



United States
Department of
Agriculture

Forest Service

June 30, 2008

Notice of Proposed Action

Opportunity to Comment

Carson Ranger District

Clear Creek Fuels Reduction and Ecosystem Enhancement Project

Humboldt-Toiyabe National Forest
Carson City and Douglas County, Nevada

Background

The Carson Ranger District of the Humboldt-Toiyabe National Forest is proposing to reduce the risk of a catastrophic wildland fire, improve forest health and enhance and expand aspen stands southwest of Carson City, Nevada. This project, called the Clear Creek Fuels Reduction and Ecosystem Enhancement Project, is located within the Wildland Urban Interface (WUI). The Clear Creek Fuels Reduction and Ecosystem Enhancement Project, which will be called Clear Creek throughout this document, has an approximately 12,190 acre analysis area. Of this, approximately 7,230 are National Forest System lands, 404 acres are Carson City lands; 410 acres are Nevada Division of State Parks or State of Nevada lands; 170 acres are Washoe Tribe or Nevada and California lands; and 3,976 acres are private or other lands. Although the analysis area includes Forest Service and other ownerships, treatments proposed in this document would only occur on National Forest System lands. This project is being completed under the Healthy Forests Restoration Act of 2003.

The legal description for the analysis area is Township 14 North, Range 19 East, sections 4, 5, 6, 7, 8 and 9 and Township 15 North, Range 19 East, sections 20, 21, 22, 23, 25, 26, 27, 28, 29, 30, 31, 32, 33, 35 and 36. Figure 1 is a vicinity map and also displays the locations and names of previous large wildland fires on the Humboldt-Toiyabe National Forest. Figure 2 is a map indicating ownership within the Clear Creek analysis area.

Figure 1
Vicinity Map and
Previous Large
Wildland Fires
on the
Humboldt-Toiyabe
National Forest

Clear Creek Fuels
Reduction and
Ecosystem
Enhancement
Project

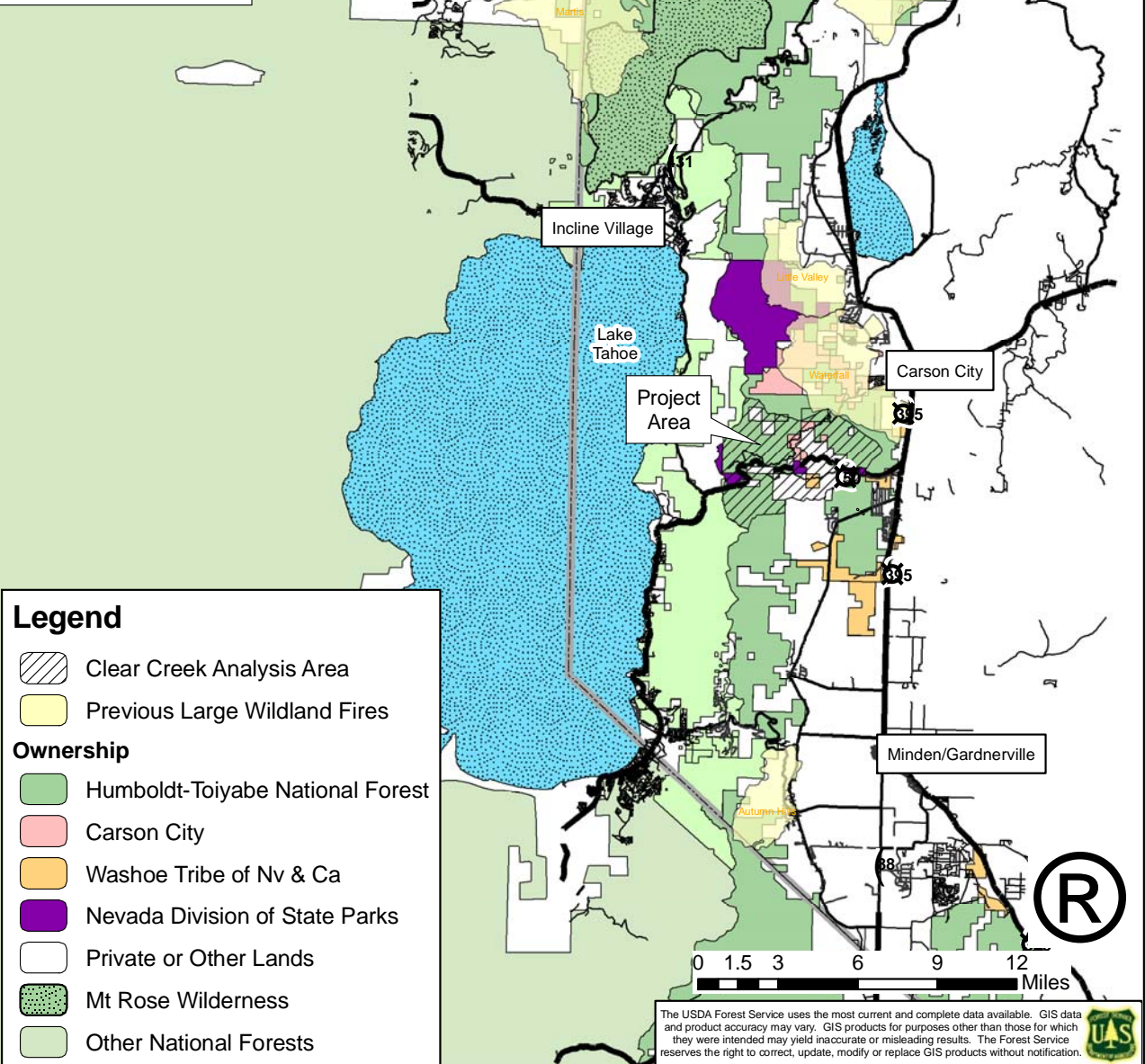
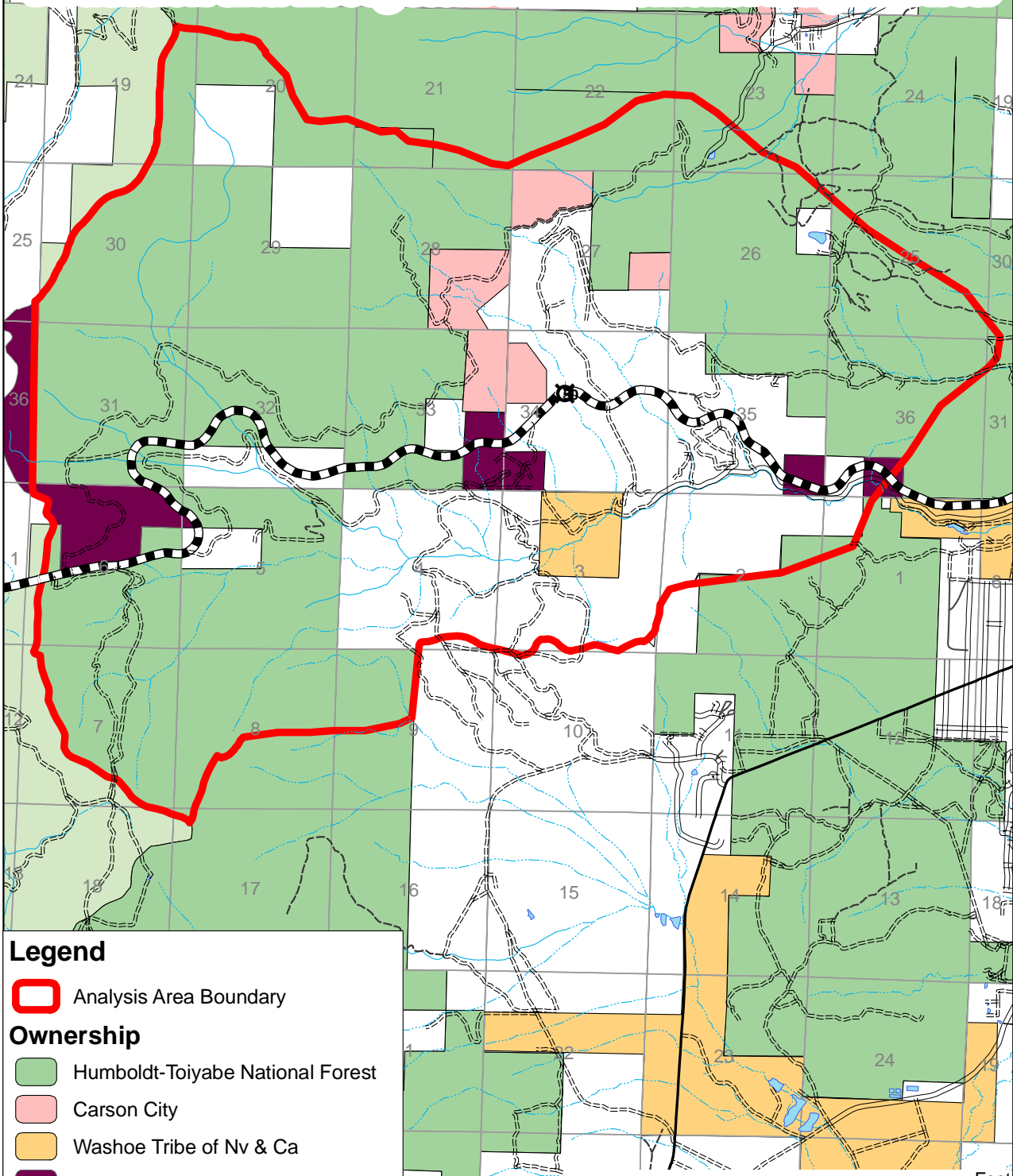


Figure 2 + Ownership within the Clear Creek Fuels Reduction and Ecosystem Enhancement Analysis Area



Legend

- Analysis Area Boundary
- Ownership**
- Humboldt-Toiyabe National Forest
- Carson City
- Washoe Tribe of Nv & Ca
- Nevada Division of State Parks
- Private or Other Lands
- Lake Tahoe Basin Management Unit

0 1,650 3,300 6,600 9,900 13,200 Feet



The USDA Forest Service uses the most current and complete data available. GIS data and product accuracy may vary. GIS products for purposes other than those for which they were intended may yield inaccurate or misleading results. The Forest Service reserves the right to correct, update, modify or replace GIS products without notification.

This area has been intensively managed beginning in the late 1800's when it was logged to provide lumber and firewood for the Comstock mining boom in Virginia City, Nevada.

A timber salvage was completed to remove dead trees in the 1990's following an epidemic infestation of bark beetles.

Dense stands of sagebrush, bitterbrush, manzanita and ceanothus occur at the lower elevations. Many of the shrubs in this area have become over mature and no longer provide high quality forage which is important for mule deer.

Aspen stands are scattered throughout the analysis area. Healthy aspen stands provide desirable scenic value, critical wildlife habitat and protection for soil and water. Many of the aspen stands in the analysis area are slowly declining in size and vigor due to conifer encroachment. As conifers encroach upon aspen stands, the diversity of suitable wildlife habitat and water yields are decreased. Generally, when conifers replace aspen there is a potential for a decrease in water yields. This loss of water means that it is not available to produce undergrowth vegetation, recharge soil profiles, or increase stream flow (Bartos 2001).

The project area currently has a moderate to severe crown fire hazard risk with the potential to threaten adjacent urban areas in Carson City.

In 2005, stand examination was completed to collect fuels, vegetation, surface and topographic data on 1,699 acres within the forested analysis area. One sample plot was located every eight acres, for a total of 212 sample plots. This data was utilized to complete analysis of the vegetation and fuels conditions and assist with development of the proposed action. Figure 3 displays the stand examination units where data was collected. Table 1 displays the vegetation data and table 2 displays the fuels data and crown fire risk by stand.

Figure 3 - Clear Creek Fuels Reduction and Ecosystem Enhancement Project Stand Examination Units

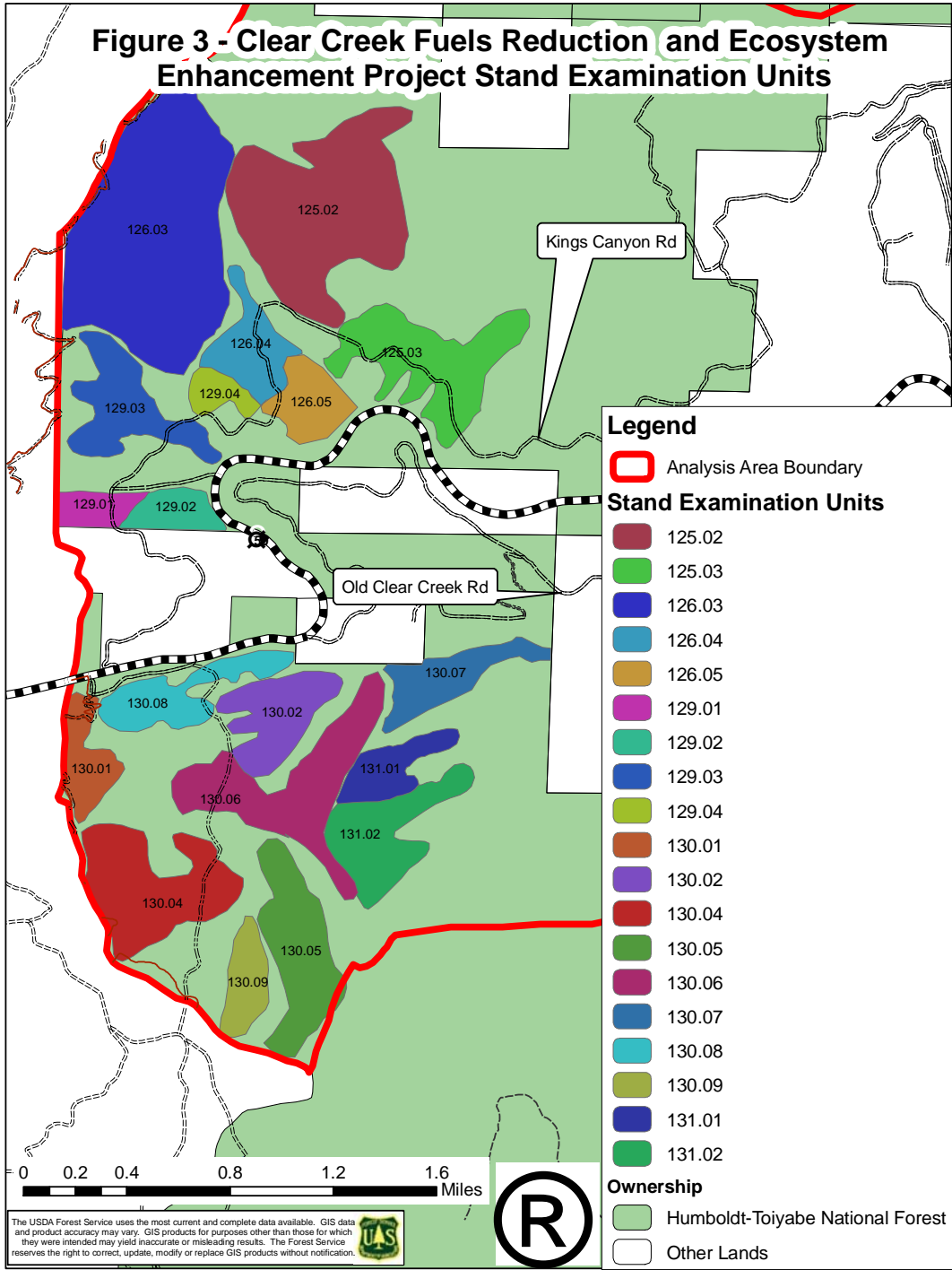


Table 1 – Vegetation data

Stand #	Basal Area Per Acre	Canopy Closure (%)	Trees Per Acre	Stand Density Index (SDI)	% Max SDI Before	Acres	QMD Before
125.02	94	30	74	146	32%	237	15.2
125.03	118	37	51	163	36%	123	20.6
126.03	107	38	366	222	49%	328	7.3
126.04	117	42	416	245	54%	55	7.2
126.05	87	30	354	186	41%	46	6.7
129.01	73	30	333	162	36%	26	6.4
129.02	101	50	1326	273	61%	31	3.7
129.03	101	36	130	172	38%	81	11.9
129.04	121	46	256	228	51%	21	9.3
130.01	102	46	1641	287	64%	43	3.4
130.02	109	35	87	169	38%	71	15.1
130.04	70	25	751	182	40%	123	4.1
130.05	100	35	596	231	51%	101	5.5
130.06	90	34	636	215	48%	130	5.1
130.07	134	47	840	312	69%	56	5.4
130.08	126	49	961	306	68%	63	4.9
130.09	77	30	286	162	36%	38	7.0
131.01	96	33	185	178	40%	42	9.7
131.02	63	25	382	146	32%	84	5.5

QMD = Quadratic Mean Diameter

In table 1, basal area is the cross-sectional area of a single stem, including the bark, measured at 4.5 feet above the ground. The Quadratic mean diameter (QMD) is the diameter of average basal area per tree. The stand density index (SDI) is a relative measure of stand density, as stand density increases so does insect and disease impacts and fire hazard. Some key relative densities include 25% of the maximum SDI which is when crown closure and the on set of competition begins; 35% of the maximum SDI which is when the stand is at the lower limit of full site occupancy and 60% of the maximum SDI, which is the lower limit of self-thinning.

Table 2 – Fuels and Crown Fire Hazard

Stand #	Flame Length	Torching Index	Crowning Index	Crown Fire Hazard	% Mortality	Total Tons Per Acre of Down Fuels
125.02	7.3	24.7	53.6	Moderate	39	30.4
125.03	7.6	29.4	58.9	Moderate	36	6.5
126.03	11.6	0.0	25.6	Severe	98	61.7
126.04	7.2	0.0	36.5	Severe	96	13.5
126.05	13.7	2.7	54.8	High	93	97.2
129.01	13.2	2.2	45.9	High	95	95.1
129.02	6.7	0.0	44.7	High	94	18.0
129.03	7.0	0.0	32.1	Severe	96	21.7
129.04	7.4	0.0	27.2	Severe	98	0.3
130.01	6.9	0.0	30.5	Severe	97	36.1
130.02	7.0	32.7	40.5	Moderate	25	22.1
130.04	8.6	14.0	42.2	High	94	37.5
130.05	7.6	0.0	30.3	Severe	97	18.5
130.06	8.9	0.0	46.8	High	94	37.3
130.07	8.7	0.0	20.5	Severe	99	40.3
130.08	7.3	0.0	35.5	Severe	96	32.9
130.09	8.3	0.0	35.1	Severe	96	14.9
131.01	7.5	30.0	47.6	Moderate	56	2.8
131.02	8.6	0.0	41.2	High	96	34.8

In table 2, these figures are for a wildland fire burning at a 20 mile per hour wind at 70° Fahrenheit. The torching index is the 20-foot windspeed for which crown fire activity can initiate and the crowning index is the 20-foot windspeed at what active crown fire is possible. When the torching index is low, the hazard of crown fire is high, when the crowning index is low; the hazard of crown fire is high. The crowning and torching indexes were used to determine the crown fire hazard. The percent mortality is the percentage of basal area that would be consumed in this type of fire.

In 2008, 15 partners representing local, Federal, State, County and Tribal agencies completed a multi-jurisdictional comprehensive strategy to reduce the risk of large and destructive wildfires in the Carson Range. This strategy, called the Carson Range Multi-Jurisdictional Fuel Reduction and Wildfire Prevention Strategy had three outcomes; 1) propose projects that create “community defensible space”; 2) comprehensively display all proposed fuel reduction treatments, and 3) facilitate communication and cooperation among those responsible for plan implementation. Lands owned by Nevada State Parks, Carson City and private individuals occur within or adjacent to National Forest System Lands within the project area. Collaboration between the US Forest Service, the Nevada Division of Forestry, Nevada Fire Safe Council, Washoe Tribe of Nevada and California,

Carson City and private land owners occurred in developing this proposal. Hazardous fuels reduction projects have been completed in the Clear Creek area on all jurisdictions in the past and additional projects are proposed in the future. These fuels reduction projects located on various jurisdictions will compliment and enhance each other and achieve the most desirable result of reducing the risk of a wildland fire.

A desired condition is a statement describing a common vision for a specific land area. Following are the desired conditions for the wildland urban intermix defense and threat zones and California spotted owl and Northern goshawk protected activity centers (USDA, 2004).

Desired conditions for wildland urban interface defense zones, which roughly extend ¼ mile out from communities, include:

- 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 crown fuels, both horizontally and vertically, result in very low probability of sustained crown fire.

Desired conditions for wildland urban interface threat zones, which buffer the defense zone are described as: 1) flame lengths at the head of the fire are less than 4 feet; 2) The rate of spread at the head of the fire is reduced to at least 50 percent of pre-treatment levels; 3) Hazards to firefighters are reduced by managing snag levels in locations likely to be used for control of prescribed fires and fire suppression consistent with safe practices guidelines. 4) Production rates for fire line construction are doubled from pre-treatment levels. 5) Tree density has been reduced to a level consistent with the site's ability to sustain forest health during drought conditions.

Desired conditions for California spotted owl and Northern goshawk protected activity centers (PAC) include: Stands in each PAC have: 1) at least two tree canopy layers; 2) dominant and co-dominant trees with a average diameters of at least 24 inches dbh; 3) at least 60 to 70 percent canopy cover; 4) some very large snags (greater than 45 inches dbh); and 5) snag and down woody material levels that are higher than average.

Comments Welcome

We welcome your comments on this proposal within the Clear Creek watershed. Written, facsimile, hand delivered, oral, and electronic comments concerning this action will be accepted for 30 calendar days following the publication of the 36 CFR 215 Notice of Proposed Action in the Reno Gazette Journal. For detailed information on how to provide comments please refer to the "Comment Process" section of this document.

Purpose and Need

West-wide wildfires are currently burning much larger acreages with high severities; killing the majority of the trees in the fire areas. The majority of western forests managed by the US Forest Service have experienced a significant increase in relative areas burned from 1940 to 2000 (Stephens 2005).

The purpose of this project is to:

- Reduce fuel loading and ladder fuels in forested and shrub areas adjacent to the wildland urban interface West of Carson City. Dense timber and shrub stands, high fuel loadings and excessive ladder fuels have created a high risk of uncharacteristic catastrophic wildland fires.
- Reduce dense vegetation in order to increase vigor, health and growth rates in the forested ecosystem. Competition from high tree densities has reduced stand vigor, thus increasing the possibility that insects, disease, or wildfire will kill the forested stands, including late and older successional trees. Improving the health of the forested ecosystem will reduce the long-term risk of loss and protect this ecosystem component while enhancing productivity.
- Enhance and expand existing aspen stands. Aspen stands are in a declining condition because the encroaching conifer trees shade out and replace the sun-loving aspen regeneration, eventually eradicating the aspen stand completely. Removing encroaching conifers and some older decadent aspen from within the aspen stands will enhance the existing aspen stand, and removal of conifer within a tree and half height from the edge of the stand will allow the stand to expand. This action will restore an ecosystem component that has diminished in size and vigor. This will improve habitat for a variety of wildlife species, including migratory birds and mule deer.
- Improve the quantity and quality of mule deer forage and deer winter range.
- Help firefighters control and/or suppress potential wildland fires.

The need for this project includes:

- The need for reduced wildland fire risk to the Clear Creek, Carson City and Kings Canyon communities.
- The need for healthy, functioning, expanding aspen stands.
- The need for improved forest health.
- The need for improved forage for mule deer and other wildlife. In some areas, bitterbrush and sagebrush is old and decadent, providing poor forage for mule deer. Removal of some shrubs will encourage sprouting, providing improved forage.

This action responds to the goals and objectives outlined in the Toiyabe National Forest Land and Resource Management Plan (1986), as amended by the Sierra Nevada Forest Plan Amendment Record of Decision (January, 2004) and helps move the project area towards desired conditions described in those plans.

Decision Framework

Based on the environmental analysis and disclosure documented in the environmental assessment, the District Ranger will decide 1) whether to select the proposed actions as proposed or modified, or no action; 2) what design features or mitigation measures are needed; and 3) what monitoring is appropriate.

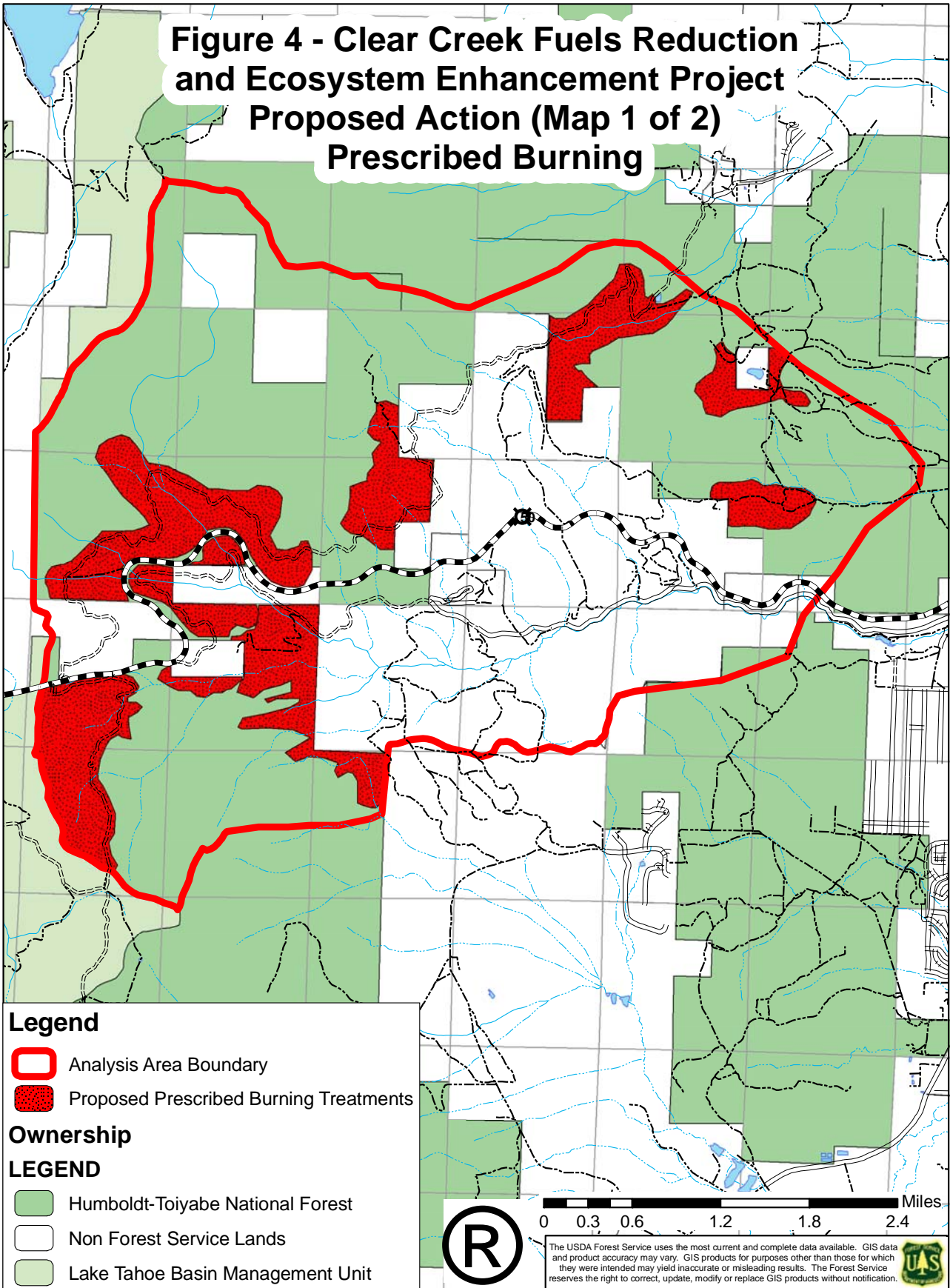
The Proposed Action

The Forest Service proposes to meet the purpose and need within the Clear Creek Project area by implementing the following activities. Figure 4 indicates the proposed action prescribed burning areas. Figure 5 indicates the proposed action on forested, aspen and shrub areas.

Aspen Enhancement. Enhance aspen stands by removing conifers and possibly mature aspen from within existing stands. Expand aspen stands where expansion is possible by removing conifers within a tree and a half length (up to a maximum of 150 feet) from the edge of the stands. Campbell and Bartos (2001) describe five risk factors for aspen dominated stands, which are: 1) conifer cover (understory and overstory) greater than 25%; 2) aspen canopy cover less than 40%; 3) dominant aspen trees greater than 100 years old; 4) aspen regeneration less than 500 stems per acre (5 to 15 feet tall); and 5) sagebrush cover greater than 10%. If none of these conditions are present, the aspen is properly functioning and would not be treated. If any of the conditions are present, conifers would be removed. Underburning would also occur in aspen stands if conifer removal does not stimulate aspen regeneration, no pile burning would occur within aspen stands. This treatment is proposed within and adjacent to existing aspen stands on approximately 250 acres.

Commercial Thinning on Forested Areas. On up to approximately 1,000 acres, thinning of commercial sized trees, generally 8" to 29.9" diameter at breast height (DBH) would occur. Approximately 15% of this area would utilize a ground based logging system and 85% would utilize a helicopter logging system. This treatment would involve thinning from below by removing smaller understory trees that are most susceptible to wildfire and leaving the dominant tallest trees that are less susceptible to fire. Residual overstory trees would be irregularly spaced across the landscape and small groups of typically three to six closely spaced overstory trees would be left to retain structural diversity. Dead and insect infested trees would be removed. Whole tree yarding would be utilized to remove slash. Where available, three of the largest snags per acre would be retained. Figure 5 visually depicts a stand of timber after the proposed action treatments, and during a simulated catastrophic wildland fire with no action and the proposed action. Treatments in the stand of timber in figure 6 included commercial and non-commercial thinning and prescribed underburning. This stand was modeled using the Forest Vegetation Simulator (FVS) and Stand Visualization Simulator (SVS). Stand examination data, collected in 2005, was used to provide the statistics for FVS and SVS.

**Figure 4 - Clear Creek Fuels Reduction and Ecosystem Enhancement Project
Proposed Action (Map 1 of 2)
Prescribed Burning**



**Figure 5 - Clear Creek Fuels Reduction and Ecosystem Enhancement Project
Proposed Action (Map 2 of 2)
Forested, Aspen and Shrub Treatment Areas**

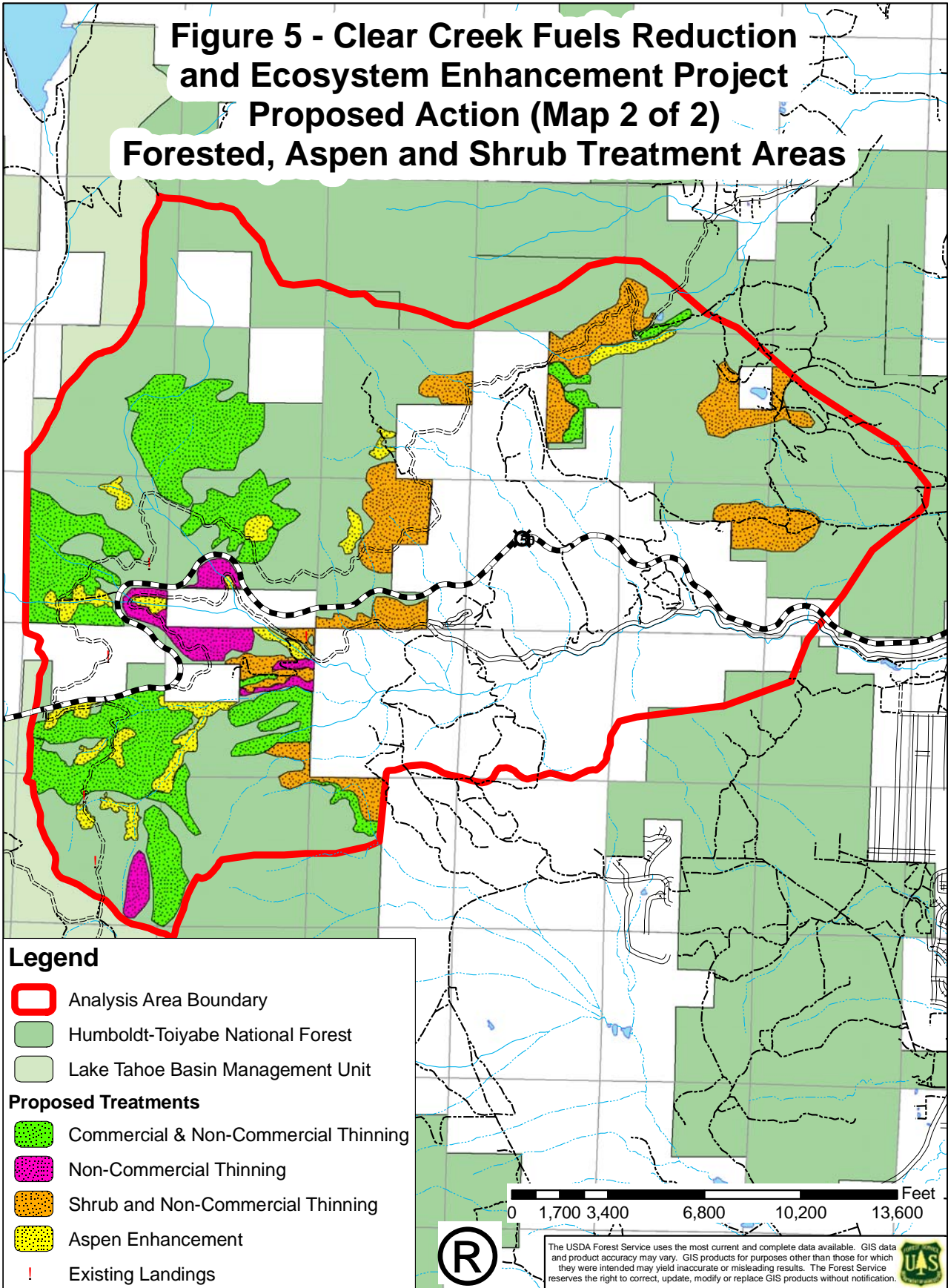
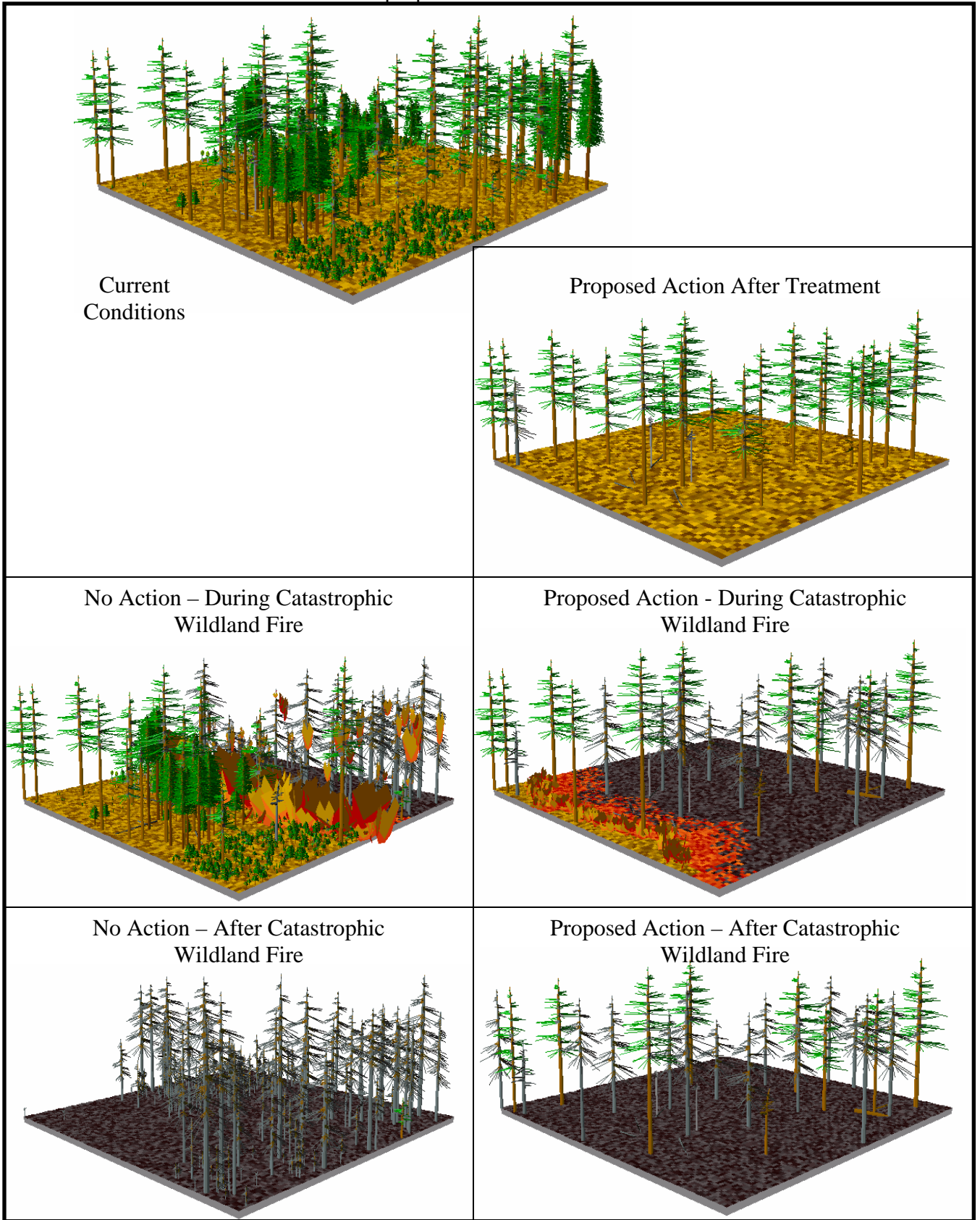


Figure 6 – Visual depiction of a timbered stand with proposed treatments and a simulated wildland fire with no treatment the proposed treatment



Biomass Removal. Slash brought to the landing, primarily limbs and tops of trees, and non-commercial timber, would be utilized for biomass. Some of the biomass utilization opportunities in this area include fuel for cogeneration plants, biofuels production, landscaping materials and furniture.

Non-Commercial Thinning. On up to 600 acres, thinning of noncommercial trees, generally less than 8" to 10" DBH would be completed utilizing prescribed fire, hand crews or mastication equipment would occur. This treatment would occur in areas where dense concentrations of small sized trees occur, acting as ladder fuels to move a fire from the surface into the tree crowns. Non-commercial trees would be treated under three different circumstances: 1) In areas proposed for commercial thinning and underburning and contain a non-commercial component that is so dense that hand felling would need to occur prior to underburning to achieve the desired results; 2) in areas that are not proposed for commercial thinning, but a dense non-commercial ladder fuel component exists; 3) In areas where commercial thinning occurs and a dense non-commercial ladder fuel component exists, but underburning is not practical.

Mastication equipment would be utilized where access and slope allow and hand crews would be utilized in steeper, more inaccessible areas. Slash resulting from this activity would be shredded in the masticated areas, lopped and scattered in areas proposed for underburning, piled and burned in areas where underburning is not feasible, but pile burning is and lopped and scattered and left on site in inaccessible areas where prescribed burning is not feasible.

Shrub Treatments. This would involve thinning of shrubs and noncommercial small sized trees on up to 600 acres. Mechanical treatments would include mastication that would shred and masticate some shrubs. Hand treatments would include cutting of some shrubs and noncommercial trees up to 10" DBH and piling and burning or underburning. Shrubs would be treated in a mosaic pattern and residual densities would be 30% to 80% depending on the location. Areas adjacent to the Forest Service boundary that currently have or have the potential to contain structures would generally have more intense treatments and interior areas would generally have less intense treatments.

Cheatgrass and Invasive Species Reduction. In areas where these species dominate the site various methods would be utilized to reduce densities. These methods would include hand pulling, utilization by domestic sheep or goats and seeding with native grasses. Monitoring would identify locations where treatments would occur.

Prescribed Burning. This treatment would include both underburning and pile burning and would occur in aspen, conifer and shrub areas. Pile burning would occur in areas where shrub or non-commercial trees are hand thinned and piled. Underburning would occur where location, slope and vegetation densities are such that success is assured. Burning would only occur under safe weather conditions. These safe weather conditions would be analyzed and documented in an approved burn plan, which would be completed prior to any prescribed burning activities. All prescribed burning would be staffed with sufficient fire fighting personnel and equipment to ensure public and firefighter safety. All burning would follow an approved Region 4 burn plan.

Roads and Landings. Existing roads and landings would be utilized; no new roads or landings would be constructed. The proposed action includes road maintenance on

approximately seven miles of road. This maintenance would include removal of any downed trees, brushing out road sides, blading road beds, including ditches where needed, cleaning culverts, constructing water bars and hazard tree felling.

Summary of Potential Proposed Action Impacts

The affected resources and potential impacts of the proposed action are summarized for consideration in Table 3. In the environmental assessment, these impacts will be considered for detailed analysis and compared to impacts from the no action alternative.

Table 3 – Affected resources and potential impacts.

Affected Resource	Summary of Impacts
Air Quality	Short term adverse impacts due to smoke emissions from pile and underburning and dust could occur. Prescribed fires are subject to permitting by the Nevada Division of Environmental Protection (NDEP).
Watersheds	Surface and vegetation disturbance from the proposed action has the potential to increase soil erosion and impacts to the watershed. With the inclusion of Best Management Practices, this impact is not anticipated to be significant.
Conifer and Shrubland Vegetation	Beneficial impacts include improved tree vigor, species and structural diversity and reduced to risk from wide spread insect related mortality and stand replacing wildfires.
Aspen Vegetation	In areas where helicopter logging is not utilized, short term impacts would include soil compaction and reduced aspen sprouted related to treatment activities. This is not expected to be an impact with helicopter logging systems. Long term benefits include larger, healthier aspen stands that support a variety of wildlife and provide natural fuelbreaks.
Noxious and Invasive Weeds	Potential adverse impacts include the possibility of invasive and noxious weeds spreading, however, this is not anticipated to be significant because the proposed action includes measures to minimize and reduce invasive and noxious weeds.

Table 3 – Continued

Affected Resource	Summary of Impacts
Wildlife (including aquatic species, special status plant species, neo-tropical and migratory birds)	Short and long term impacts are expected, these would be analyzed in the Biological Evaluation/Biological Assessment and specialist report. Biological surveys are being conducted and results would be included in the analysis.
Heritage Resources	Cultural resource surveys have been completed on most of the project area and will continue. A number of sites, both historic and prehistoric, were identified. Sites will be identified and protected prior to project implementation. It is expected that there will be no adverse impacts to any cultural resource site.
Native American Religious Concerns	Consultation with the Washoe Tribe of Nevada and California has and will continue to occur. This project was developed in cooperation with the Washoe Tribe of Nevada and California and it is expected that there will be no adverse impacts to Native American Religious Concerns.
Visual Resources	Potentially short term impacts to scenery could occur during project implementation. The visual impacts of the treatments will be consistent with the natural landscape characteristics and in the long term, beneficial. Treated areas would be most visible for one to two years following project activities and may not be aesthetically appealing to some individuals. Long term benefits would be due to reducing the risk of a stand replacing fire or widespread insect-related mortality.
Public Access/Recreational Uses	Short term closures of some areas during project implementation would result in short term loss of access. Noise from project activities would also cause short term adverse impacts. Long term benefits to recreation would occur due to reducing the risk of a stand replacing fire or wide-spread insect-related mortality.

Public Involvement

This project has been posted on the Quarterly Schedule of Proposed Actions (SOPA) in 2006, 2007 and 2008. Further information about this project can be found on our website located at www.fs.fed.us/r4/htnf/projects.

A public open house meeting to present this project is scheduled for Wednesday, July 23rd, 2008 from 6:00 pm to 8:00 pm at the Carson City Community Center Sierra Room, 851 E. William Street, Carson City, Nevada.

Comment Process

The Forest Service encourages your comments on this proposed action, along with supporting reasons that the responsible official should consider in reaching a decision.

Your comments will help us prepare an environmental assessment on the proposed action. The assessment will be used to determine whether to prepare an environmental impact statement or a finding of no significant impact. If there is no potential for significant impacts, that finding, along with the environmental assessment and a proposed decision will be sent to those who commented. If the environmental assessment concludes that there is the potential for significant impacts then an environmental impact statement would be prepared.

Written, facsimile, hand-delivered, oral, and electronic comments concerning this action will be accepted for 30 calendar days following the publication of this notice in the Reno Gazette Journal.

Comments must be submitted to: District Ranger, Carson Ranger District, 1536 South Carson Street, Carson City, NV 89701 or fax 775-884-8199. The office business hours for those submitting comments in person are: 8:00 am to 4:30 pm Monday through Friday, excluding holidays.

Electronic comments must be submitted in a format such as an email message, plain text (.txt), rich text format (.rtf), and Word (.doc) to *comments-intermtn-humboldt-toiyabe-carson@fs.fed.us*. Comments must have an identifiable name attached or verification of identity will be required. A scanned signature may serve as verification on electronic comments.

It is the responsibility of persons providing comments to submit them by the close of the comment period. Those who provide substantive comments during this comment period are eligible to appeal the decision under the regulations. Individuals and organizations wishing to be eligible to appeal must provide the information identified in 36 CFR 215, including:

- Name and Address;
- Title of the proposed action;

- Specific comments (36 CFR 215.2) on the proposed action, along with supporting reasons that the Responsible Official should consider in reaching a decision;
- Signature or other verification of identity upon request; identification of the individual or organization who authored the comments(s) is necessary for appeal eligibility;
- For multiple names or multiple organizations, a signature must be provided for the individual authorized to represent each organization, or for each individual that wishes to have appeal eligibility, and
- Individual members of organizations must submit their own substantive comments to meet the requirements of appeal eligibility as an individual, comments received on behalf of an organization are considered as those of the organization only.

Comments received in response to this solicitation, including names and addresses of those who comment, will be considered part of the public record for this project and will be available for public inspection and will be released if requested under the Freedom of Information Act.

For further information please visit our website at www.fs.fed.us/r4/htnf/projects or contact Amanda Brinnand at 775-882-2766.

The U. S. Department of Agriculture (USDA), prohibits discrimination in all its programs and activities on the basis of race, color, national origin, gender, religion, age, disability, political beliefs, sexual orientation, and marital and familial status. (Not all prohibited bases apply to all programs.) Persons with disabilities who require alternative means for communication of program information (Braille, large print, audiotape, etc.) should contact USDA's TARGET Center at 202-720-2600 (voice and TDD).

To file a complaint of discrimination, write USDA, Director, Office of Civil Rights, Room 326-W, Whitten Building, 14th and Independence Avenue, SW, Washington, DC 20250-9410 or call 202-720-5964 (voice or TDD).

USDA is an equal opportunity provider and employer.

Literature Cited

Bartos, D.L., 2001. Landscape dynamics of aspen and conifer forests. P 5-14. In: Shepperd, W.D., Binklye, D., Bartos, D.L., Stoltgren, T.J., and Eskew, L.G. compilers. Sustaining aspen western landscapes: symposium proceedings. Proceedings RMRS-P-18 USDA Forest Service, Rocky Mountain Research Station, 460 p.

Campbell, R.B., D.L. Bartos. 2001. p. 299-370. Aspen ecosystems: objectives for sustaining biodiversity. In: Shepperd, W.D., Binklye, D., Bartos, D.L., Stoltgren, T.J., and Eskew, L.G. compilers. Sustaining aspen western landscapes: symposium proceedings. Proceedings RMRS-P-18 USDA Forest Service, Rocky Mountain Research Station, 460 p.

Graham, R.T., S. McCaffrey, T.B. Jain. 2004. Science basis for changing forest structure to modify wildfire behavior and severity. USDA Forest Service Rocky Mountain Research Station General Technical Report RMRS-GTR-120. 43 p.

Stephens, S.L. 2005. Forest fire causes and extent on United States Forest Service lands. *Int. J. Wild. Fire*, 14: 213-222.

USDA Forest Service. 2004. Sierra Nevada Forest Plan Amendment, final environmental impact statement, record of decision. U.S. Department of Agriculture, Forest Service, Pacific Southwest Region.