material, a minimum 20 feet in length, and 20 inches in diameter at the small end will be maintained following all proposed activities, including prescribed fire. Additional class 2 and class 3 materials should be maintained across the treatment areas as well. In order to maintain at least several pieces of class 2 or 3 material, no piling or direct lighting of any existing down woody material in excess of 10 inches diameter will occur unless more than five pieces, greater than 20 feet in length, per acre exist.

27. A minimum of three of the largest snags per acre will be maintained across all activity areas with the exception of goshawk PACs. A minimum of 5 snags per acre will be maintained in goshawk PACs where they occur. Only snags larger than 15 inches dbh or larger will be counted towards meeting this requirement. In addition, these snags should be clumped and distributed irregularly across the treatment units vs. maintaining individual snags scattered throughout each acre.

28. Leave at least two slash piles per acre for wildlife cover in areas lacking other suitable wildlife cover, except where fire hazard or visual management standards will be exceeded (Forest Plan, p. IV-44, #5, p. IV-26).

29. Implementation of the measures described under Hydrology/Water Quality/Soils (below) will protect fish, waterfowl, and aquatic wildlife habitat. These measures are designed to reduce disturbance and sediment deposition in riparian zones while protecting riparian resources including wildlife habitat.

Hydrology/Water Quality/Soils

Watershed resources and water quality will be maintained and protected during Project activities through the employment of best management practices (BMPs) described in the *Water Quality Management for Forest System Lands in California: Best Management Practices* (USFS 2000). Proposed activities shall adhere to riparian conservation objectives (RCOs) for management of Riparian Conservation Areas (RCAs) and Stream Environment Zones (SEZs).

The RCA designation is used for regional planning. RCAs are a Sierra Nevada Forest Plan Amendment (SNFPA) defined buffer for streams, special aquatic features and other hydrological depressions (USDA FS 2004). The buffer width is dependent on the stream or feature type (perennial, intermittent, ephemeral) rather than soils or vegetation present in the area. Activities within RCAs must be consistent with RCOs as described in the SNFPA 2004 ROD. RCAs include 300 feet on each side of perennial streams and 150 feet on each side of intermittent streams, measured from the bank-full edge of the stream.

The SEZ designation is used by the LTBMU and TRPA to define biological communities that owe their characteristics to the presence of surface water or a seasonally high groundwater table. The criteria for defining SEZs include indicators of vegetation, hydrology, and/or soil type (WQCP 1995). SEZs provide a minimum buffer for protection. Treatment activities may be limited within SEZs.

For project planning purposes, SEZs were based on riparian vegetation as mapped by the US Forest Service using infrared, low-altitude aerial photographs taken in 1987 and as mapped by Forest Service botanists during field surveys. Soil types were not used, as the scale of National Resource Conservation Service (NRCS) mapping was not sufficiently detailed to indicate SEZ soil types within the project area.

Treatment activities will take place primarily within the normal operating period, between May 15 and October 15. However, operable conditions may take place outside of that time period and inoperable conditions may occur during that time period. Some activities may be conducted outside the normal operating period, including pile burning and over-snow mechanical treatments. Design features are included that apply to treatment activities within and outside of the normal operating period.

Vegetation treatments in uplands (during normal operating period)

30. Ground based equipment operations will occur only when soil moisture conditions are such that compaction, gullying, and/or rutting will be minimal, or when snow conditions are at depths and temperatures, as determined by a LTBMU Watershed Specialist, are suitable for over-snow operations (BMP #1-13).

31. Evaluate soil moisture conditions at the 4 to 8 inch depth; dry to moist soils at this depth, as determined by a LTBMU Watershed Specialist, will indicate operable moisture conditions. Use the table in the SEZ Sensitivity Rating (see Appendix 1) to determine operable soil moisture conditions.

32. Mechanical treatments may be used on slopes less than 30 percent, except for those soils that are poorly suited for mechanical treatment or have other sensitive resource issues.

33. Hand treatments, end-lining, equipment reach, or cable treatments shall be used on slopes greater than 30 percent (BMP #5-2).

34. Where small areas of slopes greater than 30 percent are present in a unit, hand-fall trees and end-line the logs to a part of the unit where they could be picked up by heavy equipment.

35. No more than 15 percent of the total treatment area shall be left with detrimental soil disturbance by skid trails and landings. If more than 15 percent of the soil in a given treatment area is detrimentally disturbed by skid trails and landings, as estimated by a LTBMU Watershed Specialist, the contractor shall be responsible for rehabilitating portions of the area to stay below 15 percent detrimental disturbance (BMP #1-15).

36. Water bars shall be installed on skid trails to provide proper drainage and prevent erosion (BMP #1-17). Design and spacing of water bars would be in accordance with the Forest Service Timber Sale Administration Handbook (USDA Forest Service 1992).

37. To the extent feasible, where end-lining occurs on slopes greater than 10 percent, end-line material along slope contours (i.e. cross-slope) to avoid creating ruts oriented down-slope. Where implementation monitoring finds potential for sediment delivery to streams, rake in the berms from ruts created by end-lining.

Vegetation treatments in RCAs and SEZs (during all operating periods)

38. Limit work in SEZs to times when soils are dry or when operable winter conditions are present.

39. Limit mechanical equipment operations in SEZs to innovative technology equipment that has been demonstrated to adequately protect soil and water resources, such as; cut-to-length harvester and forwarder (CTL) operations; low ground pressure

a) Spooner SEZ stands that exhibit equal or less sensitivity than the Heavenly Valley Creek SEZ Demonstration Project (HSEZ) site based on the Sensitivity Rating System (see Appendix 1) may be treated with mechanical equipment under operable soil moisture conditions.
b) SEZ stands that rate more sensitive than the HSEZ project site shall be treated by hand crews, end-lining, or mechanical over-snow operations.
c) When stands are rated more sensitive than the HSEZ site, but only a portion of the stand is responsible for the high sensitivity rating, the less sensitive part may be treated with mechanical equipment, but the sensitive portions of these stands must be treated by hand crews, end-lining, or mechanical over-snow operations. Areas with wet soils or other sensitive features shall be flagged for hand treatment prior to commencement of mechanical operations.

40. Flag and avoid equipment use in and adjacent to special aquatic features (springs, seeps, and marshes). Use hand treatments in these areas (BMP #1-22). See botany prescriptions for specific buffers.

41. Leave existing downed trees and large woody debris (LWD) that are in perennial or intermittent stream channels in place unless channel stability needs dictate otherwise, as determined by a LTBMU Watershed Specialist (LRMP Std/Gd 15).

42. Slash piles shall be placed and burned at least 50 feet outside perennial or intermittent stream channel or standing water and 10 feet outside ephemeral drainages (BMP #1-22, 2-13, and 5-5).

43. Design underburning prescriptions to avoid adverse effects on soil and water resources. Plan prescribed fire to ensure that fire intensity and duration do not result in detrimentally burned soils. Flame heights shall not exceed two feet within 50 feet of stream courses or on wetlands unless higher intensities are required to achieve specific objectives. Whenever feasible, plan prescribed fire (underburning and slash piles) when soils are wetter (at least moist) and fuels are dry to decrease damage to soils.

44. Prescribed underburns shall not be started in SEZs. Fire may be allowed to back into SEZs. Firelines shall not be constructed within SEZs.

45. Ground based equipment in whole tree treatment stands shall not operate in SEZs or stream channel buffers. Mechanical equipment may reach into SEZs to remove logs.

46. Treat SEZs within whole tree stands with hand crews leaving the resulting logs in place unless fuel loading exceeds 15 tons per acre. Slash in excess of 15 tons per acre shall be removed by hand from the 50 foot buffer from stream channels and lakes, piled and burned.

47. Where feasible, logs shall be fully suspended within SEZs. To achieve desired fuel loading in SEZs within whole tree units, logs may be end-lined out of the SEZ after consultation with a LTBMU Watershed Specialist. Where end-lining occurs:

    a) Provide ground cover adequate to prevent erosion in disturbed areas, such as slash, wood chips, or masticated material.
    b) Where implementation monitoring indicates potential for sediment delivery to a stream, rake in the berms from ruts created by end-lining.

48. Ground based equipment will not operate within:

    a) 25 feet of the transition to upland soils and vegetation from the edge of Lake Tahoe.
    b) 25 feet of the high water line of other lakes or ponds, but may reach in to remove material.
    c) A minimum of 25 feet of perennial or intermittent stream channels except at temporary or permanent stream crossings (BMP #1-19), but may reach in to remove material.

49. Additional SEZ buffer widths may be determined by a LTBMU Watershed Specialist, based on proximity to Lake Tahoe (less than 0.5 mile), slope steepness (greater than 30 percent), and amount of existing ground cover (less than 30 percent).

50. Avoid tree removal methods that disturb the ground surface within 25 feet of perennial or intermittent streams or other water bodies (e.g. other lakes, ponds).

51. To avoid removing or altering bank stabilizing vegetation, live or dead trees within 5 feet of the bank edge of perennial or intermittent streams and lakes or ponds may be marked for removal, as approved by the LTBMU Fisheries Biologist and/or Watershed Specialist. This is only allowed where fuel loads or stand densities exceed prescription and where LWD is at or above desired levels or where trees are a hazard to safe operations.

52. Trees shall be felled away from perennial and intermittent stream channels unless the channel reach is identified as deficient in LWD, in which case a LTBMU Fisheries Biologist and/or Watershed Specialist shall select trees greater than 12 inches DBH to be felled directionally into the channel.

53. Treatment debris shall be removed from the stream channel unless the LTBMU Fisheries Biologist and/or Watershed Specialist consider it beneficial to the stream.

54. Where it is necessary to cross an area with inoperable soil moisture conditions, equipment shall operate over a slash mat, landing mat, or other protective material to minimize soil compaction.

Hand piling and pile burning in SEZs

55. Maintain a 50-foot buffer (no piling or burning) along perennial or intermittent streams, lakes, and ponds.

56. Maintain a 10-foot buffer (no piling or burning) from the edge of ephemeral drainages.

57. Allow fire to creep between piles and into these buffers, maintaining flame lengths of less than 2 feet in height except where sensitive plant occurrences and the noxious weeds whitetop, cheatgrass, bull thistle, and Russian knapweed are present.

58. Where feasible, place piles in a non-linear pattern within each unit, maximizing the distance between piles and maintaining approximately 20 foot average spacing between piles in each unit.

59. To minimize damage to soils, maximum pile size shall not exceed 6 feet in diameter and 6 feet in height. Where feasible, burning will occur on moist soil, very moist soil or wet soil and when fuels are dry.

60. No more than 30 percent of any SEZ acre may be occupied by piles.

61. No more than 15 percent of any SEZ acre may be burned each year.

62. After initial ignition of piles, but while still burning, allow each pile to be re-piled once (i.e., place large unburned pieces back into the burning pile). Additional re-piling will be allowed if necessary to achieve 80 percent consumption of the piled material.

63. Hot piling of burn piles is prohibited within SEZs (i.e., don't feed one pile with the material from other piles or ground material), unless necessary to meet desired fuel load conditions.

64. When piles are adjacent to aspen trees, re-piling during pile burning shall be restricted to one time per pile and hot piling (i.e,. feeding one pile with the material from another pile or with ground material) is prohibited without exception.

Roads (during normal operating period)

65. New temporary (unclassified) roads will be outsloped to ensure proper drainage.

66. New temporary roads shall be located outside SEZs except where stream crossings are necessary.

67. After use and where feasible based on soil type, new and existing temporary roads would be restored, by:

a) Providing at least 50 percent ground cover, such as slash, wood chips or masticated material (spread no more than 6-inches thick).
b) Installing water bars as appropriate to prevent accumulating water on the decommissioned road surface.
c) Ripping, where feasible, when soils are moist or dry.

d) Installing natural barriers such as large logs and rocks where necessary at the decommissioned road entrance points to prevent continued use of road alignment.

68. Stream crossings for equipment or temporary roads shall be minimized and approved by the LTBMU Watershed Specialist prior to construction. Crossings shall consist of culverts, bridges, coarse rock fills, hardened fords, or low-water crossings. Crossings shall be restored to the extent practicable when treatments are finished. Vehicles and equipment shall cross streams only at established crossings.

69. Construct and remove temporary crossings on ephemeral drainages when the channels are dry and before the winter season begins (BMP #2-16).

70. Construct and remove temporary crossings on intermittent channels when the channels are dry and install crossings such that water flow and fish passage will not be obstructed (BMP #2-16).

71. Strategically establish barriers along open areas adjacent to road or trail access (boulders, split rail fence, and barriers/signs) to discourage post-treatment establishment of user-created routes that are not designated routes.

72. Measures will be established off Genoa Peak Road (Rd. 14N32) to prevent Off Highway Vehicle (OHV) access and activity into landings and staging areas and temporary roads (e.g. berms, signage, gates, rocks).

Landings

73. Landings, fuel storage, and refueling are prohibited in SEZs (BMP #1-12).

74. Landings, staging areas, and storage areas are prohibited in RCAs unless no feasible alternative exists.

75. Proper drainage from landings will be provided; ditching or sloping may be used where needed (BMP #1-16).

76. Hazardous materials, including Sporax® or equivalent, diesel fuel, and gasoline shall be transported (except across designated crossings), stored, and handled outside SEZs. Sporax® or equivalent used in SEZs must be used according to label directions. Spill Prevention, Containment, and Countermeasures Plans shall be prepared, if quantities used require them. Allow fuel storage and refueling in RCAs only if no feasible alternative exists.

77. Landings located within RCAs, and those that are greater than a quarter acre in size, will be priorities for decommissioning as long as the soil type allows (i.e., not too rocky).

78. After operations, landings will be decommissioned using the following methods:

a) Applying wood chips or masticated material to a maximum depth of 6 inches.

b) Ripping the landing to approximately 12 inches depth (ripping may not be possible in very rocky soils; this determination may be made by the Contract Administrator).
c) Seeding the area with a weed-free native seed mix of grasses, forbs, and shrubs (BMP #1-15).

Vegetation treatments in uplands (outside normal operating period)

79. When working outside of the normal operating period, conditions must be adequate to prevent erosion and detrimental soil compaction. Operable conditions must be present on at least 85 percent of the treatment unit to prevent more than 15 percent detrimental disturbance to the soil and will include the following:

a) For frozen soil operations, a minimum 3 inch depth of frozen soil shall be maintained throughout the treatment unit and on all access roads.
b) For over-snow operations, a minimum of 12 inches of compacted snow/ice shall be maintained on undisturbed ground, and 6 inches of compacted snow/ice shall be maintained on existing disturbed surfaces.
c) Lesser depths may be agreed to by a LTBMU Watershed Specialist and the Contract Administrator.
d) Conditions that are likely to result in sedimentation to a natural water body are not considered operable.

80. If operable soil moisture conditions are present beneath a lesser snow depth (i.e., less than 6 inches), operations may continue until soil moisture conditions become inoperable. Use the table in the SEZ Sensitivity Rating (see Appendix 1) to determine operable soil moisture conditions.

81. Flag and avoid springs, seeps, and other areas that do not freeze well.

82. When working outside of the normal operating period, monitor operations regularly to ensure that adequate snow and frozen soil depths are maintained and that soil and water quality impacts are not occurring.

83. Move equipment and materials to areas near pavement before conditions become inoperable.

84. For over-snow and frozen soil operations in SEZs, exclude ground based equipment from the 25-foot buffer around perennial and intermittent channels.

85. Temporary crossings on intermittent or ephemeral channels may be approved on a case by case basis through agreement between the Contract Administrator and a LTBMU Watershed Specialist, and the conditions of the agreement shall be documented. These crossings shall not result in bank damage or water quality impairment.

Roads (outside of normal operating period)

86. Unless adequate snow cover or frozen soil conditions exist, where a native surface road meets a paved road, the road intersection must be covered with rock or organic material to prevent tracking of mud onto the paved road.

87. Native surface roads should not be used during wet periods (e.g. ponded water on roads) or if soil is very moist or wet and should have a stable surface and sufficient drainage to allow use while also maintaining water quality. Where wet season (normally October 15 to May 15) field operations are planned:

a) Native surface roads should be upgraded (e.g. rocked, armored);
b) low ground pressure vehicles should be used;
c) frozen ground conditions should be present; or,
d) maintenance should be intensified to handle the traffic without creating excessive erosion and damage to the road surface.

88. If a native surface road becomes rutted, close the road unless spot-rocking or other mitigation of rutted areas will be effective in preventing road damage. Rutting is defined as two-inch deep depressions, over 10 percent or more of the road surface, on a per mile basis.

89. Rutting of a road, forwarder trail, or any other disturbance that can deliver sediment into a water body or SEZ must be avoided.

90. During winter operations, paved surfaced roads may be plowed, including turnouts, if the action will not cause damage to the road surface and associated drainage structures.

91. On native surface roads, retain a minimum of 6 inches of compacted snow on 85 percent or more of the road surface after plowing to facilitate freezing. During road use, a minimum of 6 inches of compacted snow must be present on 85 percent or more of the road surface, unless the road surface is frozen to a depth of 3 inches or more. Ensure that plowing does not damage drainage structures.

92. Road alignments within the contract area that require snow removal shall be visibly marked on both sides along the entire alignment to facilitate plowing. Excess snow removed during plowing shall not be placed into drainages or riparian areas.

93. Before over-snow operations begin, mark existing culvert locations. During and after operations, ensure that all culverts and ditches are open and functional.

94. When roads are plowed, snow berms must be breached to allow drainage during snowmelt. Space outlets so as not to concentrate road surface flows (usually spaced at a minimum of every 300 feet). Erosion control structures may be necessary at outlets to collect road generated sediment, and will be agreed to by the Contract Administrator and a LTBMU Watershed Specialist.

Heritage Resources

95. Heritage sites which are either unevaluated for, or determined eligible to the National Register, that are located within the proposed undertaking's Area of Potential Effect

96. Sites that are flammable (i.e. Comstock era stumps, wooden flumes, etc) will also be avoided and protected during prescribed burning (including slash piling and broadcast burning).

Scenery Management

97. A Landscape Architect will be involved with the initial layout strategy with other resource specialist, including timber and fuels layout crews. A portion of the project area that is representative of the whole project area will be used to convey specific resource prescriptions and overall marking strategies. The scenery management measures will include:

a) Randomly sized islands will be retained in the masticated areas within sensitive viewsheds.
b) Roadside "eyebrows" of brush will be left intact to minimize the potential for unauthorized motorized use (illegal OHV activity).
c) Provide thinning that accentuates the desired characteristics such as large trees and clusters of aspen creating diversity within the natural appearing view.

98. Unit boundary marking on trees will be completed on the opposite side of the tree from where it is seen from the road and other travel ways.

99. Landings, temporary staging areas and access points will be rehabilitated as specified in soils design features.

100. Where prescribed underburning is proposed, scatter burned slash on control lines, after treatment, to reduce the color contrast of the exposed soil.

101. Where feasible, within immediate Foreground (150 to 200 feet) of Sensitive Areas (e.g. Highway 50, State Route 28, recreation areas, residential areas, and major roads and trails) remove slash and do not pile.

102. Where skid trails are readily visible to concentrations of recreational users, use natural features (e.g. trees, shrubs, logs, rocks, etc.) to aid in blocking and/or closing these trails to unauthorized motorized use.

103. Flush cut stumps within 6 inches of the uphill side of the stump where practicable.

104. Leave shrub islands of various shapes and size in a random distribution to provide a natural appearance, while meeting fuel reduction objectives around private dwellings or recreation areas.

105. In addition, within Highway 50 and State Route 28 (Nevada Scenic Byways) Corridors - the following design features (mitigation measures) will apply to areas in

a) Leave shrub islands of various shapes and size in a random distribution to provide a natural appearance, while meeting fuel reduction objectives.
b) To eliminate direct views into landings from the Highways, do not locate landings perpendicular to the Highways when possible.

106. Any temporary equipment staging areas and access points will be rehabilitated and blocked after project completion. Rehabilitation will include returning the ground to natural contours, implementing decompaction and erosion control measures as needed, and covering bare soil with slash, chips, pine needles, or cut brush as necessary.

107. Temporary road construction:
a) Will be designed to meet the prescribed VQO. The location of the roads should fit the landscape with a minimum degree of landform alteration limiting the amount of earthwork. Avoid excessive cut and fill slopes for road construction.

Recreation and Improvements

108. Reduce existing hazards, such as dead standing trees, in public use areas and take measures to improve the recreation environment through erosion control methods, increase stand health through thinning to benefit future recreation opportunities.

109. Recreation Staff and/or Forest Landscape Architect will be consulted during layout and design near Forest System trailheads and recreation areas.

110. Post signs advising trail users when project activities are going to take place at appropriate trailheads and recreation areas.

111. Where there is a safety concern for recreationists, sites where project treatment is implemented will be temporarily closed until the safety concern is removed.

112. Post news releases about temporary forest closures related to the project.

113. Repair and rehabilitate any damage caused by this project to recreation improvements/facilities after project activities are completed. Recreation improvements include, but are not limited to camp sites, picnic sites, parking, trailheads, roads. Facilities include, but are not limited to, picnic tables, grills, fire rings, fences, vault toilets, and water systems (including hydrants).

114. Interpretative panels describing fuels management in the landscape will be placed in recreation sites nearby, if funding is available.

115. Coordinate with Thunderbird Lodge on any potential disruption to recreation activities, relating to any treatments within proximity of the property prior to and during project implementation.

Agency Coordination

116. LTBMU staff will coordinate with Tahoe Regional Planning Agency (TRPA) for planning and project implementation.

117. Nevada Division of Environmental Protection (NDEP) regulates prescribed burning accordance with the State Implementation Plan (SIP). Prescribed burning in this project will coordinate with the respective State and follow the SIP to protect air resources; including obtaining and following air quality permits.

Monitoring

118. The following is a preliminary list of proposed monitoring elements for this project.

a) Each year, the 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 used for protecting soil and water resources associated with timber, engineering, recreation, grazing, and revegetation activities. During the Spring, fuel treatment units that were treated the previous field season are evaluated for BMP implementation and effectiveness. The Project BMPs will be included in the pool for random BMP evaluations under the BMPEP program.

b) Implementation monitoring will occur in fuels treatment areas. This will include completing a checklist that contains every BMP and design feature contained in the NEPA and contract documents. The checklist may require visits to the field site before, during and after implementation to ensure that all BMPs and design features are carried out on the ground as they were prescribed.

c) Noxious weed monitoring would take place within treatment areas post implementation.

Appendix 1
Spooner SEZ Sensitivity Rating System

This rating system was designed to evaluate the sensitivity of mechanical treatment units that contain stream environment zones (SEZ) in order to determine the suitability for mechanical treatment and the level of monitoring needed. This rating system was designed for the South Shore Project and can be applied to other areas within the Lake Tahoe Basin. The results from the rating exercise for each SEZ unit proposed for Cut-To-Length (CTL) mechanical treatment within the Spooner Project will be compared to the sensitivity rating for the Heavenly Creek SEZ Demonstration Project site (HSEZ) using the same criteria. If Spooner units have a higher rating than the HSEZ site, they will be either partially (in areas deemed most sensitive to impacts) or entirely changed to hand treatment. The rating for Heavenly SEZ was 5, so Spooner stands with a rating of 5 or lower will be treated mechanically with the CTL equipment providing that soil moisture conditions allow, and Spooner stands that rate 6 or higher will be hand treated, all or in part.

The following assumptions apply to this rating system:

- USFS LTBMU Forest Plan and Sierra Nevada Framework Standards and Guidelines will be met.
- All Timber Management, Road and Building Site Construction, Vegetation Manipulation, Fire Suppression and Fuels Management, and Watershed Management BMPs found in the BMP guidebook, Water Quality Management for Forest System Lands in California (USDA FS, 2000) will be followed.
- Sierra Nevada Forest Plan Amendment (SNFPA, 2004) Riparian Conservation Objectives will be met.

First, determine if the SEZ proposed for mechanical treatment exhibits the following characteristics that would make it **NOT** suitable for mechanical treatment:

- If the average slope or slope range throughout the SEZ is ≥30%, or
- If slopes are unstable and greater than 20%, with less than 15 ft of floodplain width to act as a buffer, or
    - Slopes are considered unstable if they are in poor condition as defined by the TRPA Code of Ordinances – Slopes show evidence of active and pronounced surface (sheet, rill, gully) erosion or mass wasting over more than 50 percent of the slope surface. Slopes are typically covered less than 50 percent with original duff layer, down logs, slash, low growing vegetation or rock fragments greater than 1-2 inches in diameter. Soil horizons are typically non-cohesive and unconsolidated. Evidence of seeping is often present.
- If soil moisture content and the associated compaction risk (varies based on soil texture) fall within the highlighted sections of Table 1, or
- If the entire unit is not accessible with ground based equipment (based on size and extent of wet areas, boulders, steep slopes, etc.).

Table 1. Protocol for determining operability of soils based on soil moisture at 4 to 8 inch depth.

Soil Moisture % Increases Downward	Coarse Soils Loamy sands, fine sand loam, very fine sands, coarse sands	Light Soils Fine sandy loams, sandy loams, very fine sandy loam	Med. Soils (<35% clay) Sandy clay loam, loam, silt loam, sandy clay loam, clay loam	Heavy Soils (>35% clay) Clay loam, sandy clay, silty clay loam, clay
Dry soils	Dry, loose, single grained flows thru fingers	Dry, loose, flows thru fingers	Powdery, dry, sometimes slightly crusted but breaks down into powdery conditions	Hard, baked, cracked sometimes has loose crumbs on surface
Slightly moist soil	Still appears dry, will not form a ball with pressure	Still appears to be dry; will not form a ball	Somewhat crumbly, but will hold together from pressure	Somewhat pliable; will form ball under pressure. At plastic limit.
Moist soil	Still appears dry, will not form a ball with pressure	Tends to ball under pressure but seldom will hold together	Forms a ball and is very pliable, sticks readily if high in clay.	Easily ribbons out between fingers, has a slick feeling. At plastic limit.
Very moist soil	Tends to stick together slightly, sometimes forms a very weak ball	Forms a weak ball breaks easily, will not stick. Plastic limit or nonplastic.	Forms a ball and is very pliable, sticks readily if high in clay. Exceeds plastic limit.	Easily ribbons out between fingers, has a slick feeling. Exceeds plastic limit.
Wet soils	Upon squeezing, free water may appear. Wet outline is left on hand. Nonplastic.	Upon squeezing free water may appear. Wet outline left on hand.	Can squeeze out free water. Wet outline left on hand.	Puddles and free water forms on surface. Wet outline left on hand.

Recommended not operable by USFS Regional Soil Scientist

Proposed additional restriction based on Bob Powers (USFS PSW Soil Scientist) comment

Once the unit is determined to be suitable for mechanical treatment based on the above mentioned criteria, then rate each SEZ unit for the level of sensitivity (i.e. higher numerical score indicates a higher level of sensitivity):

1) Does this SEZ contain or share a boundary with any of the following special aquatic features: lakes, bogs, fens, vernal pools, and/or springs?
    a. If no…(0)
    b. If yes, but features could be flagged and avoided…(2)

c. If yes, and could not be flagged and avoided…Not appropriate for mechanical operations.

Score_____

2) Does the treatment unit have a stream/defined channel within its bounds or in close proximity to the unit?
    a. If no…(0) (Skip to #3)
    b. If yes and the channel is perennial…What is the channel type, based on Rosgen's classification?
        i. Aa+ - Very steep (>10%), deeply entrenched, debris transport, torrent streams. Very high relief. Vertical steps with deep scour pools, waterfalls. Low width to depth ratio, totally confined, sinuosity 1 to 1.1. Risky for mechanical treatment. (5)
        ii. A – Steep (4-10%), entrenched, cascading, step/pool streams. High energy, debris transport associated with depositional soils. Very stable if bedrock or boulder dominated channel. High relief, confined, frequently spaced deep pools. Low width to depth ratio, sinuosity 1 to 1.2. Risky for mechanical treatment. (5)
        iii. B – Moderately entrenched, moderate gradient (2-3.9%), riffle dominated channel, with infrequently spaced pools. Very stable plan and profile, stable banks. Moderate relief, colluvial deposition, and/or structural. Moderate width to depth ratio. Narrow, gently sloping valleys, rapids predominate with scour pools. Sinuosity >1.2. Little risk associated with treating these areas with mechanical equipment. (3)
        iv. C – Low gradient (<2%), meandering, point bar, riffle/pool, alluvial channels with broad, well defined floodplains. Broad valleys with terraces, in association with floodplain. Slightly entrenched, sinuosity >1.4. If soils are dry, little risk associated with treating these SEZ mechanically. (3)
        v. D – Braided channel with longitudinal and transverse bars. Very wide channel with eroding banks and bed. Broad valleys with alluvium, steeper fans. Glacial debris and depositional features. Active lateral adjustment with abundant sediment supply. High risk associated with bringing heavy equipment into these dynamic systems. (5)
        vi. DA – Anastomosing (multiple channels) narrow and deep with extensive, well vegetated floodplains and associated wetlands. Very gentle relief with variable sinuosities and width to depth ratios. Very stable streambanks. Broad, low gradient valleys with fine alluvium or lacustrine soils. Very low bedload, high wash load sediment. Some risk associated with heavy equipment operations near these channels. (4)
        vii. E – Low gradient (<2%), meandering riffle/pool stream with low width to depth ratio and little deposition. Very efficient and stable, high meander width ratio. Broad valley/meadows. Alluvial materials with floodplains. Highly sinuous (>1.5) with stable, well vegetated banks. If soils are dry, little risk in treating these SEZs mechanically. (3)

viii. F – Entrenched, meandering riffle/pool channel on low gradients (<2%) with high width to depth ratio. Entrenched in highly weathered material. Meandering, laterally unstable with high bank erosion rates. Sinuosity >1.4. Treatment could be risky near banks. (4)

ix. G – Entrenched gully step/pool and low width to depth ratio on moderate gradients (2-3.9%). Narrow valleys or deeply incised in alluvial or colluvial materials (i.e. fans or deltas). Unstable, with grade control problems and high bank erosion rates. Sinuosity >1.2. Risky for mechanical treatment. (5)

Score_____

c. If yes and the channel is intermittent…

i. Are the banks defined and stable [stability is defined as channel characteristics (rocks, overflow channels, woody material) being adequate to dissipate energy, vegetation on banks, vertical stability, and/or no visible signs of excessive erosion or deposition (TR 1737-15 1998)] (2)

ii. Defined and unstable (instability is defined as lacking the above listed characteristics) (3)

iii. Undefined (1)

Score_____

d. If yes and the channel is ephemeral…

i. Are the banks defined and stable (1)

ii. Defined and unstable (2)

iii. Undefined (0)

Score_____

3) If the unit is adjacent to perennial channels or lakes, and the slope between the treatment unit and the channel/lake is >20% with less than 15 ft of floodplain width to act as a buffer, or slopes are >30%…(1)

Score_____

Note: During implementation monitoring in stands that exhibit these characteristics, observers will note whether the slope of the stand is trending toward the steep slope leading to the channel or away from it, and any evidence on the ground of sediment transport or erosion will be reported and considered in this context.

4) Adjacent to perennial channels where treatment would occur on the slope, if slopes are stable and >20% with little to no floodplain width to act as a buffer, or slopes are unstable and <20% with little to no floodplain width…

a) If the risk associated with mechanical treatment in these areas could be mitigated or reduced with the application of more rigorous BMPs…(1)

b) If the application of more rigorous BMPs would not reduce or mitigate mechanical treatment effects…(2)

Score_____

5) How many stream crossings would be necessary to treat the SEZ with mechanical equipment?

a) If no crossings are necessary, (0)
b) If 1 crossing for every 800 feet of channel could be used (for ephemeral or intermittent channels)…(1)
c) If 1 crossing for every 800 feet of channel could be used (for perennial channels)…(3)
d) If more than 1 crossing is needed for every 800 feet of channel (for ephemeral or intermittent channels)…(2)
e) If more than 1 crossing is needed for every 800 feet of channel (for perennial channels)…(5)

Score_____