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Environmental Assessment

Angora Fire Restoration Project

Lake Tahoe Basin Management Unit, Region 5—USDA Forest Service

Legal Description: Portions of Sections 13, 23, 24, 25, and 26 Township 12 North, Range 17 East, and Sections 6, 7, 8, 18, and 19 Township 12 North, Range 18 East Mount Diablo Baseline & Meridian (Emerald Bay, South Lake Tahoe, Echo Lake, and Freel Peak Quadrangles).

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Acronyms and Abbreviations

Acronym/Abbreviation	Definition
AMS	aquatic management strategy
APE	area of potential effects
ATM	Access Travel Management Plan
BACM	best available control measures
BAER	Burned Area Emergency Rehabilitation
BBWP	black-backed woodpecker
BMI	Benthic Macroinvertebrates
BMPEP	Best Management Practices Evaluation Program
BMPs	best management practices
BDT	bone dry ton
CAAQ	California Ambient Air Quality
CARB	California Air Resources Board
CA-SHPO	California State Historic Preservation Officer
CE	Categorical Exclusion
CEQ	Council on Environmental Quality
CO	carbon monoxide
CO_2	carbon dioxide
CTL	cut-to-length
CWA	Clean Water Act
CWHR	California Wildlife Habitat Relationships
dbh	diameter at breast height
dbh	diameter at breast height
EA	environmental assessment
EDAQMD	El Dorado Air Quality Management District
EOs	element occurences
EP	eastside pine
ESA	Endangered Species Act of 1973 as amended
FEW	freshwater emergent wetland
FFE	fire and fuels extension
Forest Plan	Lake Tahoe Basin Management Unit Land and Resource Management Plan
Forest Service	U.S. Department of Agriculture Forest Service
FRI	fire return interval
FVS	forest vegetation simulator
GHG	greenhouse gas
HRCA	Home Range Core Area
HRM	Heritage Resources Manager
HSEZ	Heavenly Valley Creek SEZ Demonstration Project
IPCC	Intergovernmental Panel on Climate Change

Lahontan Water Board	California Regional Water Quality Control Board, Lahontan Region
LOP	Limited Operating Period
LRMP	Land and Resource Management Plan
LTBMU	Lake Tahoe Basin Management Unit
MAPS	Monitoring Avian Productivity and Survivorship
MIS	management indicator species
MOU	Memorandum of Understanding
MRI	montane riparian
mt	metric ton
NEPA	National Environmental Policy Act
NF	National Forest
NFMA	National Forest Management Act
NFS	National Forest System
NHPA	National Historic Preservation Act
NIPS	Non-Native Invasive Plant Species Project
NO_X	nitrogen oxides
NPDES	National Pollution Discharge Elimination System
NRHP	National Register of Historic Places
OSV	over the snow vehicle
OSV	over snow vehicle
PAC	Protected Activity Center
PM10	particulate matter less than 10 micrometers in size
PPN	ponderosa pine
RCAs	Riparian Conservation Areas
RCOs	Riparian Conservation Objectives
RFR	red fir
ROD	Record of Decision
SDWA	Safe Drinking Water Act
SEZ	stream environment zone
SMC	Sierran mixed conifer
SNFPA	Sierra Nevada Forest Plan Amendment
SNPLMA	Sierra Nevada Public Lands Management Act
SRPM	standard resource protection measure
TES	threatened, endangered or sensitive
tg	teragram
TPA	trees per acre
TRPA	Tahoe Regional Planning Agency
TRPA report	Tahoe Regional Planning Agency
USDA	U.S. Department of Agriculture
USFWS	U.S. Fish and Wildlife Service
VOCs	volatile organic carbons
VQOs	visual quality objectives
VRI	valley foothill riparian

WFR	white fir
WT	whole tree
WTM	wet meadow
WUI	Wildland Urban Interface

Chapter 1
Introduction

Chapter 1
Introduction

1.1 Document Structure

The U.S. Department of Agriculture (USDA) Forest Service (Forest Service) has prepared this Final Environmental Assessment (EA) in compliance with the National Environmental Policy Act (NEPA) and other relevant federal and state laws and regulations. This report discloses the direct, indirect, and cumulative environmental effects that would result from the proposed action and the no-action alternative. The document is organized as follows:

- **Chapter 1, "Introduction,"** includes information on the structure of the EA, background of the project, overview of the existing condition, the desired conditions, the purpose of and need for action, summary of the proposed action, applicable management direction, and the decision framework. This chapter also details how the Forest Service informed the public of the proposal through public involvement, describes the issues identified by the public, and summarizes laws, regulations, and policies that are applicable to the proposed project.
- **Chapter 2, "Alternatives, Including the Proposed Action,"** provides descriptions of alternatives considered but dismissed from detailed analysis, the no-action alternative, and the Forest Service's proposed action. It also summarizes the effects of the no-action alternative and the proposed action.
- **Chapter 3, "Affected Environment and Environmental Consequences,"** presents an overview of the analysis, the indicators used to document the effects, the existing conditions, and the environmental effects of implementing the proposed action and no-action alternative, and possible mitigation. The effects of the no-action alternative are described first to provide a baseline for evaluation and comparison of the proposed action.
- **Chapter 4, "Consultation and Coordination,"** provides a list of preparers and agencies consulted during the development of this document.
- The **appendices** provide best management practices, a risk assessment, and riparian conservation objective analysis.

Additional documentation may be found in the project record located at the Lake Tahoe Basin Management Unit (LTBMU) Forest Supervisor's Office in South Lake Tahoe, CA.

1.2 Background

On the afternoon of June 24, 2007, the human-caused Angora Fire began on National Forest System (NFS) land managed by the LTBMU. The Angora Fire burned over 3,100 acres including approximately 2,700 acres of NFS land, all within the Wildland Urban Interface (WUI) Defense Zone, and destroyed or damaged more than 250 structures on the South Shore of Lake Tahoe. See Figure 1-1 for a vicinity map and boundary of the fire perimeter.

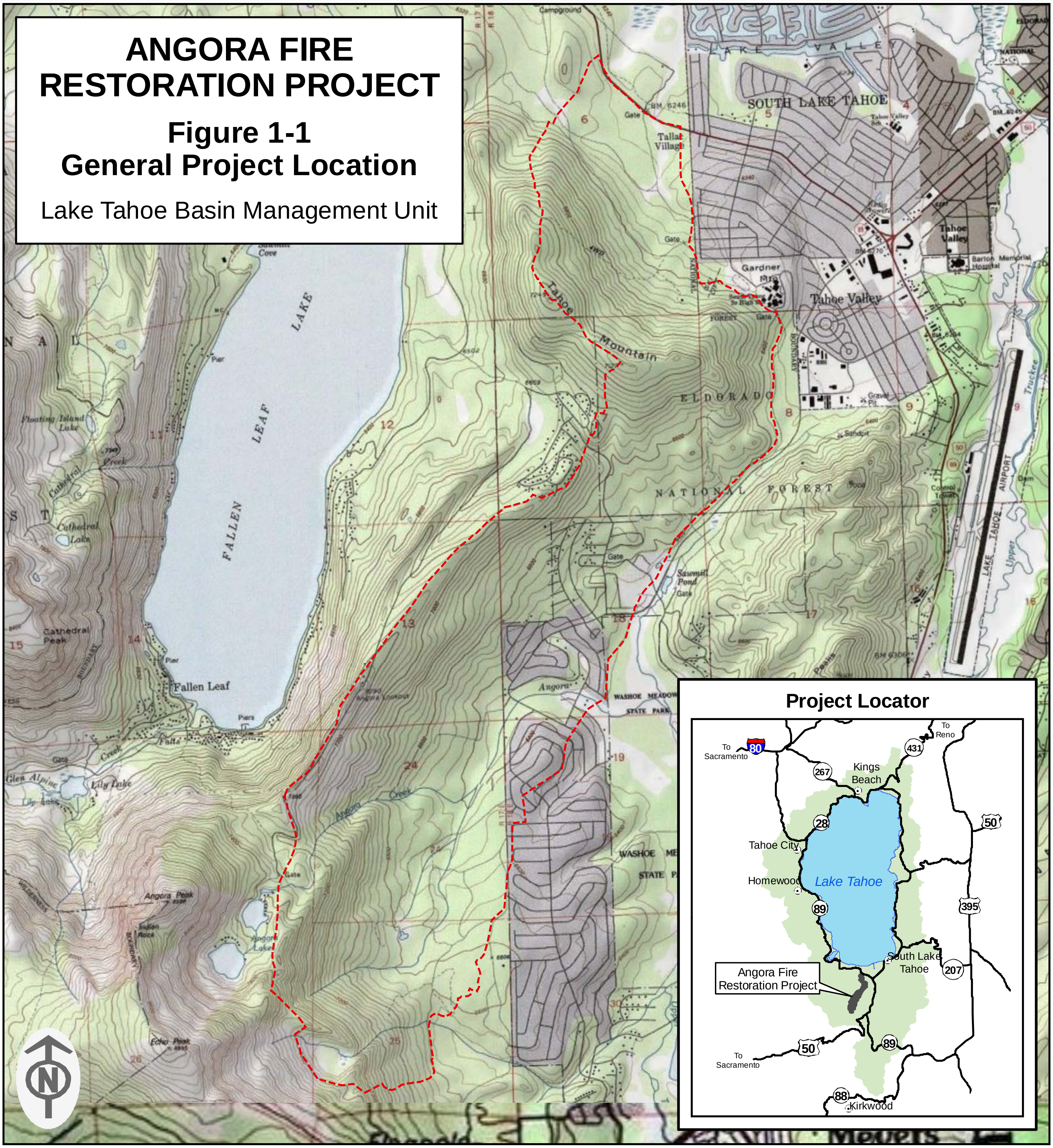
The LTBMU strategy for post-fire rehabilitation on NFS land includes three phases.

1. The first phase was fire suppression rehabilitation that occurred during the "mop-up" of the fire and was completed in November 2007. This was a series of immediate post-fire actions to rehabilitate hand and dozer fire lines, roads, safety zones, and portions of urban lots used during fire suppression efforts.
2. The second phase of rehabilitation of the area took place under the Burned Area Emergency Rehabilitation (BAER) process, in which erosion control measures were implemented in preparation for the initial storm events of fall and winter. The BAER work also included noxious weed detection surveys of disturbed areas and subsequent weed abatement, urban lot seeding for erosion control, hand mulching, water bar installation and armoring, culvert maintenance, fencing installation, and aerial hydromulching.
3. The third phase of rehabilitation is longer-term and includes three stages.
    a. The first stage addresses public safety within the burned area. This includes the removal of hazard trees on urban lots (completed in October 2007) and along NFS roads and trails. In March 2008, the LTBMU Forest Supervisor signed a Decision Memorandum for the Angora Hazard Tree Removal Project authorizing hazard tree removal and mitigation along 256 acres of roads and trails. This work started in December 2008 and is scheduled for completion in the summer of 2010.
    b. Planting seedling trees (reforestation) on approximately 965 acres is a separate ongoing stage. Reforestation includes hand planting Jeffrey pine, sugar pine, incense cedar, and red fir. Site preparation for seedling planting includes scraping of duff and litter down to mineral soil 12 inches around the planting spot. The purpose for planting seedlings is to expedite desired stand conditions such as density, tree size, and species composition. Relying on natural regeneration alone in certain areas would be delayed due to lack of a seed source and would result in areas dominated by shrubs and/or non-preferred tree species, white fir and lodgepole pine. To date, planting has occurred on approximately 220 acres of urban lots in 2009. In April 2010, the LTBMU Forest Supervisor signed a Decision Memorandum that authorized reforestation on approximately 745 acres. In May 2010, approximately 450 acres were planted. The April decision acknowledges that another 295 acres could be planted over the next couple years with the planting timed and considered with the activities under this decision (Stage 3).
    c. The third stage of long-term restoration includes the proposed action evaluated in this EA, in which an interdisciplinary team of resource specialists addresses a comprehensive approach toward restoring the burned landscape to meet desired social and ecological conditions. Survey work has been completed. From May through June 2008, the Forest Service invited initial public input on restoration opportunities. Approximately 60 people attended a public open house, and an additional 15 people submitted written comments or called with verbal input. Based on the direction found within the LTBMU Land and Resource Management Plan (as amended) (Forest Plan) and public input received, the proposal for restoration includes the following five major restoration categories:
        i. Fire, Fuels, Vegetation, and Forest Health,
        ii. Wildlife Habitat,
        iii. Aquatic Habitat and Stream Channel Restoration,

ANGORA FIRE RESTORATION PROJECT

Figure 1-1
General Project Location

Lake Tahoe Basin Management Unit



Legend

Angora Fire Restoration Project

0 0.25 0.5 1 Miles

For more information, contact: Lake Tahoe Basin Management Unit
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(530) 543-2600 (530) 541-4036 TTY

USDA

Source: USFS & USGS 7.5' Quad., CA: Emerald Bay, South Lake Tahoe, Echo Lake, & Freel Peak

iv. Road and Trail Delineation, and

v. Noxious Weeds Detection and Removal.

During the three phases of rehabilitation, a variety of research and monitoring activities were implemented concerning air quality, upland soils and erosion control effectiveness, stream geomorphology, water quality, and biological resources.

1.3 Overview of the Existing Condition

1.3.1 Fire, Fuels, Vegetation, and Forest Health

The Angora Fire created a mosaic of dead and live trees. Areas of moderate and high fire intensity and severity have significant tree mortality caused by the fire burning through heavy surface fuels and the crowns of trees. Fire behavior was altered and severity was reduced in areas that were treated prior to the fire with understory thinning and surface fuels reduction.

Prior to the Angora Fire, portions of the area encompassed by this project were not typical of the natural (historical) regime in terms of vegetation characteristics, fuel composition, and fire frequency, severity, and pattern. Historically, fires burned in Jeffrey pine and mixed conifer forest types within the Lake Tahoe Basin on a frequent basis (every 0 to 35 years) and were primarily of low severity. Decades of fire suppression resulted in vegetation that was highly altered from the natural condition, including increased densities, encroachment of shade-tolerant species, and large quantities of surface and ladder fuels. As a result of this landscape alteration, the fire regime changed from frequent fires of low-to-mixed severity to infrequent fires of high severity. The Angora Fire is a recent example of this shift. Approximately 60% of the Angora Fire area burned at high vegetation severity (greater than 75% basal area mortality).

The Angora Fire burned approximately 3,100 acres of Jeffrey pine and mixed conifer forest. The fire killed thousands of trees and affected forest resources such as soil and riparian and wildlife habitat. In the areas of high vegetation burn severity and much of the areas that burned at moderate severity (25–75% basal area mortality), the overall fuel loading is now low (average of less than 7 tons per acre). However, as dead trees fall, surface fuels will increase over time. This, in combination with surface grass, forb, and shrub growth, will contribute to the potential for future high fire severity (Project Record Document E1) and will affect future fire behavior and suppression capabilities.

The following conditions are expected approximately 10 years post fire if no action is taken:

- Most of the smaller diameter dead trees (less than 15 inches diameter at breast height [dbh]) would have fallen, and a few of the larger dead trees (greater than 15 inches dbh) would have fallen.
- Approximately 10 to 15 live trees per acre (tpa) would exist in some areas, mostly surviving Jeffrey pine with diameters averaging more than 20 inches dbh.
- Dead standing trees (snags) would average 80 to 120 tpa; about 10 to 20 tpa would be greater than 20 inches dbh.

- There would be some natural regeneration of conifer species averaging about 100 to 200 tpa with heights varying between 0.5 to 2 feet tall. Tree species would consist primarily of white fir or red fir.
- Shrub regeneration would occur with averages of 40–70% cover and heights of approximately 1 to 3 feet tall. Shrub species could include green leaf manzanita, whitethorn, huckleberry oak, and species of ceanothus.
- Surface fuels would average 30 to 40 tons per acre.
- Jeffrey pine would regenerate naturally only in areas that are sufficiently open and where a seed source is available. In the areas of high and moderate vegetation burn severity, there is a lack of reliable conifer seed sources due to a consumed seed bank and a lack of nearby living seed-producing trees. In higher severity burn areas, minimal to no natural regeneration of conifers would occur. On south aspects, a higher shrub component would be present, occupying about 50% of the area with a patchy distribution of mixed conifer regeneration averaging about 20 tpa. Where lodgepole pine dominated an area before the fire, natural regeneration of mainly lodgepole pine would average more than 200 tpa. Hardwood trees such as aspen, alder, and willow would benefit from the lack of conifer competition and thrive initially within some riparian areas.

The following conditions are expected approximately 20 years post fire if no action is taken:

- More snags would have fallen, adding to the downed wood fuel component. Overall, snags would amount to about 80 to 100 tpa.
- Mortality of 20–30% of the natural conifer regeneration would occur, while surviving conifer seedlings would grow to about 2 to 4 feet tall.
- Shrubs would have grown to occupy 60–70% of the area and would be about 3 to 5 feet tall.
- The increase of surface fuels over time would result in an average of about 60 tons per acre.
- Riparian species would be well established, with some lodgepole pine and white fir trees beginning to grow adjacent to riparian areas. The burn area would have reverted from mid- and late-seral forest conditions to early-seral forest conditions.

The above expected conditions were derived from field observation. In addition, stand exam data taken after the fire was used to validate the above expected conditions. It would take at least 100 years to reestablish large trees (>24 inches dbh) and at least 250 years to develop old trees with decadence features beneficial to wildlife (Project Record Document E2, Chapter 2, page 138).

Over time, the excessive (average of over 15 tons per acre) large woody debris and overall high fuel loads would increase probability of future wildland fires to burn at high severities (greater than 75% basal area mortality) and provide conditions that would make suppression of wildfires more difficult. The severity of fire effects and difficulty in fire suppression are primarily associated with the total amount of fuel available and consumed (Project Record Document E3). In other words, given the same weather and topographic conditions, areas with higher fuel loads release more energy (burn hotter), exhibit longer flame lengths, have greater potential to convert to crown fires, are more difficult to contain and suppress, kill more vegetation, and damage soils more severely than areas with lower fuel loads. A higher fire severity impacts impaired watersheds, soils, and archeological sites. Excessive small woody debris from small trees and limbs of larger trees increase a fire's rate of spread and fire line intensity, reducing the ability of firefighters to suppress the fire and increasing the ultimate fire size. Fire line construction is significantly slowed where fire lines intersect numerous large logs. This is referred to as "resistance to control" and can lead to larger fires since fire lines have to be relocated to areas of less woody debris or where tractor fire lines can be built (e.g., on flatter ridgetops).

1.3.2 Wildlife Habitat

The Angora Fire burned a dense conifer overstory, heavy loadings of downed logs, and continuous ladder fuels to the upper canopy, which allowed aspen stands to accelerate growth. Four different aspen stands were burned, totaling approximately 12 acres. Two aspen stands (TM01 [4.87acres] and Sl01 [0.55acres]) burned at a low-to-moderate vegetation burn severity level. These stands are at risk of further conifer encroachment if live conifers are not removed. Two aspen stands (ANG03 [3.5 acres] and ANG04 [2.53 acres) are located in the high vegetation burn severity areas where all vegetation was killed (see Figure 2-1 in Chapter 2, "Alternatives, Including the Proposed Action").

A California spotted owl (*Strix occidentalis occidentalis*) Protected Activity Center (PAC) (ED226), and two northern goshawk (*Accipiter gentiles*) PACs (R0519AT01 and R0519AT31) were burned in the Angora Fire. Immediately after the fire (July 1, 2007), a northern goshawk auditory detection was recorded in the moderate vegetation burn severity area in one small patch of trees and shrubs along the headwaters of Angora Creek. These birds were known to forage near this area prior to the fire, and the area may have been used after the fire for species refuge because of its proximity to the burned PAC. This area will not be included in the overall long-term restoration goal of the fire area because long-term fuel loading standards would not exceed desired conditions. The burned area no longer provides viable northern goshawk and/or California spotted owl nesting habitat.

The Forest Service delineated new PACs for northern goshawk and California spotted owl in suitable habitat outside of the burned area. These PACs, which are adjacent to the burned area, will provide potential critical nest stand structure for these species. They will also provide an opportunity to establish new territories outside of the burned area. The burned area will not provide desirable nesting habitat for these species in the foreseeable future (20 years or less).

1.3.3 Aquatic Habitat and Hydrologic Function Restoration

The section of Angora Creek that lies above the current location of the Lake Tahoe Boulevard crossing has undergone considerable change since the early 1900s. During this era, uncontrolled livestock grazing was prevalent throughout the basin, and diverting streams was a common associated practice. Stream diversion coupled with overgrazing in meadow and riparian areas resulted in channel incision and widening. Road crossings have also contributed to channel degradation due to the installation of undersized culverts. Effects from the Angora Fire exacerbated these conditions, as most of the fire resulted in a high-intensity burn, leading to widespread tree mortality and an increase in available surface and groundwater sources.

Meadow landscapes were historically prevalent throughout the South Shore area of Lake Tahoe. Land management practices, such as grazing, fire suppression, logging, road construction, and urban development (late 1890s to early 2000 era) affected the quantity and quality of meadow systems. Conifer encroachment and associated channel degradation are two common relict effects of historic management activities. The Angora Fire burned through two meadows occurring along Angora Creek and along the northwest side of Gardner Mountain (Figure 2-3 in Chapter 2, "Alternatives, Including the Proposed Action”). Although the fire killed a number of encroaching conifers, there still remains a portion of encroachment that will undoubtedly persist.

Seneca Pond is a human-made water body originally constructed in the early 1960s under private land ownership (Figure 2-3 in Chapter 2, “Alternatives, Including the Proposed Action”). Prior to pond construction, this area appears in historic aerial photos to be a wet meadow/stream environment zone (SEZ). The wetland complex functioned as an important source of groundwater recharge to Angora Creek, which both buffered water temperatures and provided perennial base flow sources in summer months. In the mid-1990s, the Forest Service undertook a pond modification project that included road decommissioning, restoration of natural drainage to one of the streams diverted into the pond, partial fill of the pond, construction of a small island, and installation of a clay liner to maintain water levels in the pond. Additionally, to maintain water flow into the pond, a perennial stream sourced from an uplands spring was diverted through a constructed ditch to the pond. This restoration stabilized the pond but left the area in a highly altered state; water is no longer available to recharge base flows in Angora Creek. In addition, Seneca Pond provides breeding, rearing, and over-wintering habitat for non-native/invasive bullfrogs, which are known to out-compete and displace native amphibians. Prior to pond construction Angora Creek and the adjacent wetlands provided habitat for native amphibian species such as Western toads.

Currently, Seneca Pond provides little hydrologic function or no water quality benefit to Angora Creek; it is not connected to the downstream channel, and the clay liner prevents groundwater recharge. Additionally, the banks of the pond are constructed of hard, packed fill that supports very little riparian vegetation. A breach in the artificial channel occurs near the spring outlet where the flow is diverted. This breach takes approximately half of the flow back to the natural drainage path, leaving the remaining flow in the artificial channel. As part of the breach, a new channel has been formed in an associated swale. This area is covered mostly with mosses and a small amount of herbaceous riparian vegetation indicating groundwater influence from the breach area.

Ecosystem benefits of this pond are minimal as the population of non-native bullfrogs precludes the colonization of native amphibian species, such as Western toad (*Bufo boreas*). Riparian vegetation (willows) grows in and along the constructed ditch that diverts water into the pond. However, because this ditch is shallow and runs slightly side-slope, this additional material makes the channel vulnerable to breaching and diversion, creating a source of upland erosion. This results in rilling of the slopes, which have potential to create flow and sediment delivery pathways to Angora Creek.

1.3.4 Roads and Trails

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. A classified road is characterized by 1 of 5 maintenance levels, depending on the level of service required. Maintenance on Level 1 roads is generally minimal and given to maintaining drainage facility and runoff patterns. Level 5 roads are generally maintained as double-lane paved facilities and have high traffic volumes and speeds with a high degree of user comfort and convenience (Project Record Document E4). There are five trail classes, ranging from the least developed (Trail Class 1) to the most developed (Trail Class 5) (Project Record Document E5). Not all classified roads are open for vehicular use by the public; some are only available for Forest Service administrative access. All other roads and trails are unclassified, though they may 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. Motorized use of unclassified roads is generally prohibited.

Currently, there is inadequate administrative access within the Angora Fire area provided by NFS roads. Throughout the project area, there is a lack of classified administrative roads for forest management (activities such as fuel reduction treatments, habitat management, fire suppression, etc.). Existing road crossings of streams are in lower capability soils. Stream crossings have widened and eroded due to poor location and inadequate flood capacity of crossing structures.

Unclassified roads and trails in the project area are in low capability soils and are eroding. Unclassified roads and trails are currently used by the public for non-motorized access to the forest. These routes have a greater erosion risk due to the lack of designed best management practices (BMPs), locations in low capability soils, and steep sections. Road and trail location signage does not exist to guide non-motorized recreation use. Roadside parking at Sawmill Pond has resulted in compacted dirt shoulders.

Some classified and unclassified roads and trails are located in SEZs, in low capability soils, and on steep slopes, impacting water quality, scenic quality, forest productivity, and recreation experience.

The mileage of classified and unclassified roads and trails is shown below in Table 1-1. Within the project area, there is a total of 5.0 miles of classified roads and 5.4 miles of classified trails while there are 3.8 miles of unclassified roads and 16.7 miles of unclassified trails.

Table 1-1. Mileage of Classified and Unclassified Roads and Trails included in Angora Restoration Project

	Classified	Unclassified
Road	5.0	3.8
Trail	5.4	16.7

1.3.5 Invasive Weeds

Species considered invasive weeds have been identified in the Lake Tahoe Noxious Weeds Working Group Memorandum of Understanding and Draft Non-Native Invasive Plant Species Management Strategy. Prior to the Angora Fire, there was only one known invasive weed site. The site, located off of Panther Lane, contained 1,500 square feet of tall white top (*Lepidium latifolium*) and was used as a safety zone during fire suppression. Tall white top has spread throughout the safety zone, and the tall white top site has expanded to approximately 30,000 square feet as a result of creation of the safety zone. Also, a small population of field bindweed (*Convolvulus arvensis*) was discovered at the Panther Lane site. Four additional invasive weed species were detected within the fire perimeter during post-fire surveys. Three of the four sites are on NFS land and include:

- Approximately 25 acres of bull thistle (*Cirsium vulgare*) have been identified throughout the entire burned area with highest densities in wet areas along streams, near springs, in aspen stands, and within meadows.
- St. Johns wort (*Hypericum perforatum*) was identified within a fen where a Forest Service (Region 5) sensitive plant species, three-ranked hump-moss (*Meesia triquetra*), occurs.

- Ox-eye daisy (*Leucanthemum vulgare*) was identified in a holding basin off Lake Tahoe Boulevard adjacent to a meadow.
- Teasel (*Dipsacus fullonum*) was also identified within the burn area on adjacent private land (outside NFS lands); this is the first occurrence of this species within the Lake Tahoe Basin.

Since 2008 both monitoring and manual treatment of invasive weeds in the burn area have occurred on Forest Service urban lots and in other general forest areas. All urban lots, trails, roads, waterways, and tributaries in the burn area were surveyed in a 2-week period. A total of 21 sites were discovered. To date, hand-pulling of invasive weeds has targeted bull thistle populations along stream, roads, trails, and in urban lots. Hand pulling of tall whitetop, St. Johns wort and ox-eye daisy is ineffective and has not been attempted in the burn area for that reason.

1.4 Desired Conditions

1.4.1 Fire, Fuels, Vegetation, and Forest Health

One goal of the restoration project is to move the area toward desired future conditions as defined by the Forest Plan, including the Sierra Nevada Forest Plan Amendment (SNFPA) (Project Record Document E6, pages 36–48). Desired conditions for defense zones (Project Record Document E6, pages 45–46) are geared toward reducing wildland fire behavior under high fire weather conditions (90^{th} percentile). They include flame lengths of less than 4 feet at the head of a fire, reductions in rate of spread at the head of the fire, reduction of hazards to firefighters by removing snags from locations likely to be used for fire suppression, and a doubling of fire line construction rates. To meet these desired conditions for defense zones, stands should be fairly open and dominated by larger, fire-tolerant trees; surface and ladder fuel conditions should reduce the likelihood of crown fire ignition; and crown fuels should be discontinuous, resulting in very low probability of sustained crown fire. Overall, average fuel loading to meet desired conditions should be less than 10 tons per acre of various size and decay classes of woody debris (see discussion under Section 1.3, "Overview of the Existing Condition"). Fuel loading within SEZs is expected to be higher and would average 15 tons per acre or less to meet desired conditions.

In a totally unmanaged forest, lightning can initiate wildfires, killing large numbers of trees. In addition, when forest stand density indices are allowed to exceed levels of about 150 square feet of basal area per acre, bark beetle populations are more likely to expand into outbreak levels, killing a large number of trees (Project Record Document E7). Under desired conditions for the LTBMU, both fire and insect populations would be managed. As evidenced by the Angora Fire, areas that were treated with thinning and surface fuel reduction prior to the fire have intact stands of living trees. Therefore, preserving what is left of these live trees and stands is important for providing larger fire-resilient trees and maintaining the aesthetics they provide.

Management of insect populations is best achieved by creating forests that have better defenses to resist insects by manipulating the stand density. The desired condition is for native insects and pathogens to function in a background role only. Under these conditions, insects and diseases act as agents of diversity. They influence forest composition, structure, and density by selectively killing or slowing the growth of some trees while affecting others to a lesser degree or not at all. They have important roles in nutrient recycling, creation of small canopy gaps, and specialized wildlife habitat.

At background levels, they coexist with host plants in a way that permits populations of each to survive.

Post-fire conditions will ultimately include an increase in bark beetle activity in the project area since remaining live trees are under stress from current drought conditions and the effects of the Angora Fire. Maintaining lower densities of remaining live trees would increase resistance to bark beetle and other insects and diseases. According to Fettig et al. (2007) optimal levels at which infestation is less likely would be approximately 70 square feet of basal area per acre. Lower densities would promote a higher chance of tree survival due to less competition for water and nutrients, thereby increasing growth and vigor (Project Record Document E7).

1.4.2 Wildlife Habitat

The desired condition for forest habitat is to provide a diversity of habitat structure, such as snags and downed wood. It is important to maintain sufficient levels of snags and downed logs while reducing fuel loads to provide diverse characteristics of forest habitat. Some dead trees left standing today may contribute in the short term to the decaying, fallen log component and would provide habitat for species such as small mammals, which in turn provide prey for other species (i.e., northern goshawk). Decomposing logs are an important element of the structural complexity of old forests, providing habitat for old-forest-dependent wildlife species and their prey and contributing to soil biomass. Meeting the desired conditions described above requires survival and growth of individual trees and forested stands over many years without the occurrence of another stand-replacing wildfire. Treating the dead and dying tree component of the landscape is the first step in reducing long-term fuel loading, thereby reducing the impacts of fires on the future forest. However, in order to meet objectives for forest structural diversity, wildlife snag zones were identified by considering terrestrial habitat conditions (both pre and post-fire) and species responses as a result of such disturbance events. See pages 2-8 and 2-9 of Chapter 2, "Alternatives, Including the Proposed Action," for a complete description of wildlife snag zones. The delineation of wildlife snag zones was necessary as a planning and analysis tool in the post-fire environment, is specific to the Angora Fire Restoration Project, and does not supersede or amend any management area designations outlined in the 1988 Land and Resource Management Plan, as amended by the 2004 SNFPA. The wildlife snag zones include a range of vegetation prescriptions (including no treatment) in order to retain snags and downed wood while meeting the purpose and need.

Riparian habitats occur along stream corridors and wetland and meadow systems. Riparian ecotypes increase wildlife habitat availability for a diverse range of species that use aspen stands for nesting, cover, and foraging areas. The desired condition for riparian habitats is to provide aspen stands and willow, alder, and wetland herbaceous vegetation types. Activities that reduce conifer encroachment of undesirable species, such as lodgepole pine in riparian corridors and meadow systems, will increase the overall acreage of these habitats.

1.4.3 Aquatic Habitat and Hydrologic Function Restoration

Stream, wetland, and meadow ecosystems within the Angora Fire area function as habitat for a diverse group of aquatic and terrestrial wildlife species and positively influence the quality and quantity of water in the fire area. In addition, the following desired conditions apply to Riparian Conservation Areas (RCAs) and have specific application to Angora Creek and its tributaries, including the meadow reach (above Lake Tahoe Boulevard), Gardner Mountain Meadow, and stream reaches that have been impacted by roads and/or trails:

- Water quality would meet the goals of the Clean Water Act (CWA) and Safe Drinking Water Act (SDWA); it would be fishable, swimmable, and suitable for drinking after normal treatment.
- Habitat would support viable populations of native and desired non-native plant, invertebrate, and vertebrate riparian and aquatic-dependent species.
- Species composition and structural diversity of plant and animal communities in riparian areas, wetlands, and meadows would provide desired conditions and ecological functions.
- The distribution and health of biotic communities in special aquatic habitats (such as springs, seeps, vernal pools, fens, bogs, and marshes) would perpetuate the unique functions and biological diversity of these habitats.
- The connections of floodplains, channels, and water tables would distribute flood flows and sustain diverse habitats.
- Soils maintain infiltration characteristics that promote diverse vegetative cover and would absorb and filter precipitation and sustain favorable conditions of stream flows.
- In-stream flows would be sufficient to sustain desired conditions of riparian, aquatic, wetland, and meadow habitats and keep sediment input and transport as close as possible to those with which aquatic and riparian biota evolved.
- The physical condition of streambanks are resistant to bank erosion processes and sustain desired habitat diversity.
- The ecological status of meadow vegetation would be late seral (50% or more of the relative cover of the herbaceous layer is late seral with high similarity to the potential natural community). A diversity of age classes of hardwood shrubs would be present and regeneration would be occurring.
- Meadows would be hydrologically functional. Sites of accelerated erosion, such as gullies and headcuts, would be stabilized or recovering. Vegetation roots would occur throughout the available soil profile. Meadows with perennial and intermittent streams would have the following characteristics:
    - stream energy from high flows would be dissipated, reducing erosion and improving water quality;
    - streams would filter sediment and capture bedload, aiding floodplain development;
    - meadow conditions would enhance floodwater retention and groundwater recharge; and
    - root masses would stabilize streambanks against cutting action.
- The wetland complex in the Seneca Pond area would provide a consistent level of groundwater recharge and improved water quality to Angora Creek, as well as improved hydrologic function and aquatic habitat.

1.4.4 Roads and Trails

The following desired conditions apply to roads and trails.

- New road segments would be used, and road segments would be constructed to provide access for forest management (activities such as fuel reduction treatments, habitat management, and fire suppression) and non-motorized recreation.
- Classified road use would be limited to administrative vehicle and over the snow vehicle (OSV) use where currently permitted.
- Vehicle access would be controlled on the new road segments from residential areas by gates and fences.
- The application of BMP measures would be implemented or improved on classified roads and trails to meet Forest Service standards necessary for water quality protection.
- Conversion of unclassified roads and trails to classified status would be considered.
- The accessibility of the transportation system would be improved by providing way-finding signage, and BMPs would be employed at the existing parking at Sawmill Pond (where there are no BMPs or such signage).

1.4.5 Invasive Weeds

Invasive weeds compete with native upland and riparian vegetation. The desired condition is to control and reduce the current weed populations, which have been exacerbated by the Angora Fire. The long-term goal is to limit spread and extent of invasive weed populations.

1.5 Purpose and Need for Action

1.5.1 Fire, Fuels, Vegetation, and Forest Health

There is a need to:

- reduce the amount of dead and downed trees that resulted from the Angora Fire, and
- reduce the density of live trees in remaining conifer stands while conserving a portion of live trees.

The purpose of removing dead trees is to reduce long-term fuel loading to reduce future fire severity. The purpose of reducing tree density (thinning live trees) is to increase the resiliency of the remaining live trees from insects, disease, and drought stress.

Meeting the desired conditions requires survival and growth of individual trees and forested stands over many years without the occurrence of another stand-replacing fire. Without removal of some of the standing dead trees, they will fall and contribute to high fuel loads in about 5 to 10 years.

1.5.2 Wildlife Habitat

There is a need to:

- remove the live, dead, and dying conifers in two aspen stands approximately 6 acres in size in order to perpetuate and increase the vigor and health of aspen stands in the burned area;

- plant aspen seedlings and/or root stems along riparian corridor(s) and along meadow edge(s) within 11 0.25-acre plots identified to establish new aspen stands in the burned area; and
- provide a diversity of terrestrial habitats for wildlife species by maintaining a level of existing snags and downed wood. The level of snags and downed wood retained would vary by prescription type in each wildlife snag zone.

The purpose of removing conifers in aspen stands is to increase the health and vigor of aspen stands in the burned area while reducing the risk of fuel loading within these stands, and to provide increased recovery of aspen stands in the Angora Fire area.

The purpose of aspen planting is to increase the distribution of aspen stands within the burned area to increase wildlife habitat availability for a diverse range of species that use aspen stands for nesting, cover, and foraging.

1.5.3 Aquatic Habitat and Hydrologic Function Restoration

There is a need to:

- restore water quality and improve hydrologic function and aquatic habitat in Angora Creek, including managing for connected floodplains, floodplain/in-channel roughness, stable streambanks, pool habitat, and riparian/wetland vegetation;
- provide meadow, wetland, and spring systems to act as natural areas for groundwater recharge (via meadow restoration in Gardner Mountain Meadow and at Seneca Pond);
- provide SEZ habitats for aquatic, wildlife, and native plant species that rely on these systems; and
- maintain or restore soil function.

The purposes of channel reconstruction, large wood placement, and meadow and wetland restoration are to:

- expedite hydrologic and geomorphic processes that result in improved water quality and aquatic habitat conditions in Angora Creek and its tributaries and adjacent to Seneca Pond ;
- minimize sedimentation from eroding streambanks;
- increase in-channel roughness to promote floodplain connectivity and improve pool habitat diversity (via large wood placement in Angora Creek); and
- improve the capacity of meadows to recharge groundwater and trap sediment (via restoration in Gardner Mountain Meadow).

1.5.4 Roads and Trails

There is a need to:

- provide a sustainable transportation system that serves Forest Service administrative needs;
- provide non-motorized public recreation opportunities;
- reduce existing impacts from classified and unclassified roads and trails on hydrologic function, water quality, and soil function;

- restore unclassified roads and trails as described in the proposed action (Chapter 2); and
- decommission classified roads and trails as described in the proposed action (Chapter 2).

The purpose is to lessen the effects of the road and trail system on water quality while providing administrative and recreation access.

1.5.5 Invasive Weeds

There is a need to:

- conduct detection surveys and early treatment of new invasive weed infestations, and
- contain and control established invasive weed infestations.

The purpose of invasive weed control is to maintain and restore ecosystem diversity by reducing competition from invasive weeds to allow the natural establishment of native plants.

1.6 Summary of the Proposed Action

From May through June 2008, the Forest Service invited initial input on restoration opportunities. Approximately 60 people attended a public open house and an additional 15 people submitted written comments or called with verbal input. Based on this input, as well as Forest Service management direction and comments from local agencies, the proposed project activities fall under five main areas of restoration. Table 1-2 summarizes the proposed activities:

Table 1-2. Summary of Proposed Action. Total project activities encompass 1,416 acres[1] of burned area NFS lands, which includes all restoration activities below. Project activities occur within the 1,398 acres and 13 acres of Gardner Mtn. Meadow Restoration, as well as approximately 5 acres of road and trail activities that are outside of the other treatment activity boundaries. Specific acres of activities are shown below. Overall, the untreated portion of the burned area where specific project activities do not occur equals 1,284 acres. The untreated acreage is further broken down by 116 acres in the urbanized portion of the fire perimeter (i.e., streets and homes) and 1,168 acres NFS lands.

Areas of Restoration	Summary of Major Activities	Purpose
Fire, Fuels, Vegetation, and Forest Health and Wildlife Habitat (up to 1,398 acres)	• Remove standing and downed dead trees and live tree thinning - up to 1,398 acres. • Plant aspen (2.75 acres) and conduct thinning in aspen stands (6 acres). • Manage for 220 acres of wildlife snag zones spread across the tree cutting and thinning areas, a total of 12 zones within the 12 project stands. There are 5 zones of “Leave” prescription (87 acres), 4 zones of “Leave/Plant” (56 acres), 1 zone of “Modify/SEZ” (39 acres), and 2 zones of “Modify/Subdivision” (38 acres). This totals 77 acres of modified treatment and 143 acres of no tree cutting. (See Figure 2-1 and Section 2.3.1.)	• Reduce future wildfire risk and restore habitat. • Manage wildlife leave islands. • Prioritize areas near neighborhoods for treatment.
Aquatic Habitat and Hydrologic Function	• Restore 1,200 feet of Angora Creek floodplain. • Restore Seneca Pond. • Place large woody debris on 2 miles of stream. • Restore Gardner Mountain Meadow (13 acres conifer thinning and stream channel grade control).	• Reduce erosion and sedimentation. • Improve natural wetland conditions. • Restore fish habitat. • Recharge groundwater and trap sediment.

[1]The EA includes 12 stands totaling approximately 1,541 acres. This included all restoration activities except for 13 acres of Gardner Mountain meadow restoration and 5 acres of road and trail activities. However, this number did not originally subtract the wildlife snag zones where no tree cutting occurs (143 acres). Therefore, 1,541 + 13 +5 – 143 = 1,416 acres.

Areas of Restoration	Summary of Major Activities	Purpose
Roads and Trails	• Restore/Decommission 16.7 miles of trail. • Construct 8.9 miles of trail. • Restore/Decommission 1.9 miles of road. • Construct 6.4 miles of road.	• Reduce impacts from local uncontrolled recreational use. • Upgrade recreational route access. • Move roads and trails out of SEZs. • Improve access for fuels/vegetation management and fire suppression. • Utilize existing transportation access. • Restore drainage and soil functions.
Invasive Weed Detection and Removal	Survey and remove weeds.	• Contain, control, and/or eradicate the occurrences of invasive non-native weed species.

1.7 Management Direction

The Forest Plan, as amended, provides direction for ecosystem restoration following catastrophic events. These restoration activities are included in all land allocations and call for managing disturbed areas to achieve long-term fuels profiles (decreased fuel loading and resiliency to wildfire) and restoring habitat (2004 SNFPA ROD, Project Record Document E6). Forest Plan land allocations (through SNFPA) within the Angora Fire boundary are defense zones[2] and RCAs adjacent to perennial, seasonal, and ephemeral streams. In addition, several neighborhoods surround the burned area boundary, and there are multiple points for recreational access to administrative roads and recreational trails.

Although not binding in terms of approved management direction, the Emergency California–Nevada Tahoe Basin Fire Commission Report (May 2008) recommended that the LTBMU undertake steps to facilitate the removal of burned trees (pages 45, 95). This recommendation includes conducting multi-agency collaboration that would expedite such actions because priority areas for removing burned trees are within the WUI Defense Zone. (Project Record Document E9.) The Angora Fire Restoration Project would carry out the necessary planning in accordance with NEPA to be consistent with applicable laws, regulations, and policies.

The 2004 SNFPA incorporates the aquatic management strategy (AMS) to restore aquatic systems and associated wildlife habitats as a fundamental component (Appendix A of Project Record Document E8). The basic principle of the AMS is to retain, restore, and protect the processes and landforms that provide habitat for aquatic and riparian-dependent organisms while producing the highest levels of water quality. Key elements of the AMS include attainment of specific AMS goals,

[2]A defense zone is generally defined as a buffer close to communities, areas with higher densities of residences, commercial buildings, and/or administrative sites with facilities (Project Record Document E6, page 40).

watershed restoration, riparian area designation and management, standards and guidelines to maintain natural watershed processes and mitigate management effects, and development and implementation of monitoring and adaptive management programs.

AMS goals target and provide management direction for the following areas important to ecosystem function:

- **Water Quality:** Improve water quality to meet goals of the CWA and SDWA, providing water that is fishable, swimmable, and suitable for drinking after normal treatment.
- **Wildlife Species Viability:** Maintain and restore habitat as a means to restore and maintain wildlife species viability.
- **Plant and Animal Community Diversity:** Maintain and restore species composition and structural diversity of plant and animal communities in riparian and meadow settings and provide desired habitats and ecological functions.
- **Special Habitats:** Provide self-sustaining habitat for species dependent on unique habitat areas, such as springs, seeps, vernal pools, and fens.
- **Watershed Connectivity:** Maintain and restore connectivity within and between watersheds to provide for unobstructed movement for survival, migration, and reproduction of wildlife species.
- **Floodplains and Water Tables:** Maintain and restore the connections of floodplains, channels, and water tables to distribute flood flow and sustain the diverse habitats that result from flooding processes.
- **Watershed Conditions:** Maintain and restore favorable soil and vegetative conditions to absorb and filter precipitation and regulate runoff to sustain favorable streamflow conditions.
- **Streamflow Pattern and Sediment Regime:** Maintain and restore streamflows sufficient to sustain desired conditions for riparian, aquatic, wetland, and meadow habitats, and keep sediment regimes as close as possible to those with which aquatic and riparian biota evolved.
- **Streambanks and Shorelines:** Maintain and restore the physical structure and conditions of streambanks and shorelines to minimize erosion and sustain desired habitat diversity.

The LTBMU has designated RCAs where management is directed toward preserving, enhancing, and restoring habitats in riparian and meadow settings. The AMS calls for analysis of RCAs and development of Riparian Conservation Objectives (RCOs) for evaluating prescriptions to determine if an existing or proposed land use activity is consistent with the desired conditions of the AMS goals.

1.8 Decision Framework

The decision to be made by the Forest Supervisor (responsible official) on NFS lands is two-fold:

1. Whether to implement the proposed action, take action through an alternative combination of activities, or take no action at this time, and
2. Provide sufficient evidence and analysis for determining whether to prepare an environmental impact statement or a finding of no significant impact (FSH 1909.15, Chapter 41.1).

This decision does not include or incorporate specific project activities found in other NEPA documents that have project areas that either overlap or are immediately adjacent to the Angora Fire area. Such projects include: Angora Reforestation CE, South Shore Fuels Reduction and Healthy Forest Restoration, Fallen Leaf Lake Trail Access and Travel Management, Angora-Twin Peaks Access and Travel Management, Terrestrial Non-Native Invasive Plant Species Treatment, Angora Hazard Tree Removal Project, and the Urban Lot EA (Vegetation, Fuels, and Watershed Management). These projects further complement work being proposed in this EA.

1.9 Public Involvement

From May through June 2008, the Forest Service invited initial input on restoration opportunities. Approximately 60 people attended a public open house, and an additional 20 people submitted written comments or called with verbal input. Based on this input, as well as the LTBMU Forest Plan as amended, and comments from local agencies, the Forest Service developed the proposed action, which reflects many concerns of individuals, agencies, and organizations that care deeply about the future of the Angora project area and Lake Tahoe. The proposed action reflects five main areas of restoration. In addition, the proposed action contains numerous highly detailed project design features that address resources and in some cases minimize or avoid adverse impacts of the restoration work. Of particular note are the project design features for protection of wildlife habitat and the design for roads and trails to minimize soil and hydrologic effects. By conducting this rigorous and collaborative pre-project public involvement, the Forest Service was able to prepare and present a proposed action that focuses the project on activities important to the local community and proactively addresses important environmental concerns.

As part of the public involvement process, and as required by management direction, the agency subjected the initial meadow restoration project design to a peer review.

The proposal was listed in the Schedule of Proposed Actions on April 1, 2008 and has been available via the Forest Service website (http://www.fs.fed.us/r5/ltbmu/) and navigate to "Land and Resources Management" and search under "Projects"). The proposal was provided to the public and other agencies for comment during scoping, which began on February 11, 2009. The scoping letter and proposed action document were also available for public review on the Forest Service website (http://www.fs.fed.us/r5/ltbmu/angora-fire/Angora_Restoration/). Public scoping included a public meeting held on March 3, 2009, at the Inn by the Lake in South Lake Tahoe. Thirty-nine scoping letters were mailed or hand-delivered to interested parties requesting comments for consideration in the Angora Fire Restoration Project by March 13, 2009. Additionally, public notices were placed in the *Tahoe Daily Tribune* on February 18, 2009, notifying readers of the public meeting and where to go for more information. Copies of these notices are on file (Project Record Document C1).

In addition to this public outreach, from December 2008 through April 2009 meetings to discuss the project proposal and address any specific comments and concerns were held with representatives from the Tahoe Regional Planning Agency (TRPA), Lahontan Water Board, League to Save Lake Tahoe, Sierra Forest Legacy, South Lake Tahoe Chamber of Commerce, South Lake Tahoe City Council, and El Dorado County. A description of these meetings is included in the project file (Project Record Document C2).

In response to the scoping request, 25 comments were received, summarized, and responded to in a Scoping Summary Report (Project Record Document C3).

The EA was published on March 10, 2010, and widely circulated for a 30-day comment period. Ten comments were received on the EA. The responses to the comments will be prepared as an appendix to the Decision Notice.

1.10 Issues

The Forest Service separated the issues into three groups: 1) non-significant issues, 2) significant issues considered but eliminated from detailed study, and 3) significant issues leading to an alternative to the proposed action. The Council on Environmental Quality (CEQ) NEPA regulations require this delineation in Sec. 1501.7, "…identify and eliminate from detailed study the issues which are not significant or which have been covered by prior environmental review (Sec. 1506.3)…" The Scoping Summary Report (Project Record Document C3) fully discloses the comments and their categories and includes a list of non-significant issues and reasons regarding their categorization as non-significant.

- **Non-significant issues** (Category 1) do not meet the purpose and need for the project; are outside the scope of the proposed action; are already decided by law, regulation, or Forest Plan; are not supported by scientific evidence; are addressed by project design features; or are addressed by additional information or clarification of the proposed action. Non-significant issues also represent opinions and statements that do not present problems or alternatives. Numerous comments were received. Most of these were requests to the Forest Service to discuss and disclose specific items in the environmental document. None of these comments necessitated development of an alternative to the proposed action.
- **Significant issues considered but eliminated from detailed study** (Category 2) meet the purpose and need for the project but were considered in alternatives already studied and eliminated, or additional project design features were developed which reduced or eliminated the effects. The public comments revealed concerns regarding the locations of proposed trails, the impacts to wildlife habitat from the proposed action, the potential recreational impacts from the proposed treatments for Seneca Pond, and climate change. These areas of concern did not lead to the development of an alternative considered in detail (see below) since they were addressed in the development of the proposed action. See Chapter 2 for a discussion of alternatives considered but eliminated from detailed analysis. Specific comments regarding the locations of proposed trails, the impacts to wildlife habitat from the proposed action, the potential recreational impacts from the proposed treatments for Seneca Pond and climate change were addressed by both overall project design and identification of specific design features within the proposed action. For instance, comments received regarding specific alternate trail locations were addressed by adjusting trail location where appropriate to meet the purpose and need and public concern. Concerns regarding wildlife habitat impacts were addressed by incorporating areas where snags and downed wood are managed at higher levels and incorporation of aspen restoration in order to achieve multi-species needs. In addition, concerns regarding recreation impacts from restoring Seneca Pond to a wetland complex were addressed by ensuring continued public access via trail systems and incorporating restoration elements that provide for a quality recreation experience. Concerns regarding climate change

were addressed by overall project design by creating long term, sustainable terrestrial and riparian vegetation conditions.

- **Significant issues** (Category 3) meet the purpose and need for the project and are significant in the extent of the geographic distribution, the duration of effects, or the intensity of interest or resource conflict and therefore merit consideration for the development of an alternative to the proposed action. None of the concerns raised during the scoping process were identified as being significant to the extent that they merited the full development of an alternative to the proposed action.

1.11 Applicable Laws, Regulations, and Policies

All resource management activities described and proposed in this document would be implemented to the extent that they are consistent with applicable federal law, USDA regulations, Forest Service policies, and applicable provisions of state law. The major applicable laws are as follows:

1.11.1 National Forest Management Act

The National Forest Management Act (NFMA) requires the development of long-range land and resource management plans. The Forest Plan was approved in 1988 as required by this act. It has been amended several times, including in the SNFPA (Project Record Document E8). The Forest Plan provides guidance for all natural resource management activities. The NFMA requires that all projects and activities be consistent with the Forest Plan. The Forest Plan has been reviewed in consideration of this project, and the design of the Angora Fire Restoration Project is consistent with the Forest Plan. The Final EA (Appendix C) provides a piece of the Forest Plan consistency check/ analysis associated with riparian conservation objectives associated with the 2004 SNFPA. A Forest Plan consistency matrix and review for this project was completed (Project Record Document B1).

1.11.2 Endangered Species Act

In accordance with Section 7(c) of the Endangered Species Act, the U.S. Fish and Wildlife Service (USFWS) list of "endangered and threatened species that may be affected by Projects in the Lake Tahoe Basin Management Area" (updated on January 29, 2009) was reviewed (Project Record Document E12).

1.11.3 National Historic Preservation Act

Section 106 of the National Historic Preservation Act (NHPA) requires federal agencies to take into account the effect of a project on any district, site, building, structure, or object that is included in, or eligible for inclusion in, the National Register of Historic Places. Surveys were conducted for Native American religious or cultural sites, archaeological sites, and historic properties or areas that may be affected by this project (Project Record Document E13). Compliance with the NHPA was achieved through the use of the USDA Forest Service Region 5 and California State Historic Preservation Officer (SHPO) Programmatic Agreement (2001) regarding compliance with Section 106 of the NHPA. There was a no effect determination made with the use of standard resource protection measures, so consultation with SHPO was not required as described in the Programmatic Agreement.

1.11.4 Clean Water Act (Public Law 92–500)

All federal agencies must comply with the provisions of the CWA, which regulates forest management activities near federal waters and riparian areas. The design features associated with the proposed action ensure that the terms of the CWA are met, primarily prevention of pollution caused by erosion and sedimentation.

1.11.5 Clean Air Act (Public Law 84–159)

Forest Service managers follow specified provisions for smoke management whenever fire is prescribed for pile and understory burning. The following documents provide Forest Service managers with the guidance and direction for smoke management to protect air quality: 1) Interim Air Quality Policy on Wildland and Prescribed Fires, issued by the Environmental Protection Agency in 1998; 2) Memorandum of Understanding between the California Air Resources Board (CARB) and the USDA Forest Service, signed on July 13, 1999; and 3) Smoke Management Guidelines in Title 17 of the Code of Federal Regulations.

The project area lies within the Lake Tahoe Air Basin and the El Dorado Air Quality Management District. As a matter of regional policy, a smoke management plan would be submitted to and approved by El Dorado Air Quality Management District, who would issue a burn permit to the LTBMU prior to any burning that would occur within the project area. Several communities lie near the areas where both pile and prescribed burning is proposed to occur. Adherence to the smoke management plan for pile and understory burning would reduce negative impacts to communities. By adhering to a smoke management plan approved by the LTBMU Forest Supervisor and the El Dorado Air Quality Management District, particulate matter emissions from pile or understory burning would not violate California Ambient Air Quality (CAAQ) emission standards. Dust abatement applies to mechanical fuel reduction and channel restoration activities and would be accomplished by applying water or chip material to roads, and landings, at a frequency that would control dust.

1.11.6 United States District Court, Eastern District of California Ruling – 11/4/09

On November 4, 2009 Judge Morrison C. England issued a Memorandum and Order requiring that fuels projects that are under the 2004 Sierra Nevada Forest Plan Amendment and were not approved prior to November 4, 2009 must include a detailed consideration of a noncommercial funding alternative. The Angora Restoration Project is compliant with this order because the proposed action represents a noncommercial funding alternative as described in the Court Order. Implementation of the proposed action is not based, nor does it depend on, the commercial sale of wood fiber (e.g., saw timber, fuelwood, and/or biomass). The prescriptions for dead tree removal and live tree thinning are based solely on fuels and forest health objectives as described in Chapter 2 and not on any value in the products removed. It is not an objective of the Angora Restoration Project to generate revenue (see Section 1.5, Purpose and Need for Action). However, this does not mean that wood fiber products will not be sold as a spin-off of project operations. Due to the fact that the burned trees have experienced deterioration since the fire occurred, it is expected that removed materials in this project would consist primarily of biomass and fuelwood. These materials are normally removed through service contracts. Should markets exist at the time of implementation for wood fiber products, the Forest Service may elect to dispose of project generated fuels via sale to meet the ecological goals of the project.

1.11.7 Environmental Justice (Executive Order 12898)

Executive Order 12898 requires that all federal actions consider potentially disproportionate effects on minority and low-income communities, especially if adverse effects to environmental or human health conditions are identified. Adverse environmental or human health conditions created by any of the alternatives considered would not affect any minority or low-income neighborhood disproportionately.

The activities proposed in all alternatives were based solely on the existing and desired condition of the vegetation, sensitivity of the environment, and practical treatment access in response to the purpose and need. In no case was the treatment prescription design based on the demographic makeup, occupancy, property value, income level, or any other criteria reflecting the status of adjacent non-federal land. Federally owned lands proposed for treatment are distributed throughout the project area and are intermixed with non-federal lands. Reviewing the location of the proposed treatments in any of the alternatives in relationship to non-federal land, there is no evidence to suggest that any minority or low-income neighborhood would be affected disproportionately. Conversely, there is no evidence that any individual, group, or portion of the community would benefit unequally from any of the actions in the proposed alternatives.

1.11.8 Migratory Bird Treaty Act of 1918 as amended (16 USC 703-712)

The original 1918 statute implemented the 1916 Convention between the United States and Great Britain (for Canada) for the protection of migratory birds. Later amendments implemented treaties between the United States and Mexico, Japan, and the Soviet Union (now Russia). Specific provisions in the statute include the establishment of a federal prohibition, unless permitted by regulations, to "pursue, hunt, take, capture, kill, attempt to take, capture or kill, possess, offer for sale, sell, offer to purchase, purchase, deliver for shipment, ship, cause to be shipped, deliver for transportation, transport, cause to be transported, carry, or cause to be carried by any means whatever, receive for shipment, transportation or carriage, or export, at any time, or in any manner, any migratory bird, included in the terms of this Convention…for the protection of migratory birds…or any part, nest, or egg of any such bird." Because forestlands provide a substantial portion of breeding habitat, land management activities within the LTBMU can have an impact on local populations. The Angora Fire Restoration Project would not adversely impact any populations or habitat of migratory birds (Project Record Document E14).

1.11.9 Invasive Species, Executive Order 13112 of February 3, 1999

This EA covers botanical resources and noxious weeds. The project's design features are designed to minimize risk of new weed introductions.

1.11.10 Recreational Fisheries, Executive Order 12962 of June 6, 1995

The effects to fish habitat from the project are expected to be positive, as channel restoration will improve habitat and impacts to the aquatic environmental from the Angora Fire will be reduced. This project is consistent with this Executive Order.

1.11.11 Floodplain Management, Executive Order 11988 of May 24, 1977, and Protection of Wetlands, Executive Order 11990 of May 24, 1977

These executive orders provide for protection and management of floodplains and wetlands. Compliance with these orders will be ensured by incorporating the project riparian management objectives and adhering to the project design features, including the implementation of BMPs.

1.11.12 Special Area Designations

There are no specially designated areas that would be affected by the Angora Fire Restoration Project (e.g., Research Natural Areas, Inventoried Roadless Areas, Wilderness Areas, and Wild and Scenic Rivers).

1.11.13 Local Agency Permitting Requirements and Coordination

The TRPA and California Regional Water Quality Control Board, Lahontan Region (Lahontan Water Board) have determined that the vegetation management and fuels reduction actions in this project qualify under the terms of their *Memorandum of Understanding (MOU) for Vegetation Management* (2009) for TRPA to serve as the single regulatory agency. This project also qualifies under the Memorandum of Understanding between TRPA and Forest Service (2009) regarding Fuels Reduction and Forest Health Projects. TRPA's involvement will be guided by the conditions set forth in the TRPA-FS MOU.

CEQA applies to discretionary projects to be carried out or approved by public agencies. The Lahontan Water Board's process to grant a conditional waiver of waste discharge requirements on NFS lands is a discretionary act subject to CEQA. Prior to approving a project, the Lahontan Water Board must certify that: (1) the environmental document has been completed in compliance with CEQA; (2) that the Lahontan Water Board has reviewed and considered the information contained in the environmental document; and (3) that the environmental document reflects the Lahontan Water Board's independent judgment and analysis (Cal. Code Regs., tit. 14, § 15090.) The Angora Restoration project is a water quality improvement project due to stream, meadow, wetland, and riparian restoration activities along with road and trail improvements bringing them up to water quality standards. Restoration of aspen as well as thinning and fuel reduction activities are long term improvements to the sustainability and resiliency of watershed condition and function.

Permits will be obtained to comply with Sections 401 and 404 of the CWA through the Lahontan Regional Water Quality Control Board and the U.S. Army Corps of Engineers for stream and wetland restoration and road and trail activities that area not associated with vegetation and fuel reduction activities (as described above). The degree of permitting would be known by the time of the decision by the Forest Supervisor.

An application will be submitted to TRPA and Lahontan Water Board for project activities (between October 15 and May 1st) that trigger a grading exemption.

Permits would be required from the El Dorado Air Quality Management District prior to prescribed burning.

Chapter 2
Alternatives, Including the Proposed Action

Chapter 2
Alternatives, Including the Proposed Action

This chapter describes the alternatives considered for the Angora Fire Restoration Project, including alternatives considered but dismissed from detailed analysis, the no-action alternative, and the proposed action.

2.1 Alternatives Considered but Dismissed from Detailed Analysis

The results of scoping identified significant issues that did not merit full development and analysis of an alternative to the proposed action (see Chapter 1, Section 1.10). The Forest Service evaluated these issues to ensure that they were adequately addressed in the proposed action. This section discusses the major issues raised during public scoping and how the proposed action addressed them or how the proposed action was slightly modified to address such issues. These modifications are within the scope and intent of the proposed action and also meet the purpose and need; therefore, they do not lead to an alternative that requires full analysis.

1. **Wildlife Habitat Management:** There were concerns that the proposed action is not responsive to or would create significant impacts on wildlife habitat. The protection of existing wildlife habitat and the long-term enhancement of wildlife habitat were primary needs that the Forest Service considered in designing the proposed action, and it is highly responsive to these needs.
    a. There is acknowledgement of the effects of the fire on the dense coniferous forest habitat, aspen stands, and important wildlife features such as PACs (Project Record Document C4, page 5).
    b. There is acknowledgement that the desired condition is to provide for adequate levels of snags and downed logs and a diversity of habitat (including burned forests) (Project Record Document C4, pages 9 and 10). The proposed action was developed to create these desired conditions. The proposed action also acknowledges a need to "Provide a diversity of terrestrial habitats for wildlife species by maintaining a level of existing snags and downed wood…" (Project Record Document C4, page 12).
    c. The proposed action includes the following specific items:
        i. Establish approximately 220 acres of wildlife snag zones (see Wildlife Snag Zones section in Section 2.3.1). Approximately 56 acres would be reforested to expedite recovery of wildlife habitat. Wildlife snag zones occur in 12 separate large stands scattered across the landscape, representing a diversity of elevations and slope locations. Areas not reforested would recover through natural processes and would provide extensive habitat over the long-term to animal species that are dependent on specific characteristics of this habitat (dead trees for insect populations, roosting, and perching; dead and downed logs and other woody material; etc.). See Figure 2-1.
        ii. Remove dead trees and competing live conifers in aspen stands. Plant aspen in areas outside of current extent to promote an increase in stand distribution. Aspen

management has a primary goal of encouraging long term establishment of this species.

iii. Leave untreated habitat on approximately 1,168 acres of the burned area, providing burned forest habitat type in across low-, moderate-, and high-severity burn conditions. (Project Record Document C4, pages 18 and 19).

iv. To further provide snag habitat, in the approximately 1,398 acres where fuel removal would occur, leave standing an average of four of the largest snags per acre and approximately seven downed logs per acre (Project Record Document C4, pages 15 and 16).

2. **Trails:** The public suggested that trails be added to the proposed action. This list addresses specific suggestions:

   a. Consider adding the trail from the east side of Angora Lake toward Seneca Pond. This trail was considered for the trail system but was dropped due to erosion potential from steep slopes and crossings of numerous SEZs. It would also conflict with the existing uses on Angora Road (e.g., parking, vehicle traffic). A new trail location was considered, but this would increase the user demand for this area beyond its current capacity and is beyond what is feasible to maintain in the future.

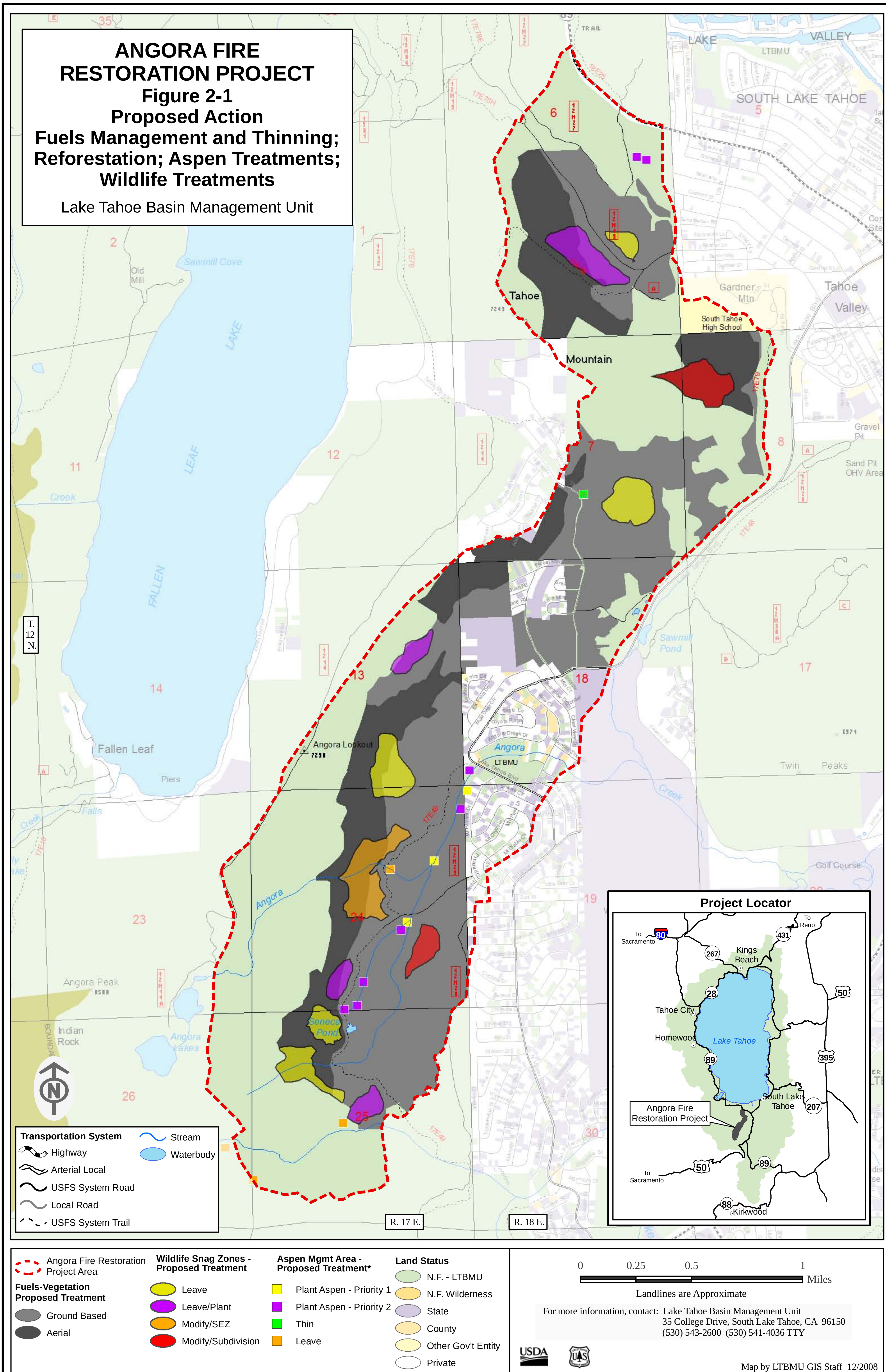
   b. Retain the original stub road as a trail from Angora Creek Road down to the creek. Due to the location within a SEZ and water quality concerns, this trail is not in a good location for resource protection. This stub would be decommissioned.

   c. Consider additional non-motorized use to accommodate increased visitor use. The Forest Service carefully considered the increasing public use as part of the overall South Shore recreational needs, including facility (i.e., trailhead parking) capacity and relationship to the ongoing trail planning efforts such as the Angora Twin Peaks Access Travel Management Plan and the Fallen Leaf Access Travel Management Plan. These considerations are already reflected in the proposed action for the Angora Project.

   d. Consider a trail from the top of Tahoe Mountain Road where it meets Glenmore Way down to Forest Mountain Road, to accommodate non-motorized, year-round recreational use. Through a combination of new trail construction and the adoption/reconstruction of a portion of unclassified existing trail, there will be a trail link from Deveron Way to the intersection of Tahoe Mountain Road and Forest Mountain Road. This proposed alignment will be roughly 2 miles in length and will provide additional trail link and loop opportunities to adjacent trail systems. Due to the soil characteristics and steep slopes involved, it is not feasible to create a trail link parallel to Tahoe Mountain Boulevard between Glenmore Way and Forest Mountain Road.

   e. Consider including spur trails to streams to allow viewing of stream areas and associated plant and animal habitats. The Forest Service has considered trail use, its relationship to SEZs, and the impacts to water quality and other ecological issues to minimize impacts. The proposed action would provide direct access across the transportation network. New spur trails would not be created as a result of this, but individuals are not prohibited from accessing SEZs of their own accord.

   f. Consider including non-motorized trails that go up the hill to Angora Lakes. New trails in this area were not considered due to the very steep slopes, associated erosion potential, and


ANGORA FIRE
RESTORATION PROJECT
Figure 2-1
Proposed Action
Fuels Management and Thinning;
Reforestation; Aspen Treatments;
Wildlife Treatments
Lake Tahoe Basin Management Unit
Fallen Leaf
Lake
Sawmill Cove
Old Mill
Piers
Falls
Creek
Angora
Angora Peak
Angora Lakes
Indian Rock
Angora Lookout
Seneca Pond
Sawmill Pond
Tahoe
Mountain
Gardner Mtn
South Tahoe High School
SOUTH LAKE TAHOE
Tahoe Valley
Gravel Pit
Sand Pit OHV Area
Twin Peaks
Golf Course
LTBMU
T. 12 N.
R. 17 E.
R. 18 E.
Transportation System
Highway
Arterial Local
USFS System Road
Local Road
USFS System Trail
Stream
Waterbody
Project Locator
To Sacramento
To Reno
Kings Beach
Tahoe City
Homewood
Lake Tahoe
South Lake Tahoe
Angora Fire Restoration Project
Kirkwood
Angora Fire Restoration Project Area
Fuels-Vegetation Proposed Treatment
Ground Based
Aerial
Wildlife Snag Zones - Proposed Treatment
Leave
Leave/Plant
Modify/SEZ
Modify/Subdivision
Aspen Mgmt Area - Proposed Treatment*
Plant Aspen - Priority 1
Plant Aspen - Priority 2
Thin
Leave
Land Status
N.F. - LTBMU
N.F. Wilderness
State
County
Other Gov't Entity
Private
0 0.25 0.5 1 Miles
Landlines are Approximate
For more information, contact: Lake Tahoe Basin Management Unit
35 College Drive, South Lake Tahoe, CA 96150
(530) 543-2600 (530) 541-4036 TTY
USDA
Map by LTBMU GIS Staff 12/2008

frequency of maintenance over the long term. Current access to Angora Lakes can be gained via Angora Ridge Road and the 12N14A trailhead.

3. **Reduced Removal of Snags:** There were concerns that the proposed action would remove snags that are not necessary to meet the purpose and need. The following alternative was considered: leaves all snags >16 inches in diameter except where they pose an imminent health and safety hazard to forest users and works. An analysis was conducted to compare the amounts of downed fuel that would accumulate in three time frames: immediately after project implementation, 20 years after project implementation, and 50 years[1] after project implementation. These values were compared with the desired conditions that are described in Chapter 1. In summary, these desired conditions are: reducing wildland fire behavior under high fire weather conditions (hot, dry summer days), including flame lengths of less than 4 feet at the head of a fire; reducing the rate of spread at the head of the fire; reducing hazards to firefighters by removing snags from locations likely to be used for fire suppression; and doubling fire line construction rates. To meet these desired conditions for defense zones, average fuel loading should be less than 10 tons per acre of various size and decay classes of woody debris (see discussion under Section 1.3, "Overview of the Existing Condition"). The desired conditions are responsive to the need to ensure that fuel loadings do not create potential wildfire behavior conditions such that fire severity is excessive or that fire suppression activities are ineffective or compromised in protecting communities or wildlife and watershed values.

   The analysis of residual fuel loadings if dead trees >16 inches dbh were left (Project Record Document E20) revealed that fuel loadings would not meet the desired conditions over time as all of the remaining dead trees fall after project implementation (36 tons per acre, weighted) and hence would not meet the desired conditions (10-15 tons per acre) nor would this alternative meet the purpose and need of reducing long-term fuel loadings (see discussion under Section 1.5.1, "Fire, Fuels, Vegetation, and Forest Health"). In addition, leaving dead trees >16 inches dbh would leave approximately 31 downed logs per acre, which would reduce fireline construction rates. This condition also would not meet the purpose and need. A study by Brown et al. (Project Record Document E179) acknowledges that leaving high amounts of coarse woody debris leads to high or even severe resistance-to-control. The predicted fuel loading if all trees >16 inches dbh were left at 36 tons per acre would lead to high or even extreme resistance-to-control, which would mean slow work for line construction by dozers and hand crews and difficulty in holding control lines. These conditions would not meet the desired conditions for defense zones immediately adjacent to communities.

2.1.1 Changes to the EA and Proposed Action from Comments

Seneca Pond

There were comments regarding the potential for Seneca Pond to be lost as a highly regarded recreational destination spot for local residents, including the loss of a swimming location for youth and pets. The Forest Service recognizes that the use of this area, primarily for swimming, would be lost if the site were converted to a functioning wetland. However, the site is not specifically

[1] The 50-year timeframe was provided in modeling for this suggested alternative, but was not relevant to the analysis in this EA as a 20-year projection was used.

managed for swimming, fishing, or other water recreation activities. Recreational access to the area would be maintained by continuing to provide hiking trails, and access to water for pets would be tied to streams. None of the comments concerning Seneca Pond warranted an additional alternative beyond what is described in the no-action alternative. Based on the public comments, it is further clarified in the proposed action that the restoration of Seneca Pond would be implemented in a deliberate and phased approach so that the public could easily see the results of the management activities as they unfold over time.

Climate Change

There were concerns regarding how the EA quantified, analyzed, and determined the project's contributions to greenhouse gas emissions. An analysis of the project's creation of greenhouse gases (GHG) and contribution to potential climate change are now disclosed in Chapter 3.11. None of the comments concerning climate change warranted an additional alternative beyond what is described in the no-action alternative.

2.2 Alternative 1—No Action

Under this alternative, no ecological restoration actions would take place, and there would be no changes to the locations of existing roads and trails systems. The currently approved activities would continue. These activities include management of vegetation and fuels on Forest Service urban lots, the removal of hazard trees along classified roads and trails, hand pulling of invasive weeds, and road and trail maintenance operations. Existing miles of classified and unclassified roads and trails in the project area are shown in Table 2-1.

Table 2-1. Existing Mileage of Classified and Unclassified Roads and Trails included in Angora Fire Restoration Project

	Classified	Unclassified
Road	5.0	3.8
Trail	5.4	16.7

2.3 Alternative 2—Proposed Action

2.3.1 Description of the Proposed Action

This section describes the proposed action for the Angora Fire Restoration Project. The acres and distances provided are estimates based on surveys and GIS mapping information. The estimated acres recommended under the proposed action for tree removal are the maximum that would be considered. Actual figures may be less when implemented but would not exceed the stated acreages discussed below.

Fire, Fuels, Vegetation, and Forest Health

Approximately 1,800 acres of the Angora Fire area was initially included for fuels treatment within the South Shore Project prior to the fire. Approximately 20% of the fire area burned at low severity (less than 25% basal area mortality) and was beneficial in reducing surface fuels, including some of those stands identified for fuels reduction treatment. The fire did not result in reduction of fuels sufficient to meet the desired conditions in all of these stands. There are approximately 325 acres of fuels treatments included in the South Shore project that are within the Angora Fire perimeter that burned at low severity or did not burn.

Treatments to reduce future fuel accumulation would provide an environment where natural disturbance regimes could retain or reestablish some of their historical influence in maintaining the diversity and productivity of regional landscapes (see Figure 2-2 for treatment stand boundaries). This part of the proposed action includes two groups of activities to meet the purpose and need for areas where the fire burned at moderate-to-high severities:

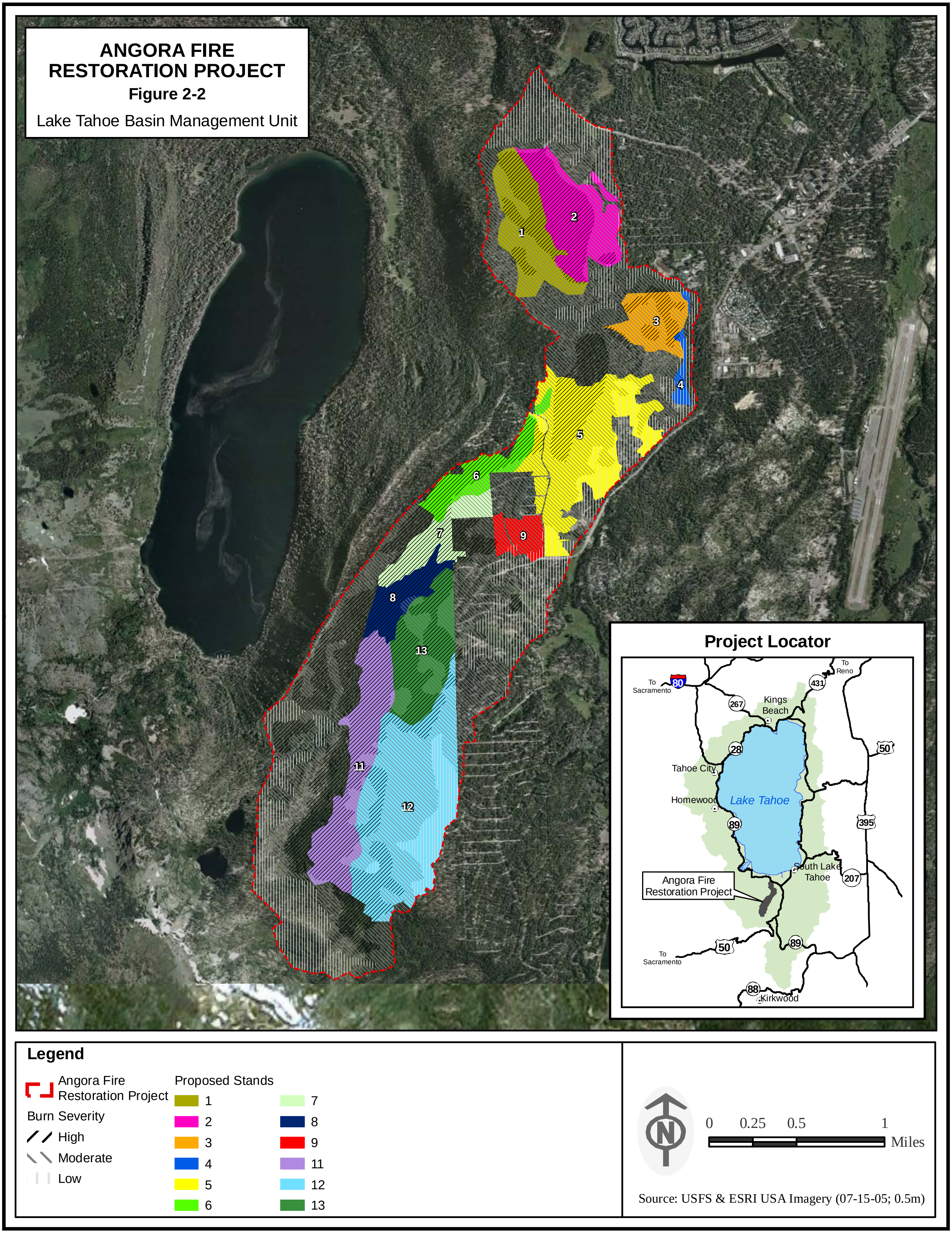
1. Fuel removal of standing dead and downed wood with thinning of live trees, based on desired residual basal area of 80 square feet per acre, to improve residual tree vigor.
2. Construction of new roads and landings to facilitate fuel removal. Reconstruction or opening of existing roads, trails, and landings to facilitate fuel removal.

Post-fire fuel removal would occur over approximately a 3-year period primarily in moderate- to high-severity burn areas. This fuel removal would encompass up to 1,398 acres within the project area (see Figure 2-1). Maintaining lower stand densities would improve growth and vigor of the residual trees, increasing their resistance to insects and diseases. Equipment used for removal may include chainsaws, harvesters, feller-bunchers, forwarders, skidders, de-limbers, chippers, masticators, de-barkers, helicopters, and other tracked or rubber-tired equipment. In lieu of "traditional" ground-based machinery such as tractors or rubber-tired skidders, the Forest Service intends to emphasize the use of low ground-pressure mechanical methods (cut-to-length forwarders/harvesters, feller-bunches, etc.). The objective where cut-to-length activities occur in SEZs is to operate on slash mats where available. Recent monitoring from these mechanical methods indicates minimal impacts to soil conditions, and these kinds of equipment are readily available in the local area of the project. Removal operations would occur under appropriate soil moisture or frozen conditions, as determined by a hydrologist or soils scientist, and would require implementation and monitoring of BMPs (Appendix A) during and after implementation. In order to provide public safety during tree removal operations, temporary forest closures may be required in portions of the project area. Fuel reduction treatments that occur within recently reforested areas will be designed to minimize seedling mortality. For example, in mechanical treatment areas, dead wood may be grouped (to avoid high frequency of equipment passes) and skid trails would be located to lessen impacts to seedlings. In addition, hand treatments would include piling fuels as far as possible from location of seedlings. Wildlife leave islands (snag and live tree retention areas) would consist of 10–15% of the fuel removal area in irregular shapes and sizes up to 40 acres. Removal systems used in fuel removal areas, road access, landings and staging areas, and reforestation are described below. In the event of any funding limitations, the priority for fuels removal would be given to areas closest to neighborhoods. This includes all ground-based areas and the aerial treatment units to the south of, and adjacent to, South Tahoe High School and west of Lookout Point Circle (Units 2-4, 6-9, 13)(Figure 2-2).

Fuel Removal of Standing and Downed Wood and Thinning of Live Trees (up to 1,398 Acres)

The proposed removal of standing and downed wood is divided into three categories based upon removal method.

1. A ground-based logging system would be employed on up to 951 acres that are located in areas with slopes under 30% and would include the following procedures:
   - Dead standing trees would be removed.
   - All live trees would be retained unless live tree basal area exceeds 80 square feet per acre at the stand level. Removal would include trees between 3 inches and 24 inches dbh.
   - Outside of wildlife leave islands, an average of four of the largest diameter snags would be retained. Snags would be at least 15 inches dbh in clumped and irregular spacing, depending on the average size class of trees in the stand.
   - Activity fuels generated from tree removal would be lopped, scattered, and left up to 5 tons per acre. Amounts greater than this would be manipulated through whole tree removal, chipping, mastication, hand and machine piling/burning, prescribed burning, or removal, leaving a maximum total of 15 tons per acre (total includes downed logs for wildlife, below).
   - Outside of wildlife snag zones, an average of seven larger diameter logs per acre (>15 inches diameter) would be retained in various decay classes on the ground where they are available.
   - Mechanical fuel removal within SEZs would take place using cut-to-length or other low ground pressure equipment. The decision to use mechanized removal would be based on a risk assessment (Appendix B) similar to that used in South Shore Fuel Reduction and Healthy Forest Restoration Project and would also consider the increased risk of erosion in post-fire conditions.
2. An aerial logging system would be employed on up to 447 acres. If aerial systems are not used due to feasibility, the fuel treatment would be accomplished by hand treatment with chainsaws and piling and burning as described below under #3. The aerial logging system may include a combination of helicopter and skyline yarding systems (e.g., a yarder or yoader system) and would include the following procedures:
   - Dead trees greater than 16 inches dbh would be removed.
   - All live trees would be retained unless live tree basal area exceeds 80 square feet per acre. Removal would include trees between 16 inches and 24 inches dbh.
   - Limbs and tops of trees would be lopped and scattered to a maximum of 15 tons per acre to provide for soil cover. In areas of higher surface fuel concentration (>15 tons/acre) fuels would be hand piled and burned. The 15 tons include the downed wood log retention as described in the ground-based logging system above.
   - Outside of wildlife leave islands, an average of four of the largest diameter snags would be retained. Snags would be at least 15 inches dbh in clumped and irregular spacing, depending on the average size class of trees in the stand.
3. Hand treatment would occur within both aerial and ground-based treatment areas as a primary or follow-up treatment. Hand treatments may be needed to remove smaller size class material (up to 16 inches dbh for live trees and 20 inches dbh for dead trees) to meet the fuel reduction objectives of both ground and aerial treatment. Hand treatments may include hand pile, lop and scatter, or chipping treatments. Hand piling would require follow-up prescribed burning. Within areas treated for hazard tree removal along roads and trails (Hazard Tree Removal


ANGORA FIRE
RESTORATION PROJECT
Figure 2-2
Lake Tahoe Basin Management Unit
1
2
3
4
5
6
7
8
9
11
12
13
Project Locator
To Sacramento
80
267
Kings Beach
431
To Reno
28
50
Tahoe City
Homewood
Lake Tahoe
89
395
South Lake Tahoe
207
Angora Fire Restoration Project
To Sacramento
50
89
88
Kirkwood
Legend
Angora Fire Restoration Project
Burn Severity
High
Moderate
Low
Proposed Stands
1
2
3
4
5
6
7
8
9
11
12
13
N
0 0.25 0.5 1
Miles
Source: USFS & ESRI USA Imagery (07-15-05; 0.5m)

Project), fuel loads will be assessed and hand piling may occur to meet fuel reduction objectives (e.g., areas along Gunmount Trail and FS road 12N21).

Construction of Roads and Landings for Fuel Removal

The following road and landing improvements are proposed to support fuel removal activities (see Figure 2-1 for fuel removal activities):

- Up to 7.7 miles of temporary road would be constructed, including spurs connecting to existing NFS and non-NFS roads. Procedures would include:
  - When a temporary road would use the alignment of a previously decommissioned road, the following reconstruction activities would take place.
  - Incidental removal of live trees, if necessary, to allow for temporary road construction.
  - Grading: Obstacles such as ruts, water bars, leadoff ditches, and pronounced dips would be graded out to make the road suitable for planned traffic.
  - Drainage: Facilities such as culverts or fords would be installed to accommodate the free flow of drainages and ditches. Dips and leadoff ditches, with energy dissipators as needed, would be installed to facilitate occasional thunderstorm runoff.
  - Restoration of temporary roads after project operations are complete. Restoration may include subsoiling, spreading of chip or masticated material, placement of downed logs and rocks, culvert removal, and re-contouring.
- Existing and new landings and staging areas would be utilized to facilitate removal of fuels for ground-based operations and helicopter operations. This entails approximately 23 new and 27 existing landings and staging areas (Figure 2-1). Procedures would include the following:
  - Incidental removal of live trees would primarily occur in new landings and staging areas.
  - Landing and staging areas may range from 0.25 to 1.5 acres in size to safely facilitate the processing and removal of sawlogs and biomass.
  - Stump wads (stump and parts of the root system) resulting from landing construction would be split and piled to be burned or removed off site.
  - Biomass that is not removed from landings would be piled, firelines would be constructed around the piles, and the piles would be burned.
  - Biomass not removed from landings with public access may be available for public and commercial fuelwood permits.
  - Landings and staging areas would be restored following the completion of removal and pile burning. Restoration may include subsoiling to a minimum of 18 inches depth, reseeding of native grass and shrub species, reforestation, and spreading slash, chip, or masticated material.

Wildlife Habitat

The proposed restoration plan for wildlife habitat includes the following activities:

- In the low- to moderate-severity burn areas, remove existing live and dead conifers where conifer removal is still needed for aspen enhancement. Aspen stands in the high-severity burn areas, where no impeding conifers or other vegetation exist, would be left alone (no fuel treatments) to allow the stand to recover on its own.

- Aspen reforestation would be accomplished through a combination of planting and natural regeneration. Planting of aspen with both seedlings and root cuttings would occur within 11, 0.25-acre plots over approximately 5 years of planting. Generally, the following guidelines would be followed when planting aspen to ensure successful regeneration:
  - Plant aspen on a 5-foot-by-5-foot spacing.
  - Plant aspen under a range of soil moisture conditions but do not plant when soils are saturated.
  - Apply landscaping fabric material to ground surface after planting aspen to prevent the growth of competing vegetation and weeds.
- Conduct approximately 6 acres of thinning in existing aspen stands.

Wildlife Snag Zones

Wildlife snag zones were identified as part of the post-Angora Fire snag retention efforts (see Figure 2-1). They are being retained as habitat for a diverse set of species including black-backed woodpecker. These wildlife zones would receive minimal to no treatment in order to meet the following optimal conditions, including residual tree size class and other criteria for snag dependent species. Refer to Figure 2-1 for potential wildlife snag zone locations in non-riparian and non-aspen stands.

1. Maintain leave islands of intact vegetation (no fuel treatments). Include leave patches in the lower, mid-, and higher elevations.
2. Minimal tree size class potential for snag dependent terrestrial species is 12 inches dbh.
3. Retain snags in clumps rather than evenly spaced distributions and retain over 42 to 50 snags per acre of 9 inch or greater dbh.

Conflicting objectives for creating desired stand conditions and fuel loads while meeting the optimal wildlife habitat conditions resulted in the development of four types of snag management zones. In the first two zones, no fuels treatments would occur. The other two zones would include partial fuels treatments due to their proximity to the neighborhoods and expected future fire behavior if no treatment were to occur. In addition to the wildlife zones within the fuel treatment zone, approximately 1,168 of the total burned area would be left untreated, providing burned area habitat. The four snag management zones are described below.

- Leave (87 acres): Fuel treatments would not occur in this zone.
- Leave/Plant (56 acres): Fuel treatment would not occur; tree planting would occur.
- Modify/SEZ (39 acres): Fuel treatment prescription would be modified to meet desired stand densities in or adjacent to Angora Creek.
  - For both aerial and ground-based logging systems, retain 40 snags per acre of the largest (>20 inch dbh) size classes.
  - Retain an average of 12 larger diameter logs per acre (>15 inches dbh) in various decay classes on the ground where they are available.

  - Activity fuels generated from tree removal would be lopped, scattered, or manipulated through chipping, mastication, hand and machine piling/burning, prescribed burning, or removal, leaving no more than 5 tons per acre in addition to the downed wood log retention for wildlife.

- Modify/Subdivision (38 acres): Fuel treatment prescription would be modified to meet desired stand densities in close proximity to communities.
  - For both aerial and ground-based logging systems, retain 15 snags per acre of the largest (>15 inches dbh) size classes.
  - Retain an average of 10 larger diameter logs per acre (>15 inches dbh) in various decay classes on the ground where they are available.
  - Activity fuels generated from tree removal would be lopped, scattered, or manipulated through chipping, mastication, hand and machine piling/burning, prescribed burning, or removal, leaving no more than 5 tons per acre in addition to the downed wood log retention for wildlife.

Aquatic Habitat and Hydrologic Function Restoration

Restoration activities for aquatic habitat and streams are proposed in four areas—the channel above Lake Tahoe Boulevard, portions of Angora Creek and its tributaries, Gardner Mountain Meadow, and the wetland complex at Seneca Pond. Proposed activities are shown on Figure 2-3 and described below.

Channel Reconstruction

A total of 1,200 feet of channel through the meadow above Lake Tahoe Boulevard would be reconstructed. The old channel would be filled by utilizing excavated material from the new channel. Sod would be utilized from various locations within the meadow to vegetate stream banks along the new channel and placed over the soil cap of the old channel. Construction of the new channel would utilize heavy equipment (track hoe and a dump truck). Access to the work site would be from Lake Tahoe Boulevard by installing a temporary road, which would be rehabilitated upon completion of the new channel. Other site preparation would involve felling the remaining live and dead conifers from the meadow and placing this material along the floodplain margins and as in-channel grade control. Riparian shrubs (willow and alder) would be planted in strategic areas of the new and old channel to provide soil stability and resistance to scour. The new channel location would be tied in at 50 to 70 feet above the Lake Tahoe Boulevard road crossing structure (bottomless arch).

Angora Creek Large Wood Placement

Large woody debris would be placed within a 2-mile segment of Angora Creek and tributaries. Existing large wood that is currently spanning the channel or along the floodplain margins would be utilized as source material. Wood would be placed in the channel as debris jams. These jams would function to induce fine sediment deposition, control grade, and increase the complexity of aquatic pool and cover habitat. Work would be accomplished with either a spider excavator (walking backhoe) or hand crews. It is estimated that an average of three structures per 200 feet would be constructed.

Gardner Mountain Meadow (above Highway 89)

Live encroaching conifers within the 13-acre Gardner Mountain Meadow would be removed. The incised gully (1500-foot length) would be filled in and plugged with soil material, and grade control structures would be installed to maintain the new elevation. Riparian shrub and sod planting would be conducted as needed to stabilize areas of exposed soil.

Restore Wetland Complex at Seneca Pond

Seneca Pond would be completely drained and partially filled with onsite materials. The current breach at the top of the diversion would serve as a point to restore the natural drainage, especially since it is likely that this new channel could naturally expand to capture the entire flow. A portion of the clay liner would be left in place to encourage a localized high groundwater table. The pond banks and earthen dam would be recontoured to decrease height and slope to match the surrounding area. Fill from the area that is currently crossed by the road/trail would be removed and the area would be recontoured to create a hydrologic connection between the pond area and lower SEZ. The upslope stream diversion would be removed, surface flow would be rerouted back into the natural drainage (groundwater flows to lower SEZ to be connected with pond area), and the diversion ditch would be decommissioned. Willows, alder, and other riparian vegetation would be planted throughout construction area where deemed appropriate.

The project would be implemented in phases that could range from 1 to 3 years for completion of Seneca Pond Restoration once initiated. Table 2-2 shows the phases of the project.

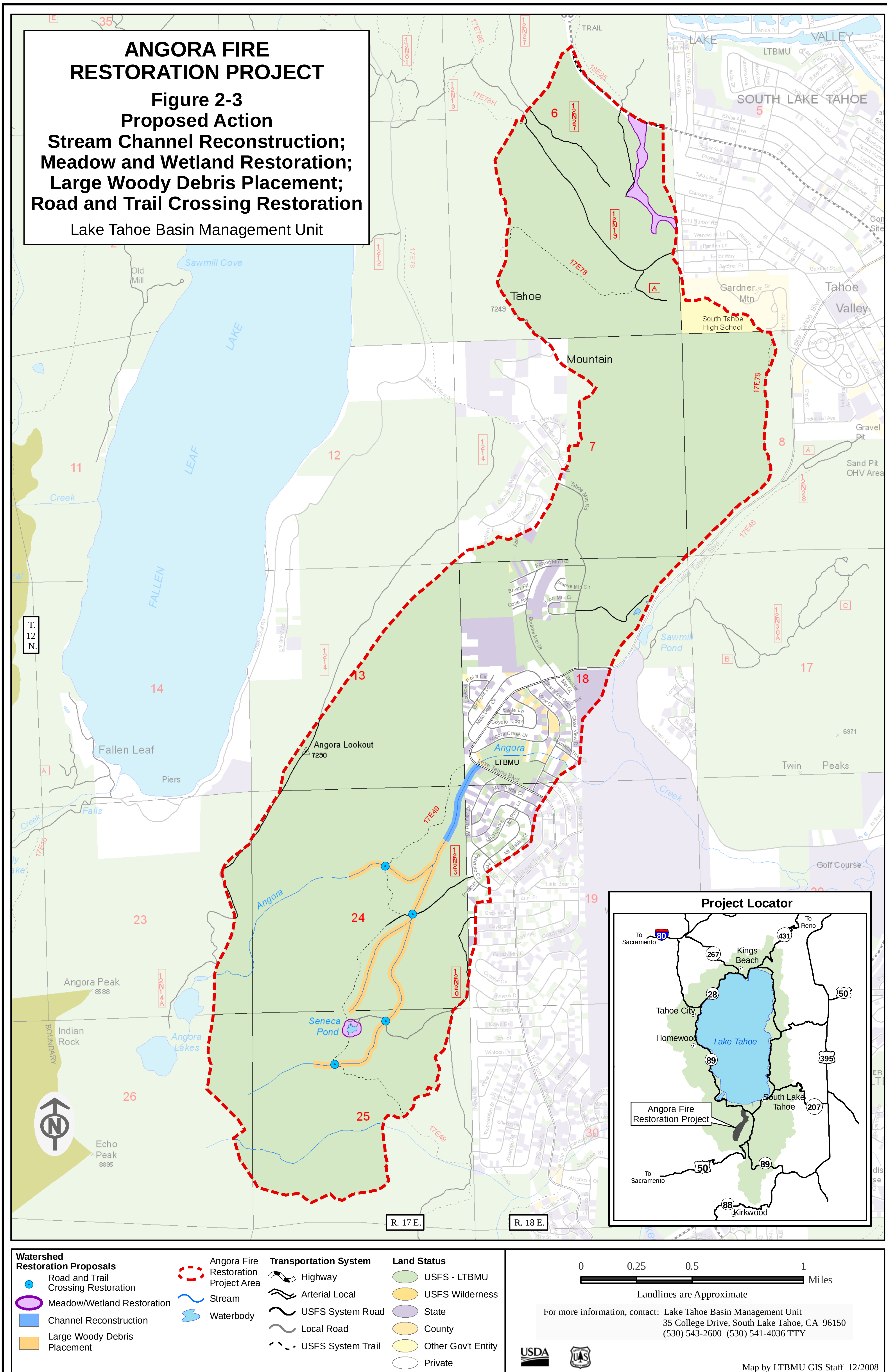
Table 2-2. Project Phases

Project Action
Re-establish source flows into the historic channel (Angora Creek)
Fill/recontour artificial channel
Recontour banks
Fill/recontour bed of pond
Plant riparian vegetation

Removing the artificial channel would restore groundwater drainage patterns across the slope allowing for localized wet areas in depressions. It is likely that some of this groundwater would drain to the restored pond area, which would further enhance hydrated conditions in the area where the pond is currently located.

Due to the concern over bullfrog presence, bullfrog removal may be carried out pre- and post-project implementation and most likely would involve manual removal methods (i.e., netting). Opportunities exist to integrate bullfrog control activities with the environmental education and Kids in the Woods programs to help accomplish yearly maintenance surveys and removal efforts.

Replacing Seneca Pond with a functional wetland would decrease the depth of the pond and increase the presence of riparian vegetation while still providing recreation access. Public access to both the restored wetland and fire area would continue to be provided by means of an upgraded trail system (see "Roads and Trails," below). In addition, the visual experience of being in a wildland/forested


ANGORA FIRE
RESTORATION PROJECT
Figure 2-3
Proposed Action
Stream Channel Reconstruction;
Meadow and Wetland Restoration;
Large Woody Debris Placement;
Road and Trail Crossing Restoration
Lake Tahoe Basin Management Unit
Tahoe
Mountain
Angora Lookout
7290
Fallen Leaf
FALLEN LEAF LAKE
Sawmill Cove
Old Mill
Piers
Angora Peak
8588
Indian Rock
Angora Lakes
Echo Peak
8895
Seneca Pond
Angora
LTBMU
SOUTH LAKE TAHOE
Gardner Mtn
South Tahoe High School
Tahoe Valley
Gravel Pit
Sand Pit OHV Area
Sawmill Pond
Twin Peaks
Golf Course
T. 12 N.
R. 17 E.
R. 18 E.
17E78
17E79
17E48
17E49
12N13
12N23
12N20
Project Locator
To Sacramento
To Reno
Kings Beach
Tahoe City
Homewood
Lake Tahoe
South Lake Tahoe
Angora Fire Restoration Project
Kirkwood
Watershed Restoration Proposals
Road and Trail Crossing Restoration
Meadow/Wetland Restoration
Channel Reconstruction
Large Woody Debris Placement
Angora Fire Restoration Project Area
Stream
Waterbody
Transportation System
Highway
Arterial Local
USFS System Road
Local Road
USFS System Trail
Land Status
USFS - LTBMU
USFS Wilderness
State
County
Other Gov't Entity
Private
0 0.25 0.5 1
Miles
Landlines are Approximate
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Map by LTBMU GIS Staff 12/2008

environment would continue to be provided and, therefore, it is anticipated that local use from community residents would not change.

Roads and Trails

The three major objectives of the proposed action for the transportation system are the following:

1. Maintain, upgrade, and develop administrative vehicle access.
2. Address unclassified roads and trails.
3. Upgrade recreation trails.

To meet above objectives and move towards the desired condition, the proposed action includes construction of roads and trails (both new and on existing prisms), decommissioning of classified roads and trails, and restoration of unclassified roads and trails. (Figure 2-4 shows proposed action roads and trails; Figure 2-5 shows the fully implemented road and trail system upon completion of the project.)

Decommissioning of classified roads and trails means eliminating the facility from NFS status. Decommissioning is a specific administrative term that applies to NFS-classified roads and trails only. Restoration is a specific term that applies to unclassified roads and trails only. Both decommissioning and restoration may include: recontouring, subsoiling, mulching, planting, and adding drainage features. Forest Service engineering or hydrology staff would determine in the field which methods are to be applied to specific roads or trails.

The proposed decommissioning, restoration, adoption (converting an unclassified road to a classified trail or road), and construction is illustrated in Figure 2-4. This includes re-routing roads and trails out of SEZs and providing administrative and public access to the area. There are a total of 1.9 miles of road decommissioning/restoration and 16.7 miles of trail decommissioning/ restoration; 1.4 miles of classified road would be adopted as a classified trail; 1.4 miles of unclassified road would be adopted as classified road; 1.2 miles of classified trail would be adopted as a classified road and 1.2 miles of unclassified trail would be adopted as a classified trail. A total of 6.4 miles of classified road would be constructed (including the 2.6 miles adopted as classified road), and 8.9 miles of classified trail (including the 2.6 miles adopted as classified trail).

Road decommissioning is intended to remove a road from the landscape permanently for motor vehicle use. In some cases additional strategies may be used to discourage non-motorized use of the decommissioned roads or roads may be converted to trails. Trail decommissioning is used to discourage use along a route, generally to protect resources. Decommissioning will include:

1. De-compaction to 8” to 10” in depth unless boulders or bedrock are encountered. On trails the surface tread is broken up or scarified depending upon equipment access.
2. Pull in berms. This work may include pulling up fill slopes to partially re-contour a route.
3. Camouflage and barricade the route with boulders and woody debris to discourage future use and naturalize the area.
4. Mulch with pine needles or wood chips to prevent rilling.

When fully implemented, the proposed transportation system would provide administrative road access to areas where it is currently needed. The proposed transportation system would provide recreation access by linking access across classified trails and roads (See Figure 2-5 and Table 2-3). Included in the road and trail actions, 0.3 miles of road and 1.4 miles of trail would be relocated out of SEZs as measured by riparian vegetation data from GIS.

Table 2-3. Mileage[1] of Classified and Unclassified Roads and Trails after Implementation of Proposed Action

	Classified	Unclassified
Road	9.5	0
Trail	10.4	0

[1]Totals come from GIS data that is shown in Figure 2-5.

All existing classified roads in the project area and all new constructed road segments would be maintenance level 1 and for administrative vehicle access and non-motorized and over snow vehicle (OSV) recreation use only. New roads adjoining public streets would have gates and other vehicle access controls. Allowable OSV access is defined in the LTBMU Snowmobile Guide (2006).

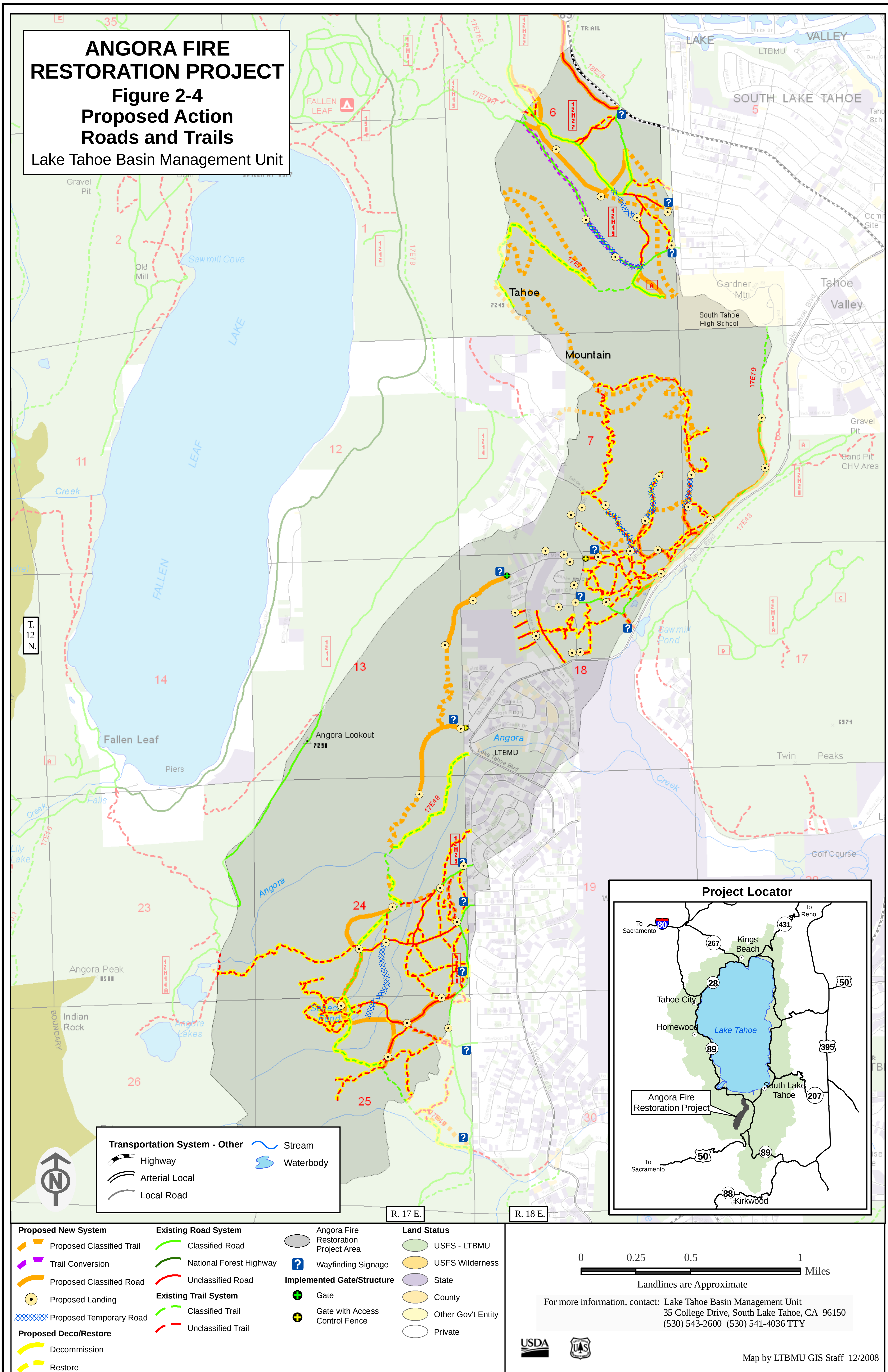
In addition, the proposal will include the following actions:

- Install three new locked gates with access control fencing.
- Construct one stream ford road crossing on the tributary to Angora creek stemming from Seneca Pond.
- On stream crossings that are intermittent or ephemeral install site specific best management practices such as culverts, permeable fill, armored fords, or elevated crossings.
- Construct two trail crossing upgrades.
- Install 14 way-finding signs at public access points.
- Upgrade shoulder parking with BMPs on Sawmill Road east of Lake Tahoe Boulevard.

Temporary Crossings

Since the Angora Fire the tributary to Angora creek stemming from Seneca Pond that flows east has been flowing perennially. Historically, this channel is intermittent or ephemeral in nature and seasonal drying has allowed vehicle passage where the channel crosses the road.

Where the project work necessitates the crossing of a forded stream channel that has flow at the time of the project, such as the location described above, a temporary crossing will be used until the permanent ford crossing is constructed. A temporary bridge is one method of crossing that does not require footings or in channel water diversion, but would involve a minor amount of blading outside of the channel at each end to create a flat surface to place the structure on. A small ramp would be constructed to access the deck and the deck would be sloped to facilitate drainage to appropriate temporary stormwater BMPs like fiber rolls, silt fence, or an infiltration basin. These structures typically have low curbs on the sides which retain debris falling from equipment on the structure. Other examples of crossings that could be used are Humboldt, culvert, or forded. The crossing type chosen will depend on cost, availability, and the hydrologic conditions (amount of flow) in the channel at the time of crossing and project work. Coordination with Lahontan and TRPA would take place prior to placement of a temporary bridge or other crossing.


ANGORA FIRE RESTORATION PROJECT
Figure 2-4
Proposed Action
Roads and Trails
Lake Tahoe Basin Management Unit
Transportation System - Other
Highway
Arterial Local
Local Road
Stream
Waterbody
Project Locator
To Sacramento
To Reno
Kings Beach
Tahoe City
Homewood
Lake Tahoe
South Lake Tahoe
Angora Fire Restoration Project
Kirkwood
R. 17 E.
R. 18 E.
T. 12 N.
Proposed New System
Proposed Classified Trail
Trail Conversion
Proposed Classified Road
Proposed Landing
Proposed Temporary Road
Proposed Deco/Restore
Decommission
Restore
Existing Road System
Classified Road
National Forest Highway
Unclassified Road
Existing Trail System
Classified Trail
Unclassified Trail
Angora Fire Restoration Project Area
Wayfinding Signage
Implemented Gate/Structure
Gate
Gate with Access Control Fence
Land Status
USFS - LTBMU
USFS Wilderness
State
County
Other Gov't Entity
Private
0
0.25
0.5
1
Miles
Landlines are Approximate
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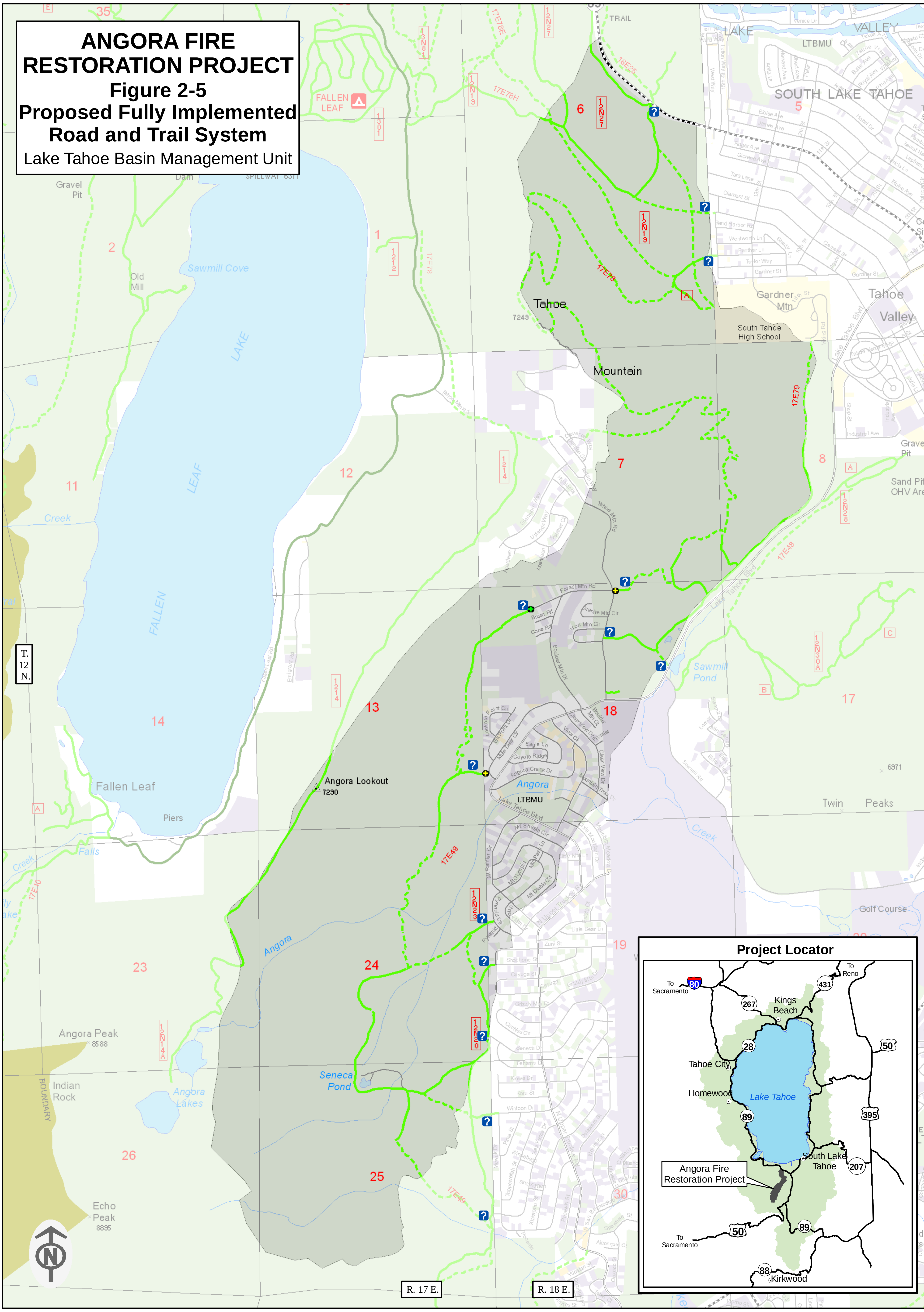
USDA
Map by LTBMU GIS Staff 12/2008
Fallen Leaf
Tahoe
Mountain
Angora Lookout
Angora Peak
Indian Rock
Angora Lakes
South Tahoe High School
Gardner Mtn
SOUTH LAKE TAHOE
Tahoe Valley
Twin Peaks
Golf Course
Sawmill Pond
Sawmill Cove
Old Mill
Gravel Pit
Sand Pit OHV Area

ANGORA FIRE RESTORATION PROJECT

Figure 2-5

Proposed Fully Implemented Road and Trail System

Lake Tahoe Basin Management Unit



National Forest Transportation System

- Classified Road
- National Forest Highway
- Classified Trail

Implemented Gate/Structure

- Gate
- Gate with Access Control Fence

- Angora Fire Restoration Project Area
- Wayfinding Signage

Transportation System - Other

- Highway
- Arterial Local
- Local Road

Land Status

- USFS - LTBMU
- USFS Wilderness
- State
- County
- Other Gov't Entity
- Private

- Waterbody
- Stream

0 0.25 0.5 1 Miles

Landlines are Approximate

For more information, contact: Lake Tahoe Basin Management Unit
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Invasive Weeds

Proposed restoration activities for invasive weeds are designed to meet the following goals:

- Eradicate, or control and contain the occurrences of invasive non-native weed species within the Angora Fire burn area.
- Provide a range of manual treatment methods for all invasive species found within the burn area.
- Treat known and new invasive plant occurrences up to three times each year, and survey for new infestations within the burned area. Treatment is expected to continue for 3 years or longer.

Project planning for the Non-Native Invasive Plant Species Project (NIPS) is currently under way and has similar goals and objectives. The NIPS project area is located throughout the LTBMU with a focus on treatment of typical conditions. The Angora Fire Restoration Project differs from NIPS because proposed actions for the Angora Fire burn area address post-fire conditions. Infestations in the burn area are expanding at rapid rates and new infestations are being found regularly. The high intensity burn areas create gaps in vegetation that can allow invasive species to become established. Additionally, this project proposes ground disturbance as well as the use of heavy equipment, which increases the risk of introducing and spreading invasive weeds. It is important to continue to focus treatments in the burn area in order to promote a healthy ecosystem.

2.3.2 Project Design Features

The Angora Restoration project direction from the Forest Supervisor was for the interdisciplinary team to prevent negative effects up-front, rather than include mitigation measures to correct effects after they occur. The Angora Restoration project proposed action is designed for prevention of negative effects, and these prevention measures are termed “design features” because they are part of the design of the project to minimize or prevent negative environmental effects. The term “design feature” is used throughout the proposed action description to clarify this purposeful project design.

Project design features were developed in response to community input during scoping, interdisciplinary team discussion and analysis, and public interaction during the implementation of the Angora Hazard Tree Removal Project. Project design features are elements of the project design that ensure consistency with the Forest Plan. These features are included as part of the proposed action based upon past experience with similar projects in the Lake Tahoe Basin area and have been proven to be effective based on monitoring and professional observations. In addition, water quality BMPs (intended to control non-point source pollution) are included in project design features, and the BMP list is shown in Appendix A.

Fuel Removal and Vegetation Treatments

Normal operating period is generally considered to be from May 1 through October 15 each year. However, operable conditions may be present outside of that time period and inoperable conditions may be present within that period. Design features may apply to one or more of the following conditions: dry, wet, frozen, or snow-covered soils. (Note: the normal operating period headings may include design features that apply in wet conditions).

All Project Phases:

1. For vegetation treatments, road and trail work, and stream and meadow restoration work: Watershed or transportation specialist will review project BMPs prior to a large storm event (1 inch in 24 hours rain event, or prolonged periods or rain over a 48 hour period exceeding a total of 2.5 inches) that may exceed BMP capacity and will notify contract administrator if additional BMPs are recommended to disconnect runoff from surface water features.

2. Coordinate construction to occur between May 1 and October 15 to the maximum extent possible. If grading or movement of soil becomes necessary between October 16 and April 30, a standard grading exception request will be submitted to TRPA. SEZs will be flagged prior to activities.

3. In general, project work (tree removal and thinning activities) would occur between the hours of 7:00 a.m. to 7:00 p.m. from Monday through Friday (excluding holidays). Tree cutting and mastication would not take place within 300 feet of residences from 6:30 p.m. to 8:00 a.m. Exceptions are approved by contract administrator in coordination with the Forest Supervisor and include the following:

   a. Vehicle or equipment maintenance/repairs.

   b. Weekend work in order to finish up a treatment area in a timely manner, or stabilize an area prior to equipment move out and prior to upcoming storm events (e.g. grading season deadlines).

   c. If fire restrictions limit operating times, extended work hours may be approved

   Contractor camping would occur under the following conditions:

   a. Implementation of proper sanitation practices (i.e., prevents pollution of air, soil, and water resources). This includes measures for garbage and human waste disposal.

   b. The location, duration, and conditions for camping would be agreed to by the contract administrator in coordination with the Forest Supervisor. For example, camping would not be allowed at the following locations: landings adjacent to or at the end of streets connecting to NFS lands (Gardner Mtn/Panther Street, Lake Tahoe Blvd., Tahoe Mtn. Road, Forest Mtn. Road, Boulder Mtn. Road, Mule Deer Drive, Pyramid Circle, Shoshone Street, and Seneca Drive) or adjacent to classified NFS trails (not connected to landing) or waterbodies.

   Equipment staging on and adjacent to county/city streets not associated with an active landing would not occur for more than 1 week at a time per neighborhood access point. Active landings that are immediately adjacent to neighborhoods include the eastern most landing off of Gardner Mtn./Panther Street, landings off of Tahoe Mtn, Forest Mtn, Mule Deer Cir., and Pyramid Cir. In these landings, equipment could be stored for more than 1 week and the longevity could be affected by factors such as weather conditions and treatment unit size.

4. To minimize scorch and residual tree mortality in units where hand piling and burning will occur, construct piles a minimum of 5 feet away from the dripline of residual live trees.

Fuel Removal/Vegetation Treatments in Uplands (during normal operating period)

5. To minimize compaction, gullying, and rutting, ground based and cable equipment operations would be conducted when soils are dry to moist at the 4–8-inch depth. This determination

would be made by a LTBMU watershed specialist, using the table in the SEZ Sensitivity Rating (Project Record Document E15) as a guideline.

6. Use hand treatments, end-lining, equipment reach, or cable on slopes greater than 30% (BMP 5-2).
7. Install water bars on skid trails and cable unit corridors to provide proper drainage and prevent erosion when operations are complete and before large precipitation events (BMP 1-17). Design and minimum spacing of water bars will be in accordance with the Forest Service Timber Sale Administration Handbook.
8. To the extent practicable, where end-lining occurs on slopes above 10%, end-line material along slope contours (i.e., cross-slope) to avoid creating ruts oriented down-slope. Where Forest Service implementation monitoring finds potential for sediment delivery, contractor would rake in the berms from ruts created by end-lining or cable system use.

Fuel Removal/Vegetation Treatments in RCAs and SEZs (during and outside of normal operating periods)

In All Units:

9. Limit work in SEZs to the time of year when soils are dry or when operable winter conditions are present (BMPs 1-13 and 5-6) (See Fuel Removal/Vegetation Treatments in Uplands [outside of normal operating period] heading).
10. Flag and avoid equipment use in and adjacent to special aquatic features (springs, seeps, and fens); use hand treatments in these areas (BMP 1-22). See sensitive plant section for buffers of individual species.
11. Leave existing downed trees and large woody debris that are in perennial or intermittent stream channels in place unless removal is needed to maintain channel stability, as determined by a Forest Service watershed specialist and/or fish biologist (Project Record Document E16).
12. Trees may be marked only (live or dead) within 5 feet of the stream bank edge of perennial or intermittent channels where fuel loads or stand densities exceed prescription and where large woody debris is at or above desired levels. Use directional falling to keep felled trees out of intermittent and perennial streams unless the channel reach is identified as deficient in large woody debris, in which case a Forest Service fisheries biologist will select trees greater than or equal to 12 inches dbh to be felled directionally into the channel.
13. Avoid equipment operating in ephemeral channels except where crossings are needed to gain access on the other side of the channel. Ephemeral channel crossings would be minimized to 1 crossing every 800 feet of channel length and the location of these crossings would be determined by contract administrator.
14. Where it is necessary to cross an area with inoperable soil moisture conditions in SEZs, equipment will operate over a slash mat, landing mat, or other protective material to minimize soil compaction. If slash is used, it would be removed when operations in the area are concluded. The determination of crossing location and method will be made by contract administrator.

In CTL Units:

15. Limit mechanical equipment operations in SEZs to cut-to-length (CTL) operations or operations using equipment that has been demonstrated to adequately protect soil and water resources (i.e., equipment that is lighter on the land, rubber-tired equipment, equipment that operates on a bed of slash, or other innovative technologies that reduce impacts to soils). Tree removal using a cable system would be acceptable, but cable corridors would be located outside of SEZs, and outside the Whole Tree buffer for perennial channels, and ponds.
    a. Stands that exhibit equal or less sensitivity than the Heavenly Valley Creek SEZ Demonstration Project (HSEZ) site based on the most current version of the sensitivity rating system may be treated with ground-based equipment under operable soil moisture conditions.
    b. SEZ stands that rate more sensitive than the HSEZ project site will 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 will be flagged for hand treatment prior to commencement of mechanical operations.
    d. For burned SEZs, apply the FS Region 5 Erosion Hazard Rating to prescribe adequate ground cover at completion of treatment. Adequate ground cover produces an erosion hazard rating of low within SEZs. If adequate ground cover cannot be provided, the SEZ must be treated by hand.
    e. Application of chipped or masticated material to provide adequate ground cover will stop at the stream buffer (i.e., chip within the SEZ only up to the equipment exclusion buffer). Chip depth will not exceed an average of 2 inches and a maximum of 4 inches.
    f. The risk assessment rating works best for treatment units of 50 acres or less. Divide larger units and rate them individually. Units will be divided prior to implementation based on relevant stream channel and/or terrestrial geomorphic features.
16. Within 25 feet of perennial or intermittent streams CTL tree removal methods would be limited to reaching in and removing logs where ground contact can be avoided to mitigate ground disturbance.
17. Contract administrator would consult with LTBMU watershed specialist to determine additional needed buffer widths, based on proximity to perennial channels, slope steepness (greater than 20 percent), and amount of existing ground cover (less than 30 percent).

In Whole Tree (WT) Units:

18. For WT operations, the following table would be used to determine equipment exclusion buffers for perennial channels, lakes and ponds:

Slope	Soil Cover	
	< 75%	> 75%
< 20%	75 ft	50 ft
> 20%	100 ft	75 ft

  a. A 25 ft buffer would still apply in WT treatments units for intermittent channels.

  b. A minimum 10 ft buffer from the top of steep slopes (>30%) that are connected to an SEZ would also apply for whole-tree equipment exclusion.

19. Ground based equipment in WT treatment stands would not operate in SEZs. Treat SEZ areas within WT stands with hand crews. The portion of a felled tree that is greater than 14" diameter would be left on site to maintain coarse woody debris while the remainder would be included in hand piles for later burning.

20. Ground based equipment would not operate within the equipment exclusion buffer for WT treatment except at temporary or permanent stream crossings (BMP#1-19), but may reach in to remove material. Avoid tree removal using a cable system within this buffer unless full suspension can be achieved.

21. To achieve desired fuel loading in SEZs within units, trees may be end-lined out of the SEZ after consultation with a watershed specialist. Slash in excess of 15 tons per acre will be removed by hand from the 50-foot buffer from stream channels and lakes, piled, and burned.

  a. Prohibit tree removal methods that disturb the ground surface within 25 feet of a perennial or intermittent stream channel or other water body (e.g., lakes, ponds).

  b. Provide ground cover such as slash, wood chip, or masticated material, adequate to prevent erosion in disturbed areas.

  c. Where Forest Service implementation monitoring finds potential for sediment delivery, contractor would rake in the berms from ruts created by end-lining.

Hand Piling and Pile Burning in SEZs

22. Maintain a 50-foot buffer (no piling or burning) along perennial or intermittent streams, lakes, bogs, and fens. Slash would not be piled in springs and seeps.

23. Permit piling and burning up to 10 feet from the edge of ephemeral channels.

24. Allow fire to creep between piles and into these buffers, maintaining a burn intensity that would protect soil and water resources. Do not allow fire in flagged areas with sensitive plant occurrences and invasive weeds.

25. Place piles in a non-linear pattern within each unit where possible.

26. The maximum hand pile size in SEZs would not exceed 10 foot diameter by 5 foot height.

27. Where feasible, burning would occur on moist, very moist, or wet soil (see Appendix B) and when fuels are dry.

28. No more than 15 percent of any SEZ acre may be piled in a given year (based on an average pile diameter of 10 feet and average pile spacing of 20 feet).

29. 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 would be allowed if necessary to achieve 80 percent consumption of the piled material, except for piles adjacent to aspen.

30. 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).

Roads (during normal operating period)

The purpose of these features is to avoid or minimize the potential for erosion from the concentration of road runoff associated with system roads or temporary roads utilized during the fuelwood and vegetation removal activities, as well as aquatic habitat and hydrologic function restoration activities. These actions will avoid adverse impacts to beneficial uses and will protect the unique hydrologic and aquatic values of Lake Tahoe.

31. New temporary (unclassified) roads would be outsloped to ensure proper drainage of the road surface. Additional BMPS would be installed as recommended by a watershed or transportation specialist to ensure that temporary roads are hydrologically disconnected from intermittent and perennial stream channels. These BMPs could include lead-off ditches, water bars, rolling dips, etc. These would be installed during temporary road construction and maintained during the time the road is in use or installed at the end of operations each day.

32. Remove ephemeral channel crossings prior to any large precipitation event (1 inch or greater) forecasted by the National Weather Service and before the winter season begins (BMP 2-16).

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

34. Stabilization of the Forest Service access road at the intersection of city or county streets and roads may be required to prevent the tracking of debris and soils onto city and county streets and roads. Onsite meetings with city or county engineers would determine the extent and type of stabilization to use at each intersection.

35. All native NFS roads that intersect with NFS paved or chip sealed roads would be stabilized through the use of aggregate base material (standard specification C or D) or wood chips. Soil type, grade, and alignment would determine the extent of this stabilization.

36. After mechanical operations are complete and where feasible based on soil type, temporary roads will be restored by using all of the following methods:
    a. providing ground cover, such as slash, wood chips, or masticated material (spread no more than 6-inches thick).
    b. removing all temporary crossings and installing drainage structures as appropriate to prevent accumulating water on the decommissioned road surface.

c. ripping, where feasible (based on soil rock content and absence of invasive weeds), when soils are moist or dry. Contract Administrator shall determine whether ripping is feasible.

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

37. All temporary roads would be returned to their original use and width under the ATMs (e.g. Forest Service trails used as temporary roads would be returned to trail width).

38. Barriers would be strategically established along open areas adjacent to roads or trails (boulders, split rail fence, and barriers/signs) after mechanical treatment has been completed. Barriers function to discourage post-treatment establishment of user-created routes that are not designated routes. In addition, natural barriers such as large logs and rocks would be placed where necessary at road entrance points to prevent continued use of decommissioned road alignment.

39. Roads would be watered for dust abatement as needed following Forest Service Handbook 2409.15. Determination of dust abatement will be made by contract administrator. The purpose of dust abatement is to control road surface loss, provide for road user safety, and minimize impact to adjacent resources and neighborhoods. Water used for dust abatement (BMP 2-23) would come from STPUD hydrants. Commercial dust palliatives may be used, if approved by the Contract Administrator.

Fuel Removal/Vegetation Treatments—Landings

40. Prohibit landings, fuel storage, and refueling in SEZs (BMP 1-12).

41. Locate landings, fuel storage, and refueling areas outside RCAs where operationally feasible.

42. Proper drainage from landings will be provided during use; ditching, sloping, and water bars or other BMPs may be used where needed as recommended by watershed specialist to disconnect runoff from surface water features.

43. Hazardous materials, including Sporax® or equivalent, diesel fuel, and gasoline will 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 will be prepared, if quantities used require them.

44. Restore landings after operations are complete using the following methods, as determined by the LTBMU Watershed Specialist:
    a. Providing ground cover, such as slash, wood chips, or masticated material (spread no more than 6-inches thick).

    b. Ditching, sloping, and water bars may be used where needed as recommended by watershed specialist to disconnect runoff from surface water features.

    c. Landings will be ripped to approximately a 12-inch depth after ground cover has been spread. Ripping is not permitted in known infestations of invasive weeds, and may not be possible in rocky soils; this determination may be made by the Contract Administrator.

    d. Landings within 50 feet of an SEZ will be seeded with a native seed mix of grasses, forbs, and shrubs. Landings within 100 feet of invasive weeds may require seeding depending on weed species. Consult with LTBMU botanist to determine if seeding is necessary.

Fuel Removal/Vegetation Treatments in Uplands (outside of normal operating period)

45. When working outside of the normal operating period, conditions must be adequate to prevent erosion, sediment delivery to water bodies, and soil compaction that would impact soil productivity or soil hydrologic function. Operable conditions must be present on at least 85 percent of the treatment unit and generally would include the following:
    a. Frozen soil operations are permitted where operated vehicles, tractors and equipment can travel without sinking into soil, road, and landing surfaces to a depth of more than 2 inches for a distance of more than 25 feet. Temperatures must also remain low enough to preclude thawing of the soil surface.
    b. For over-snow operations, maintain approximately 12 inches of compacted snow/ice on undisturbed ground, and 6 inches of compacted snow/ice on existing disturbed surfaces.
    c. Lesser depths may be agreed to by a LTBMU Watershed Specialist and the Contract Administrator based on current research and monitoring.
46. 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 (found in the Soils and Hydrology Report on file in the project record, Tab 11) to determine operable soil moisture conditions. Monitor conditions closely and stop operations when surface soil (2-4 inches) disturbance is greater than what would be expected during normal season operations.
47. When working outside of the normal operating period, monitor operations daily when rain is probable or when temperatures rise above 45 degrees Fahrenheit to ensure that adequate snow and frozen soil depths are maintained. Move equipment and materials to areas near pavement before conditions become inoperable.
48. Apply a 25 foot equipment exclusion buffer around perennial and intermittent channels during over the snow and frozen soil operations.
49. When adequate snow or frozen soil conditions are not present, temporary crossings on intermittent or ephemeral channels may be approved on a case by case basis through agreement between the sale administrator and a watershed specialist. Crossing density would be limited to 1 crossing every 800 linear feet of stream channel. These crossings shall not result in bank damage or water quality impairment or obstructed flows.

Roads (outside of normal operating period)

50. 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 reduce tracking of mud onto the paved road.
51. If a native surface road becomes rutted, close the road unless spot-rocking, or other mitigation would be effective in preventing road damage, or until conditions improve. Rutting is defined as depressions deep enough to channel water, over 10 percent or more of the road surface, on a per mile basis. Avoid any rutting that can deliver sediment to a water body or SEZ.
52. 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.

53. On native surface roads, retain a minimum of 6 inches of compacted snow on 85% 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% 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 or road surface.
54. Road alignments within the contract area that require snow removal will be visibly marked on both sides along the entire alignment to facilitate plowing. Excess snow removed during plowing will not be placed into drainages or riparian areas.
55. Before over-the-snow operations begin, mark existing culvert locations. During and after operations, ensure that all culverts and ditches are open and functional.
56. 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).

Stream Channel and Aquatic Habitat Restoration

57. Salvage/recovery of fish will be conducted within anticipated construction dewatering or diversion zones operations by electro-shocking or other suitable means as developed through consultation with the California Department of Fish and Game and LTBMU fisheries staff.
58. Stream channel construction activities will occur after groundwater levels within channel construction zones are 5 feet below the ground surface elevation (as measured from existing groundwater piezometers). From previous groundwater data, this is estimated to occur around August 1.
59. No permanent roads or trails will be constructed for stream channel/floodplain/wetland ecosystem restoration; temporary roads for restoration activities will be designed to minimize soil erosion, compaction, and stream bank deterioration.
60. Temporary roads that are needed to access channel segments and wetland areas where excavation and fill activities occur will be completely restored following project activities. Restoration of the temp road will involve de-compaction sod placement and other re-vegetation methods.
61. To facilitate rapid establishment of stabilizing bank vegetation, live sod will be placed on newly excavated channel banks and watered. The newly constructed channel segment will be treated by pumping limited flows into the new channel. Treatment will include allowing water to infiltrate in the constructed channel, pumping turbid water within pools of the newly constructed channels and dispersing that water out onto the floodplain through sprayers until turbidity standards are met as defined in the Storm Water Pollution Prevention Plan and Basin Plan Prohibition Exemption. This method of sod preparation and seasoning has been successfully used on other stream restoration projects such as Cookhouse Meadow.
62. Soil erosion controls will be installed during reconstruction activities. These controls will include the use of filter fabric, silt fencing, straw wattles, or other suitable means to contain material on site. In the event that the implementation requires more than one field season, fill used for temporary meadow access roads will be removed, stockpiled at the staging area, and reinstalled at the beginning of the next field season. Stockpiles remaining after October 15 will

be winterized, which will include covering the piles and other measures such as coir logs or silt fences.

63. Onsite dust abatement procedures will be implemented — on forest system and temporary access roads, stockpile areas, and the gravel extraction site—to ensure fine sediments are not transported off site as airborne particles. Abatement procedures will include both watering and physically covering bare soils.
64. Once flows are fully diverted into the newly constructed channel, the existing channel will be allowed to drain completely. The existing channel will then be filled with material that will have been excavated from new channel construction and stored at stockpile areas. The filled channel will be revegetated with sod plugs, native seed, live willows, and mulch.
65. Sod borrow sites and filled channel will be revegetated and irrigated for at least 1 year, and up to 2 years, post construction to maximize plant growth and site stability.
66. Water from the stream will be siphoned to use as water supply for construction activities such as dust abatement and irrigation. A screen will be placed over the siphon to avoid impacts to fish. Siphoning will be ceased if stream flow level falls below a level that will affect fisheries resources, as determined by a LTBMU fisheries biologist.

Sensitive Plants

These measures are designed to protect unique plant populations and/or habitat from damage.

67. An LTBMU botanist will be notified prior (minimum of 2 weeks) to any project implementation involving ground disturbance to properly flag sensitive areas. Sensitive plant areas identified during surveys or project implementation will be avoided. Sensitive plant areas are areas that contain Region 5 sensitive plant species and special-interest plant species (TRPA and FS).Depending on the species and habitats identified, fuel reduction or stream restoration could be implemented in buffered areas as long as the level of disturbance will not degrade local hydrology, soils, or the mychorrhizal community. For instance stream restoration activities may require short term impacts to sensitive plant sites, however by restoring the long term hydraulic regime habitat for such species will function more effectively.
68. Prescribed fire will be excluded from the sensitive plant buffered zones.
69. Trees will be directionally felled away from sensitive plant populations, sensitive plant communities (fens), or special-interest plant species.

Meesia Sites (Fens) and Sphagnum Moss Site

The design measures are proposed for both three-ranked hump-moss (*Meesia triquetra*) and broad-nerved hump-moss (*Meesia uliginosa*) and sphagnum moss (*Sphagnum* sp.) site.

70. Fens and the sphagnum moss site will be flagged and avoided, and will include a buffer, determined by LTBMU botanists. The zone of avoidance will either be defined by the edge of wet soils that support the hydrology of the sites or 100 feet from the extent of plant location.
71. No prescribed fire will occur within 100 feet from these sites.
72. LTBMU botanists will be on site around all fens during project implementation.

73. LTBMU botanists and hydrologists will flag the area of the sphagnum site and determine boundaries for mechanical or hand thinning.
74. Trees will be directionally felled away from the sphagnum site and all adjacent wet soils.

Invasive Weeds

These measures are intended to protect the native plant and animal species and associated habitat that are unique to the project area. The project design measures will be implemented to control impacts due to invasive weeds.

75. Known weed infestations will continue to be monitored and surveyed for new occurrences in portions of the project area with focus on temporary roads and landings prior to implementation. Weed infestations within the treatment area or along travel routes associated with the project area will be treated using approved methods, or flagged and avoided according to the species present and project constraints. (The entire fire area is infested with bull thistle (*Cirsium vulgare*), so prior to implementation the invasive weed coordinator will be notified so that the area can be treated by crews or flagged and avoided. Additionally, there is a staging area infested with tall white top (*Lepidium latifolium*) that should be avoided).
76. Staging areas (e.g., for equipment, materials, or crews) will not be located in weed infested areas.
77. All off-road equipment used on this project will 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 invasive weeds. Off-road equipment includes all logging and construction equipment and brushing equipment such as brush hogs, masticators, and chippers; it does not include log trucks, chip vans, service vehicles, water trucks, and pickup trucks. Equipment will be considered clean when visual inspection (by contract administrator) does not reveal soil, seeds, plant material, or other such debris. When working in known weed-infested areas, equipment will be cleaned before moving to other NFS lands that do not contain invasive weeds.
78. All earth-moving equipment, gravel, fill, or other materials are required to be weed-free. Sand, gravel, rock, or organic matter from an approved onsite source will be used.
79. Road and trail staging areas and landings would be only as large as needed for safe operation. Staging areas will be re-vegetated to discourage the establishment of invasive weeds. The LTBMU botanist will determine sites which need re-vegetation.
80. Weed-free mulches and seed sources will be used. Topsoil from the project area will be salvaged for use in onsite revegetation when possible, unless contaminated with invasive weeds. 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 cultivated timothy (*Phleum pratense*), orchard grass (*Dactylis glomerata*), or ryegrass (*Lolium* spp.) will not be used. This requirement is consistent with the Forest Service Region 5 policy that directs the use of native plant material for revegetation and restoration for maintaining "the overall national goal of conserving the biodiversity, health, productivity, and sustainable use of forest, rangeland, and aquatic ecosystems." Seed mixes will be approved by an LTBMU botanist.

81. Disturbed sites where infestations of invasive plants are likely to become established will be revegetated. Revegetation with plants native to the area would occur at landings, staging areas, and other highly disturbed sites to reduce risk of invasion from non-native invasive species. Revegetation could include tilling, mulching, plantings, watering, and seeding with native shrubs, forbs, and grasses. Sites would be evaluated for revegetation needs based on future use of site, extent of disturbance, accessibility, and similar parameters.

Heritage Resources

Twenty-four historic properties were identified within the project boundaries. Three of these properties have been evaluated and determined not eligible for the National Register of Historic Places; they will require no additional protection measures. Twenty-one properties will be treated as eligible and will require standard resource protection measures (SRPM). These SRPMs are designed to ensure that the proposed actions do not adversely affect districts, sites, highways, structures, or objects listed in or eligible for listing in the National Register of Historic Places, or adversely affect significant scientific, cultural, or historical resources. The SRPMs will be implemented to control impacts on heritage resources. Table 3.9-1 lists the Forest Service site number and the SRPMs that will be implemented.

82. Standard Resource Protection Measures

I. At a minimum, historic properties will be excluded from areas where activities associated with an undertaking will occur.

   A. All proposed activities, facilities, improvements, and disturbances will avoid historic properties. Avoidance means that no activities associated with an undertaking that may affect historic properties, unless specifically identified in this PA, shall occur within an historic property's boundaries, including any defined buffer zones. Portions of undertakings may need to be modified, redesigned, or eliminated to properly avoid historic properties.

      1. For historic properties eligible for the NRHP under 36 CFR 60.4(d), or those that may be important only for the information they contain, the physical demarcation of historic properties, and their exclusion from an undertaking's proposed activity areas is a minimum requirement.

      2. Physical demarcation and avoidance during the implementation of an undertaking is also required for other historic properties eligible for the NRHP under other criteria. But minimum protection requirements will also include the use of buffer zones to extend the protection area around historic properties where setting is an important attribute, and the proposed activity may have an effect on the setting's quality.

      3. Linear sites may be crossed or bounded in areas where their features or characteristics clearly lack historic integrity, that is, where those portions (taking into account any buffer zones related to setting) do not contribute to site eligibility or values.

   B. All historic properties within an area of potential effect (APE) will be clearly delineated prior to implementing any associated activities that have the potential to affect historic properties.

      1. Historic property boundaries will be delineated with coded flagging and/or other effective marking. Activities within historic property boundaries will be prohibited with the exception of using developed Forest transportation systems when the Heritage

Resources Manager (HRM) recommends that such use is consistent with the terms and purposes of this agreement.

2. Historic property location and boundary marking information will be conveyed to appropriate Forest Service administrators or employees responsible for implementation so pertinent information can be incorporated into planning and implementation documents, and contracts (e.g., clauses or stipulations in permits).

C. Buffer zones may be established to ensure added protection where the HRM or other professional archaeologist determines that they are necessary. The use of buffer zones in conjunction with other avoidance measures is particularly applicable where setting contributes to the property's eligibility under 36 CFR 60.4, or where it may be an important attribute of some types of historic properties (e.g., historic buildings or structures; historic or cultural properties important to Native Americans). The size of buffer zones needs to be determined by the professional archaeologist on a case-by-case basis. Landscape architects may be consulted to determine appropriate viewsheds for historic resources. Knowledgeable Native Americans should be consulted when the use or size of protective buffers for Native American traditional or cultural properties needs to be determined.

D. When any changes in proposed activities are necessary to avoid historic properties (e.g., project modifications, redesign, or elimination; removing old or confusing project markings or engineering stakes within site boundaries; or revising maps or changing specifications), these changes shall be completed prior to initiating any activities.

E. Monitoring may be used to enhance the effectiveness of protection measures in conjunction with other measures (Stipulation IV). The results of any monitoring inspections will be included in the annual report (Stipulation VI.B(1)(f)).

II. The Forest HRM may provide written approval for the work specified below within the boundaries of historic properties, under carefully controlled conditions. All activities performed under Category II SRPMs must be documented in SRs, pursuant to this proposed action; none may be performed under exemptions.

A. The following specified activity(ies) may be approved under the conditions detailed below.

1. Felling and removal of hazard, windthrow, and salvage trees within historic properties under the following conditions:

a) Felled trees may be removed using only the following techniques:

(1) hand bucking and carrying,

(2) rubber tired loader,

(3) crane/self loader, and

(4) helicopter;

b) Equipment operators will be briefed on the need to reduce ground disturbances (e.g., minimizing turns).

c) No skidding or tracked equipment will be allowed within historic property boundaries.

d) All such activities must be monitored by qualified heritage specialists at the time of tree removal.

83. In the event that any new heritage sites are discovered during project implementation, the LTBMU archaeologist will be notified and procedures in accordance with the 36 CFR Part 800 will be implemented.

2.3.3 Monitoring

The following bulleted list of monitoring is to be carried forward as part of project implementation.

- 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 created 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 Angora Fire Restoration Project BMPs would be included in the pool for random BMP evaluations under the BMPEP program.
- Implementation monitoring in fuels treatment areas would include completing a checklist to determine if BMPs and design features were implemented as described in the NEPA and contract documents. Implementation monitoring for select BMPs would occur prior to a large storm event (1 inch or greater forecasted). A watershed or transportation specialist would review project BMPs on the ground and notify contract administrator if additional BMPs are recommended on active units to disconnect runoff from surface water features.
- The LTBMU botanist would be notified after fuels reduction, aspen stand improvement, stream/meadow restoration, and road trail projects are completed of any project activities that occur on weed sites. Known invasive weed infestations within the project area would be monitored following project implementation to ensure additional weed species do not become established in the areas affected by the project and to ensure that known weeds do not spread.
- Re-vegetated sites as identified in project design features would be monitored for 3 years post-implementation to evaluate whether revegetation is successful or whether there is a need for further revegetation.
- Other project implementation monitoring may be required as part of National Pollution Discharge Elimination System (NPDES) permits (e.g., channel reconstruction).

In addition to the project's monitoring (described above), there are other long term effectiveness monitoring and research actions being carried out. Following the Angora wildfire, the LTBMU established a post-fire monitoring strategy to assess post-fire conditions for an assessment of restoration needs, as well as establish a baseline for monitoring long-term recovery of the burn area. Monitoring components include: vegetation and fuels, soils and water, and channel condition. A detailed description of these monitoring components can be found on the LTBMU website in the 2008/2009 Annual Monitoring Report. The LTBMU is also actively participating and helping Lake Tahoe Inventory and Monitoring Program partners acquire long-term post-fire datasets on instream water quality impacts on Angora Creek.

The effects of burning slash piles in SEZs are largely undocumented. Several coordinated research efforts to determine soil and water quality effects are underway in the Lake Tahoe Basin. Plans include a research site in the Angora Fire area. As conclusions from these efforts come in, project design features may be modified in coordination with regulatory agencies in order to be consistent with management recommendations from the research.

2.4 Comparison of Alternatives

This section provides a summary of the effects of implementing each alternative. Information in Table 2-4 focuses on activities and effects where different levels of effects or outputs can be distinguished quantitatively or qualitatively between alternatives.

Table 2-4. Summary of Effects of Alternatives

	Alternative 1 (No Action)	**Alternative 2 (Proposed Action)**
Fire and Fuels Management	Fuel loading would increase in the next 20 years up to approximately 25 to 45 tons per acre as dead trees fall, exceeding desired fuel loadings and leading to potential intense wildfire behavior. Heavy fuel loads would also complicate the ability to control fires due to high amounts of downed logs.	Desired conditions for fuel loading in the next 20 years would be met across the landscape (less than 10 tons per acre in uplands and less than 15 tons per acre in SEZs) and provide protection to the community by reducing risk of future intense wildfires.
Forest Vegetation	The project area would continue to revegetate through natural processes. In 20 years, the site would continue to be dominated by brush and shrub species, and natural conifer regeneration would continue slowly to be established adjacent to live trees. Forested conditions would not exist within 20 years in high burn severity areas. Natural regeneration would be highest in low to moderate severity areas. Lodgepole pine and fir would be the dominant tree species in the interior burned areas.	Approximately 56 acres would be reforested with Jeffrey pine, rust-resistant sugar pine, and incense cedar in 4 wildlife snag zones and 2.75 acres would be planted with aspen within SEZs.
Soils and Watershed	Angora Creek would persist in a degraded state; channel straightening, downcutting, and bank erosion would continue. Current user-created road and trail patterns and associated sedimentation problems would persist because trails are not scheduled for and would not receive regular maintenance. The long-term risk of extreme wildfire behavior would increase the risk of damage to soil, water quality, and beneficial uses if a fire occurred. Seneca pond would remain in place. The dam or diversion channel would not be maintained and would continue to degrade. Groundwater flow to Angora Creek would not be restored.	Short-term soil disturbance would occur primarily on areas with ground-based tree removal; no sedimentation into channels are expected due to compliance with soil quality standards, best management practices, design features, and minimal disturbance adjacent to all stream courses. Disturbance would be possible with long-term reduction as channel stabilized and deposition increased, thereby reducing sediment transport. Restoration of user-created roads and trails would reduce sedimentation and impacts to SEZs. There would be a reduction in the potential damage to soil and watershed values from future wildfires.
Recreation and Scenic Resources	Current unmanaged use patterns would persist, leading to environmental effects	The proposed action would increase recreational opportunities by providing

	Alternative 1 (No Action)	**Alternative 2 (Proposed Action)**
	(soil erosion). Restoring a mixed conifer forest would be dependent upon natural processes, likely taking several more decades than the proposed action as natural seedlings encroach from the edges of the green trees that remain. The dominant view of the project area as a burned forest would remain much longer than under the proposed action as the snags decay and eventually fall over. Seneca pond would remain in place, however the maintenance of the dam and the diversion channel would need to occur in order to maintain the pond at its current state.	regular maintenance and increasing the classified trail system by 13 miles. User experiences and safety would be improved through regular trail maintenance and improved signage; visual setting would improve with removal of high densities of burned trees in the foreground and middleground views of nearby residents and road and trail users. With the restoration of Seneca pond there would be a loss of a swimming location for youth and pets.
Botanical Resources	No effect on sensitive plant species.	No effect on sensitive plant species.
Riparian Resources	Impacts to existing habitat or aquatic species would occur. Habitat in Angora Creek and Gardner Mountain Meadow would continue to degrade due to downcutting, channel straightening, and encroachment of conifers in the meadow. Meadow habitat totaling 13 acres and 2,700 feet of current degraded channel conditions would persist.	Short-term (1-2 years) disturbance with long-term improvements in meadow health, riparian conditions, and stream-floodplain connectivity would occur. Habitat along 1,200 feet of Angora Creek and 1,500 feet in Gardner Mountain Meadow would be directly improved by restoring historic channel conditions or stabilizing channel/gully incisement, and 2 miles would be indirectly improved as large woody material improved habitat over time. Seneca Pond habitat would increase in diversity and potential impacts to native amphibian populations would be reduced with the control of the bullfrog population.
Wildlife and Aquatic Species	No impacts to existing wildlife or aquatic habitat would occur from fuels reduction activities; recovery of habitat would take much longer than the proposed action. The long-term risk of wildfire would increase the risk of damage to wildlife and aquatic habitat (including a PAC) if a fire occurred. Impacts to aquatic habitat would occur by continued channel migration from eroding banks, the persistence of bullfrogs at Seneca Pond, and sedimentation sources from roads and trails.	30% (314 acres) of the high-severity burn areas and 50% (652 acres) of the moderate-severity burn area would remain untreated, providing substantial habitat for dependent species, particularly black-backed woodpecker. An additional 220 acres of snag zones of both high and moderate severity (10% of the high and moderate severity) would be interspersed across the landscape within the treatment stands, providing high variety and quantity of burned forest habitat. No impacts to threatened and endangered species, or Tahoe Regional Planning Agency (TRPA) species of interest. Treated stands would have a reduced risk of wildfire in the long-term due to reduced fuel

	Alternative 1 (No Action)	Alternative 2 (Proposed Action)
		loadings.
Air Quality	No effects on air quality would occur because there would be mechanical operations or burning. There is a greater potential for long-term effects due to a greater risk of wildfire as compared to the Proposed Action.	There would be no negative impacts on air quality. Short-term emissions from dust and from burning of piles (from activity fuels) would be minimal due to dust abatement design feature and compliance with the approved burn plan. The potential impacts from a future wildfire would be less compared to no action due to the reduction of fuel loads that would otherwise be subject to burning in a wildfire.
Heritage Resources	No effect on known resources.	No effect on known resources.
Transportation System (Roads and Trails)	Existing user-created roads and trails would persist and the possibility of the creation of additional ones would continue. Current local use at Seneca Pond would continue. Ongoing impacts to water quality and riparian habitat would persist due to poor locations of road and trail locations within SEZs and at stream or meadow crossings. Enforcement of public access would continue to be a problem as there would be no visible means of eliminating cross-county public travel (no new gates, signage, etc).	• Restore/Decommission 16.7 miles of trail. • Construct 8.9 miles of trail. • Restore/Decommission 2.9 miles of road. • Construct 6.4 miles of road. Access by the public would be improved by signage stations and unlawful public access would be reduced by improved gate access and visible signage. All roads and trails would be part of the classified transportation system and would receive regular maintenance. Administrative access would be improved and provide more efficient and economic management of all resources. Impacts to SEZs and stream crossings from unclassified roads and trails would be reduced, improving conditions to streams and aquatic habitat.

Table 2-5 compares existing mileage of classified and unclassified roads and trails with mileage that would be implemented after project completion.

Table 2-5. Mileage of Classified and Unclassified Roads and Trails by Alternative

	Classified		Unclassified	
	Alternative 1 (No Action)	Alternative 2 (Proposed Action) after Implementation	Alternative 1 (No Action)	Alternative 2 (Proposed Action) after Implementation
Road	5.0	9.5	3.8	0
Trail	5.4	10.4	16.7	0

Chapter 3
Affected Environment and Environmental Consequences

Chapter 3
Affected Environment and Environmental Consequences

CEQ regulations direct that agencies succinctly describe the environment that may be affected by the alternatives under consideration (40 CFR 1502.15). This chapter describes the existing physical, biological, social, and economic aspects of the project area that have the potential to be affected by implementing any of the alternatives (i.e., the existing conditions). Each description of the existing conditions is followed by a description of the environmental effects (direct, indirect, and cumulative) that would be expected to result from undertaking the proposed action or other alternatives. Together, these descriptions form the scientific and analytical basis for the comparison of effects table found at the end of Chapter 2, "Alternatives, Including the Proposed Action."

3.0.1 Organization of Chapter 3

Chapter 3 combines information on the existing conditions and environmental effects of the alternatives for the various resources. The information is separated into these resource areas for ease in reading. The discussion of alternatives is organized by resource area and each resource area is presented as follow:

- *Introduction*. The scope of the analysis briefly describes the geographic area(s) for the individual resource and its indicators potentially affected by implementation of the proposed action or alternative. The scope of the analysis varies according to individual resource area and may also vary for direct, indirect, and cumulative effects.
- *Existing Conditions.* The existing conditions section provides a description of the resource environment that is potentially affected based on current resource conditions, uses, and management decisions.
- *Direct, Indirect, and Cumulative Effects.* This section provides an analysis of direct and indirect environmental effects to the resource area of implementing each of the alternatives, according to the indicators and issues identified for that resource.

  Direct effects are caused by the actions to implement an alternative, and occur at the same time and place. Indirect effects are caused by the implementation action and are later in time or removed in distance, but are still reasonably foreseeable (i.e., likely to occur within the duration of the project).

  Cumulative effects are the result of the incremental direct and indirect effects of any action when added to other past, present, and reasonably foreseeable future actions. Cumulative effects can result from individually minor, but collectively significant actions, taking place over a period of time.

3.0.2 Projects Considered for Cumulative Effects

A list of present and reasonably foreseeable actions has been prepared to identify projects that would contribute to cumulative effects of the Angora Restoration Project (Project Record Document E17). This information provides detail on the project or activity including name, a brief description and location, size (e.g., acres, feet, miles), year of implementation, and resources potentially affected. A summary of how past, present, and reasonably foreseeable actions contribute to cumulative effects analysis is described below.

Past Projects

In order to understand the contribution of past actions to the cumulative effects of the proposed action and alternatives, this analysis relies on current environmental conditions as a proxy for the impacts of past actions. This is because existing conditions reflect the aggregate impact of all prior human actions and natural events that have affected the environment and might contribute to cumulative effects.

This cumulative effects analysis does not attempt to quantify the effects of past human actions by adding up all prior actions on an action-by-action basis. There are several reasons for not taking this approach. First, a catalog and analysis of all past actions would be impractical to compile and unduly costly to obtain. Current conditions have been impacted by innumerable actions over the last century (and beyond), and trying to isolate the individual actions that continue to have residual impacts would be nearly impossible. Second, providing the details of past actions on an individual basis would not be useful to predict the cumulative effects of the proposed action or alternatives. In fact, focusing on individual actions would be less accurate than looking at existing conditions, because there is limited information on the environmental impacts of individual past actions, and one cannot reasonably identify each and every action over the last century that has contributed to current conditions. Additionally, focusing on the impacts of past human actions risks ignoring the important residual effects of past natural events, which may contribute to cumulative effects just as much as human actions. By looking at current conditions, we are sure to capture all the residual effects of past human actions and natural events, regardless of which particular action or event contributed those effects. Third, public scoping for this project did not identify any public interest or need for detailed information on individual past actions. Finally, the Council on Environmental Quality issued an interpretive memorandum on June 24, 2005 regarding analysis of past actions, which states, "agencies can conduct an adequate cumulative effects analysis by focusing on the current aggregate effects of past actions without delving into the historical details of individual past actions."

The cumulative effects analysis in this EA is also consistent with Forest Service NEPA Regulations (36 CFR 220.4(f)) (July 24, 2008), which state, in part:

> "CEQ regulations do not require the consideration of the individual effects of all past actions to determine the present effects of past actions. Once the agency has identified those present effects of past actions that warrant consideration, the agency assesses the extent that the effects of the proposal for agency action or its alternatives will add to, modify, or mitigate those effects. The final analysis documents an agency assessment of the cumulative effects of the actions considered (including past, present, and reasonable foreseeable future actions) on the affected environment. With respect to past actions, during the scoping process and subsequent preparation of the analysis, the agency must determine what information regarding past actions is useful and relevant to the required analysis of cumulative effects. Cataloging past actions

> and specific information about the direct and indirect effects of their design and implementation could in some contexts be useful to predict the cumulative effects of the proposal. The CEQ regulations, however, do not require agencies to catalogue or exhaustively list and analyze all individual past actions. Simply because information about past actions may be available or obtained with reasonable effort does not mean that it is relevant and necessary to inform decisionmaking. (40 CFR 1508.7)"

For these reasons, the analysis of past actions in this section is based on current environmental conditions.

Present Projects

There are 13 projects that are ongoing. These projects are almost all focused on the improvement of soil and watershed conditions through such project objectives as:

- implementation of best management practices,
- reforestation of burnt areas to expedite forest regeneration,
- relocation of trail routes outside of streamside environment zones,
- restoration of stream channel and riparian enhancement,
- reduction in recreation site impacts (improving trails, reducing compaction), and
- improvement of recreational facilities (improved toilets, parking).

Projects in the Planning Stage

There are an estimated 9 projects that are in various stages of planning that might affect the proposed project area. These projects are almost all focused on the improvement of soil and watershed conditions through such project objectives as:

- reduction in fuels and improvement of vegetative conditions to improve forest health (South Shore Project);
- restoration of stream channels;
- implementation of best management practices on roads, trails, and recreation sites; and
- reduction in recreation site impacts.

Section 3.1
Fire and Fuels

3.1 Fire and Fuels

3.1.1 Introduction

This section discusses the existing conditions and any direct, indirect, or cumulative environmental effects that would result from the proposed action or alternative. The discussion addresses the following major topics: fire behavior modeling, wildfire hazard analysis, potential wildfire behavior, fire types, rate of spread, and wildfire effects for stand composition and structure.

The project area is currently at low risk of high-intensity fire; however, there is a risk for future catastrophic wildfire and a renewed potential for wildfire to spread into adjacent areas, with the consequent potential risk for loss of life, property, and natural resources. This risk may vary significantly in the future depending on various factors that affect wildfire behavior, such as 1) the amount and distribution of the fuel loading on the ground resulting from trees that were killed by the fire but are currently standing; 2) the growth of planted conifers, which would lead to reforested areas; 3) the resprouting of shrubs that were present before the fire, which can lead to renewed sources of flashy fuels; and 4) the invasion of new shrubs and grasses, which also lead to new sources of flashy fuels that can carry a wildfire.

Fire behavior indicators, which are used to measure both the effectiveness and the environmental effects of the alternatives, include expected fire type, rates of spread, and fire intensity (whether the wildfire burns at a low, moderate, or high intensity). Fire intensity correlates with potential mortality for burned vegetation as well as impacts on the soil resource. Fuel models are classification systems pertaining to local site conditions that assist land managers in predicting potential fire behavior. The predicted fuel model serves as a proxy for rates of spread and fire intensity in that it provides expected rates of spread and fire intensity, which vary by fuel model characteristics.

Individual stand inventory data from the project area supplied current condition information to support analytical modeling of project effects both immediately after implementation and in 20 years. Post-treatment modeling used the West Side Sierra Nevada variant of the forest vegetation simulator (FVS) (Project Record Document E18) to supply post-treatment individual stand conditions. The FVS program is a model for predicting forest stand dynamics. The modeled effects of the proposed treatments were based on FVS projections of stands with inventory data and represent average stand conditions. Individual treatment stands were then modeled using FVS and the fire and fuels extension (FFE) of FVS to project fire behavior and the effects on individual stands for all alternatives.

3.1.2 Existing Conditions

The Angora Fire area and the proposed project treatment area are located entirely within the limits of the South Shore Fuel Reduction and Healthy Forest Restoration Project. The fuel reduction treatments involve 12 stands (Stands 1 through 13 [Stand 10 was dropped from the proposed action]) of burned conifer forest types as well as aspen stands, meadows, and stream environment zones (see Table 3.1-1 for a summary of the existing vegetation and fuel characteristics in these stands). There are approximately 1,168 acres of Forest Service lands within the Angora Fire area that are not proposed for any treatment to remove fuels. The remaining forested areas consist primarily of burned mixed conifer types and Jeffrey pine, with lodgepole pine and aspen areas near streams and meadows. In summary, the areas of low-intensity burn, which were not burned, still reflect high densities of trees and fuel loading. Existing stands have moderate to heavy densities and large areas of continuous surface, ladder, and canopy fuels. Stand examination data for the proposed treatment stands show that the average number of live trees per acre varies widely, with a range of between 50 to more than 5,000 trees per acre (Project Record Document E19).

Table 3.1-1. Current Fuel Model and Associated Fire Type for Treatment Stands

Stand No.	Acres	Expected Fire Type	Snags per Acre	Fuel Model
1	132	Surface	155	8
2	147	Surface	120	8
3	72	Surface	325	8
4	15	Surface	108	8
5	269	Surface	102	8
6	72	Surface	152	8
7	67	Surface	252	8
8	60	Surface	301	8
9	38	Surface	28	8
11	170	Surface	189	8
12	356	Surface	131	8
13	143	Surface	241	8

As described in the proposed action, the Angora Fire created a mosaic of dead and live trees. Areas of moderate and high fire intensity and severity have significant tree mortality, which was caused by the fire burning through heavy surface fuels and the crowns of trees. Fire behavior was altered and severity was reduced in areas that were treated prior to the fire with understory thinning and surface fuels reduction.

The Angora Fire burned approximately 3,100 acres of Jeffrey pine and mixed conifer forest. It affected forest resources such as soil and riparian and wildlife habitat and killed thousands of trees. Given the stand examination data collected for the treatment stands (Project Record Document E20), the overall fuel loading is now very low (an average of less than 7 tons per acre) in the areas of high vegetation burn severity (greater than 75% basal area mortality) as well as many of the areas that burned at moderate severity (25% to 75% basal area mortality).

The fire behavior anticipated with the current forest vegetation and severe weather conditions (i.e., low humidity, high temperatures, which are typical of mid-summer) is shown in the following table using the indicators of expected fire type and (as a proxy for rate of spread and fire intensity) current and predicted fuel model. Currently, the project area is at low risk for fire behavior that would substantially threaten the community of South Lake Tahoe or associated important vegetative and aquatic habitat. The severe fire effects of the Angora Fire have left the area with a low potential for extreme fire behavior (Project Record Document E19), as was exhibited by the Angora Fire. Each of the proposed treatment stands would likely exhibit a surface fire of low intensity, reflective of a Fuel Model 8, using the fuel model sets established by Anderson (Project Record Document E21). Even though there are large numbers of dead trees in each treatment stand, these snags do not yet represent a fire hazard because they are still upright and there is essentially no ground fuel to carry a wildfire and expose these snags to ignition on a large scale.

There are approximately 1,168 acres that are not within the proposed treatment units. The untreated stands have varying degrees of burn severity or are part of urban lots in which the risk of wildfire is extremely low due to past fuel treatments. The areas of moderate and high burn severity have high snag levels, which were created by the Angora Fire. Approximately 325 acres are part of the South Shore project and would be treated under that project. These areas burned at a low intensity or did not burn during the Angora Fire and contain surface and ladder fuels. To determine fuel loadings and snag levels, these untreated areas were compared with the calculated fuel loadings in the treatment stands based on their burn severity. The fuel loadings ranged from 4.4 to 7.7 tons per acre. Snag levels ranged from 102 to 155 snags per acre. These untreated areas generally represent Fuel Model 8. These results indicate that the current risk of damage from potential wildfire is low, given the lack of ground and ladder fuels that might carry a fire into the crowns of the remaining live trees.

3.1.3 Direct, Indirect, and Cumulative Effects

Alternative 1—No Action

Direct and Indirect Effects

Foregoing the activities described in the prescriptions for the proposed action would, over time, create a situation where a continual increase in fuel loading would occur across the project area. Woody material would continue to be added to the forest floor annually as dead trees fall and accumulate at a rate that is greater than the rate of decomposition. As the dead trees fall, it would become more unsafe for people to work in the area. Within 3 to 6 years after the burn, it would become physically taxing to traverse the area for any purpose, such as providing future treatments for vegetation or conducting fuels management activities. The gradual increase in the number of downed logs would make it more difficult to control wildfires. This is because downed logs burn very intensely and for longer periods of time than small-diameter fuel. Creating fire lines in areas with downed logs slows the progress of firefighters and leads to safety issues. Taking no action would eventually re-create the conditions (i.e., heavy fuel loading and high risk of severe fire behavior) that existed prior to the Angora Fire, thereby posing a threat to the community and the recovering landscape. Over a long period of time (several decades), the area could become as densely stocked with conifers as it was before the fire. These conditions would result from a higher presence of grasses, shrubs, and brush that would immediately reoccupy the burned area as well as the constant accrual of downed logs and dead trees, which would increase fuel loading and make wildfires more difficult to control.

As described in the vegetation section, a shrub component would develop that would occupy about 40–70% of the area. The shrubs would grow to a height of 3 to 5 feet, with a patchy distribution of natural mixed conifer regeneration, within two decades. The shrubs would be intermixed with the dead trees that fall over during the same period.

Fuel Models

If no action is taken, projected fuel loading would increase to more than 25 tons per acre, which exceeds the desired fuel loading levels within the WUI. This condition would be equivalent to Fuel Model 12. Under this fuel model, flame lengths and rate of spread would be very high due to the presence of heavy, compacted downed logs. Under wildfire conditions, fires would spread rapidly, with intensities that would be capable of generating firebrands, which can cause spotting. The potential fire behavior associated with Fuel Model 12 contrasts sharply with that of Fuel Model 8, which reflects a desired fuel loading in the mixed conifer forest of 10 to 15 tons of fuel per acre, with generally low-intensity fires (see Table 3.1-2 for the predicted fuel loading values). Fire behavior under these fuel models can lead to spotting, high intensities, and difficulty controlling the wildfire adjacent to the community. Dead trees would eventually fall and lead to very high fuel loading on the forest floor, with sizable amounts of fine material accumulating from brush and young trees. Furthermore, the large amounts of downed material from trees that fell after the Angora Fire would exacerbate the control of wildfires and the ability of firefighting forces to engage in direct suppression efforts.

The adjacent stands that survived the Angora Fire would continue to have very high densities of trees. They would also continue to be at risk from insect mortality due to low tree vigor or from wildfire due to high fuel loadings as fine fuels accumulate and dead trees fall. In the event of a wildfire (particularly in a summer season with 90th percentile weather conditions), fire behavior could be severe, leading to adverse impacts on the recovering coniferous forest and once again threatening the community of South Lake Tahoe.

Fuel Loadings

Fuel loading can exceed 35 tons per acre, with the 3-inch and smaller material ranging up to 12 to 15 tons per acre. These values exceed the desired overall fuel loading of approximately 10 to 15 tons per acre. While the dead and dying trees would have lost much or all of their dead branches and foliage, the amount of fine fuels (small branches, needles, etc.) still remaining on the forest floor would contribute to possible extreme fire behavior. Within 10 years, most of the dead trees measuring less than 15 inches in diameter, as well as a few larger trees, would have fallen (see Table 3.1-3 for projected fuel loadings).[1] These fuel loadings would not meet the desired conditions for the defense zone of the Wildland Urban Interface land management allocation and would once again lead to a high potential for damaging wildfires under severe burning conditions (90th percentile weather conditions that reflect expected air temperature, humidity, wind speed, and fuel moisture levels that are typical of late summer).

[1] For more detail, see *Fall Rates of Snags: A Summary of the Literature for California Conifer Species* (NE-SPR-07-01) by D. R. Cluck and S. L. Smith, Forest Health Protection, Northeastern California Shared Services Area, Region 5, USDA Forest Service.

Cumulative Effects

Taking no action would lead to an increase in fuel loadings that would exceed the desired levels for the Angora Fire area. The reforestation of 965 acres in the burn area, combined with the natural revegetation of brush and grasses and falling dead trees, would create the potential for fire behavior that could once again threaten the community or damage important wildlife and watershed resources. The area surrounding the project area would have reduced fuel loadings and managed fuel conditions as a result of treatments in the South Shore project. These conditions would make it less likely for wildfires that might occur within the project area to spread into adjacent residential, commercial, and forested areas. Future fuel buildup and forest health conditions under the no-action alternative would not meet the Forest Plan objectives for the WUI to reduce fire intensity and increase suppression capabilities across the Defense Zone.

Alternative 2—Proposed Action

Direct and Indirect Effects

The landscape-level effect of the proposed action would be the creation of an environment where natural disturbance regimes (primarily fire) can retain or reestablish some of their historical influence in maintaining the diversity and productivity of the landscape. After the project activities, with the exception of the wildlife snag zones, which would be retained for their benefits to wildlife, there would be an average of four large (greater than a 15-inch diameter) snags per acre. Surface fuels would not exceed 15 tons per acre across the burn and would be consistent with the desired fuel loading conditions. The fire behavior anticipated, after considering a combination of the predicted forest vegetation in 20 years and severe weather conditions, is shown in Table 3.1-2, using the indicators “expected fire type” (Project Record Document E20) and (as a proxy for rate of spread and fire intensity) “fuel model.” In addition, the development of a road and trail system would improve fire prevention efforts by reducing or eliminating uncontrolled public use and increasing public education and awareness regarding the risk of wildfire because signage on classified roads and trails would be improved. The development of a well-managed and properly located permanent road system would also improve long-term fuels management opportunities by providing access for prescribed fire equipment and personnel.

Fire Type and Fuel Models

With the removal of dead trees, predicted fuel loadings of less than 15 tons per acre, and thinning of residual, densely stocked conifer stands, the projected fuel model is estimated to be primarily Fuel Model 5 in 20 years (Project Record Document E21). The potential fire behavior associated with Fuel Model 5 is a fire of generally low intensity. Stand modeling indicates a predicted fuel loading of approximately 2.9 to 10.3 tons per acre, which is consistent with the desired fuel loading in the defense zone. However, pockets of fuel loading that reflect Fuel Model 8 after 20 years are expected. These would result from patches of residual conifers that survived the fire or small concentrations of fuels that would not be treated during project implementation due to environmental constraints (steep slopes, riparian/streamside zones, etc.). Fuel Model 8 exhibits similar fire behavior to Fuel Model 5, except for the potential for isolated “hot spots” (localized torching of individual conifer crowns or intense fire due to fuel concentrations already on the ground) (see Table 3.1-2 for a summary of the projected fuel models in the treated stands). This table also shows the predicted fire type that would occur under severe weather/burning conditions, such as those that existed during the Angora Fire (hot, dry, windy conditions). The table shows that all of the stands are predicted to experience a surface fire (low intensity) or a passive fire in which minor "torching" of individual trees or small clumps might occur in isolated patches, depending on the localized ground fuel or crown conditions and weather conditions. However, no active crown fire behavior is predicted, as was the case with the Angora Fire.

Table 3.1-2. Expected Fire Types and Fuel Models from the Proposed Action—20 Years

Stand No.	Acres	Expected Fire Type	Snags per Acre	Fuel Model
1	132	Passive	4	80% - 5 20% - 8
2	147	Passive	4	80% - 5 20% - 8
3	72	Surface	4	80% - 5 20% - 8
4	15	Passive	4	20% - 5 80% - 8
5	269	Passive	4	80% - 5 20% - 8
6	72	Passive	4	80% - 5 20% - 8
7	67	Passive	4	80% - 5 20% - 8
8	60	Passive	4	80% - 5 20% - 8
9	38	Surface	4	20% - 5 80% - 8
11	170	Passive	4	80% - 5 20% - 8
12	356	Passive	4	80% - 5 20% - 8
13	143	Passive	4	80% - 5 20% - 8

The areas that are not proposed for treatment are also predicted to experience a surface fire given the existing conditions with the lack of surface fuels (dead and live vegetation). These predicted effects are consistent with the analysis in the South Shore DEIS/DEIR in which both current and projected fire activity is projected to result in a surface fire (see South Shore DEIS/DEIR [Project Record Document E19], Maps 9 and 10). However, over time, these areas would see increased amounts of surface fuel as vegetation regrows and the dead trees fall.

Projected Fuel Loading

The desired condition for the Wildland-Urban Interface is for fuel loading that is less than 15 tons per acre over the area. Table 3.1-3 displays the calculated fuel loadings in the treatment stands as well as the projected levels in the treatment stands if no action is taken.

Table 3.1-3. Projected Fuel Loading in Treatment Stands

Treatment Stand Number	Surface Fuel (tons/ac)			
	Pre-Project (Existing)	No Action (2029)	Post-Project	20 Years after Project
1	5.5	26.0	7.4	12.0
2	8.0	26.0	8.0	10.3
3	7.3	30.0	8.2	8.0
4	7.7	17.0	12.6	11.6
5	5.8	24.0	6.7	9.1
6	2.9	29.0	3.7	8.3
7	8.3	34.0	8.5	9.9
8	5.9	43.0	6.3	10.3
9	4.4	8.0	5.3	7.2
11	10.3	32.0	10.5	13.6
12	4.3	15.0	4.6	6.5
13	6.8	44.0	7.0	10.4

There are approximately 1,168 acres of NFS lands outside of the treatment stands that would not experience any fuel reduction activities from the proposed action. Approximately 325 of those acres would be treated under the South Shore project. These stands would experience reduced fuel loading and risks of damage from wildfire (see the South Shore DEIS/DEIR [Project Record E19] for a detailed discussion of these effects). In the remaining portions of the untreated stands, fuel loading would range from 6.7 to 12.6 tons per acre after the project. In 20 years, the estimated fuel loading would range from 17 to 30 tons per acre. There is the potential that the stands identified for removal by aerial (helicopter) methods would instead be treated by hand-piling slash after the dead trees are felled and then prescribed pile burning. Although the fuel loading in these areas would be higher than that of helicopter treatment, the hand-piling of slash and burning would break up the possibly continuous fuel bed and reduce loading of smaller sized fuels. In addition, these areas would be surrounded by treated areas of low fuel loadings and would be isolated from areas of residences.

The areas immediately adjacent to residential areas would be well within the desired range of 10 to 15 tons per acre (see Table 3.1-3). The combined predicted fuel loadings and the isolation of areas of high fuel loadings meet the purpose and need of providing protection to the WUI Defense Zone and communities needing protection from future fires.

Cumulative Effects

The cumulative effect of the past, present, and reasonably foreseeable projects (primarily the South Shore fuel reductions and treatments associated with the proposed project) is the creation of a landscape with reduced fuel loading, which would meet desired conditions into the foreseeable future. Residential areas would be well buffered from areas with higher fuel loading. Future wildfires would be surface fires, with possible occasional torching into the crowns, as opposed to the crown fire that occurred with the Angora Fire. This is because many of the dead trees have been removed from the high and moderate burn severity areas, and the conifer stands have been thinned. Thinning and prescribed burning adds to past activities and cumulatively reduces fuel loads and fuel ladders while contributing to a reduced risk of high-intensity wildfires as well as reducing stand densities to improve overall health of the forest.

3.1.4 Analytical Conclusions

This section provides a summary of the effects analysis to fire and fuels comparing both the no action and proposed action alternatives.

For Alternative 1 (no action), dead trees will fall over time in a patchy distribution (most within 10 years) and contribute to fuel loading that is higher than pre-fire conditions over the entire area. Live and dead fuel arrangements and the dominance of flashy fuels types (with shrubs) would exceed suppression capabilities in the event of another wildfire (beyond 20 years). This fuel condition would not meet standards for wildfire behavior and suppression capabilities within the WUI defense zone.

For Alternative 2 (proposed action), the amount of dead trees contributing to fuel loading would be reduced, while snags and downed fuels would be retained at lower levels and be concentrated to higher levels within wildlife snag zones and other untreated areas. This arrangement of live and dead fuels will contribute to safe and effective suppression of wildfire and meet wildfire behavior and suppression standards within the WUI defense zone.

Section 3.2
Forest Vegetation

3.2 Forest Vegetation

3.2.1 Introduction

Forest vegetation is usually described by its composition (the tree species present and their proportional representation) and arrangement. The latter is usually referred to as *structure* and described in terms of size (diameter, height), percent canopy cover, and density (basal area per acre, stand density index, trees per acre, tons per acre). Composition and structure are heavily dependent on two factors: 1) the frequency and intensity of fires, such as the fire that burned through the Mediterranean ecosystem in the Lake Tahoe Basin, and 2) the site's ability to grow vegetation.

Historically, the frequency, or fire return interval (FRI), within the project area ranges from 5 to 32 years (Project Record Document E22). During settlement and pre-settlement periods, fires occurred frequently but were low to moderate in severity, burning primarily on the forest floor. Fires of low to moderate severity consume patches of fuel and kill mostly seedlings and saplings in the understory. However, occasionally, small groups of main-canopy trees are killed (Project Record Document E23). This creates a multi-aged forest with open- and closed-canopy conditions and heterogeneous fuels, thereby leading to a shifting mosaic of steady-state forest at the landscape level. This fire regime and the resulting forest mosaic impede the development of high-severity fires (Project Record Document E24). In the absence of fire, shade-tolerant species such as white fir (*Abies concolor*) crowd the understory and become a dominant component of the overstory, which grows much denser than historic densities, which are estimated to have been, on average, in the range of 50 trees per acre (Project Record Document E25). The forests were once dominated by widely spaced, large-diameter trees, such as Jeffrey pine (*Pinus jeffreyi*), with sugar pine (*Pinus lambertiana*) occurring in some areas.

The site's ability to grow vegetation does not change, at least not as it relates to the human perception of time, as long as there are no catastrophic events, such as landslides, or periods of severe soil erosion. However, it does often vary significantly within a forest according to topography (better on lower slopes, poorer on ridges) and aspect (drier and hotter on south aspects, wetter and cooler on north aspects). At issue for the project area is forest vegetation that burned during low-severity fires or not at all and remains too dense, resulting in trees that are less vigorous and more susceptible to insects, diseases, drought, and future fires. Also at issue is restoration of the burned landscape, which, from a vegetation standpoint, is a function of the growth of the trees that survived the fire, the survival and growth of planted trees, and the reestablishment of grasses, brush, and conifers from natural seeds.

Vegetation Modeling

Vegetation development indicators are used to measure both the effectiveness and environmental effects of the alternatives. These indicators include species composition, average diameter class, percent canopy cover, basal area per acre, and the stand density index.

Individual stand inventory data from the project area provided information regarding current conditions. Post-treatment modeling, using the west side Sierra Nevada variant of the FVS (Project Record Document E26), supplied the post-treatment conditions for individual stands. The FVS program is a model for predicting forest stand dynamics. The effects of the proposed treatments are based on FVS projections for stands with inventory data and are representative of average stand conditions. The modeling reflects forest vegetation conditions without the influence or effects of a future wildfire.

Thresholds for Indicators

Of the five vegetation development indicators—species composition, average diameter class, percent canopy cover, basal area per acre, and the stand density index—there are no thresholds for the first three indicators; rather, they are evaluated in terms of their contribution to meeting the purpose and need for the project, such as providing a diversity of wildlife habitat structures. For basal area per acre and the stand density index, the thresholds are evaluated in terms of their ability to predict the densities at which stands would be susceptible to or safe from attack by bark beetles. The levels of susceptibility are 150 square feet and 365, respectively. The levels of almost certain safety are 80 square feet and 230, respectively (Project Record Document E27).

Stands are identified and analyzed based on three types of treatments: 1) mechanical treatments, 2) hand treatments, and 3) treatments emphasizing wildlife. Stands for ground-based mechanical treatment are located on slopes less than 30% and access is available for equipment to fall and remove the trees. Hand-thinning stands are primarily located on slopes over 30% and are treated manually using chainsaws to fall the trees, and hand piling of the activity fuels. Wildlife stands have prescriptions specifically designed for the type of wildlife and habitat that is located in the stand, and have both mechanical and hand-thinning treatments. The proposed treatment prescriptions are described in Chapter 2.

3.2.2 Existing Conditions

The Angora Fire Restoration project boundary is entirely within the South Shore project boundary, and many existing conditions are relevant to both projects.

The project treatment area totals 1,541 acres and consists of 12 stands of burned conifers as well as aspen (*Populus* sp.) stands, meadows, and stream environment zones. See Figure 2-2 for a map of the locations of the stands. The conifer areas consist primarily of burned mixed conifer types and Jeffrey pine, with lodgepole pine (*Pinus contorta*) areas near streams and meadows.

The current condition of the forest vegetation in the proposed treatment stands, using the vegetation development indicators of species composition, average diameter class, percent canopy cover, basal area per acre, and the stand density index, is shown in Table 3.2-1, below.

Table 3.2-1. Condition of Forest Vegetation in Treatment Stands

Treatment Stand No.	Acres	CWHR* Species Type	CWHR Diameter Class	Average Canopy Cover (%)	Basal Area per Acre	Stand Density Index
1	132	Sierra Mixed Conifer	4	16	55	87
2	147	Barren		0	0	0
3	72	Barren		5	16	19
4	15	Jeffrey Pine	4	52	216	320
5	269	Jeffrey Pine	4	24	70	106
6	72	Sierra Mixed Conifer	5	10	33	44
7	67	Sierra Mixed Conifer	4	19	56	80
8	60	Barren		4	12	13
9	38	Jeffrey Pine	5	31	100	129
11	170	Barren		1	4	5
12	356	Sierra Mixed Conifer	4	17	46	66
13	143	Barren		0	0	0

* CWHR = California Wildlife Habitat Relationships (www.dfg.ca.gov/biogeodata/cwhr/).

This table reveals the very low canopy cover and density (basal area per acre) remaining after the Angora Fire in almost all of the treatment stands.

Currently, the Angora Fire area consists of a patchy distribution of natural conifer and aspen seedlings. Findings from surveys conducted within the Angora Fire area (Project Record Document E28) have shown that 50 to 60 percent of the higher intensity burn areas have no regeneration of seedlings occurring naturally at this time. The other 40 to 50 percent have seedling amounts of up to 106 per acre with only 5 per acre that are Jeffrey pine, the rest mostly white fir.

There are approximately 1,168 acres that are not included in the proposed action to reduce fuels or actively restore ecological conditions damaged by the Angora Fire. There are no specific stand inventories for these acres, which are not proposed to be treated. The acres of vegetation in the untreated stands are shown in Table 3.2-2, below.

Table 3.2-2. General Vegetation Types and Amounts

Species (CWHR) Type	Untreated Acres
Jeffrey Pine/Sierra Mixed Conifer and Lodgepole Pine (size class 4 and 5)	925 acres
Wet Meadow	25 acres
Montane Chaparral	208 acres
Sagebrush	10 acres

The conifer stands were burned at varying intensities by the Angora Fire. Approximately 749 acres were burned at moderate or high intensity. There are high levels of snags in these areas. Approximately 447 acres were burned at low intensity and these stands have adequate density of conifer trees remaining to fully recover in the near future. The majority of the fire-damaged area that is not proposed for treatment is located along the upper slopes of Angora Ridge on the western edge of the fire area. There are approximately 635 acres of contiguous land in this area that were burned at high and moderate intensities resulting in very low or no residual conifer vegetation, and high amounts of dead standing trees. A review of historic information revealed that this portion of the landscape once contained much lower tree densities and cover than was present when the fire occurred. This higher tree density was due to the recent practice of suppressing fires, which resulted in the loss of fire as a natural process that helped control stand densities and promote variability in species composition and in stand structure.

3.2.3 Direct, Indirect, and Cumulative Effects

Alternative 1—No Action

Direct and Indirect Effects

Jeffrey pine would regenerate naturally only in areas that are sufficiently open. Otherwise, white fir would be the principal regenerating conifer. Lodgepole pine and aspen would regenerate where these species dominated the existing vegetation before the fire. In areas of moderate-to-high burn severity, there is a lack of reliable conifer seed sources due to a consumed seed bank and a lack of nearby living seed-producing trees. In burn areas of higher severity, minimal-to-no natural regeneration of conifers would occur. A shrub component would be present; after 20 years it would occupy about 70% of the area at a height of 3 to 5 feet, with a patchy distribution of mixed conifer regeneration. Hardwood trees such as aspen, alder (*Alnus* sp.), and willow (*Salix* sp.) would benefit from the lack of conifer competition and thrive initially within some riparian areas. Riparian species would be well established, with some lodgepole pine and white fir trees beginning to grow adjacent to riparian areas. The burn area would have reverted from mid- and late-seral forest conditions to early-seral forest conditions. It would take at least 100 years to reestablish large trees (those with a diameter at breast height [dbh] of more than 24 inches) and at least 250 years to develop old trees with decadence features that are beneficial to wildlife (Project Record Document E8, page 138).

The anticipated condition of forest vegetation in 20 years after taking no action, using the vegetation development indicators of species composition, average diameter class, percent canopy cover, basal area per acre, and the stand density index, is shown in Table 3.2-3, below.

Table 3.2-3. Vegetation Conditions of Treated Stands in 20 Years after No Action

Treatment Stand No.	Acres	CWHR* Species Type	CWHR Diameter Class	Average Canopy Cover (%)	Basal Area per Acre	Stand Density Index
1	132	Sierra Mixed Conifer	4	25	98	148
2	147	Shrubs		4	5	11
3	72	Shrubs		8	23	39
4	15	Jeffrey Pine	4	58	259	373
5	269	Jeffrey Pine	4	34	109	163
6	72	Sierra Mixed Conifer	5	15	52	79
7	67	Sierra Mixed Conifer	4	26	81	121
8	60	Shrubs		7	15	28
9	38	Jeffrey Pine	5	38	128	177
11	170	Shrubs		4	10	20
12	356	Sierra Mixed Conifer	4	25	74	111
13	143	Shrubs		4	8	17

* CWHR = California Wildlife Habitat Relationships (www.dfg.ca.gov/biogeodata/cwhr/).

As demonstrated in the table, forest vegetation in 20 years is expected to exceed basal area per acre and stand density indices for forest resistance to attack from bark beetles in Treatment Stands 1, 4, 5, 7, and 9. Treatment Stand 4 significantly exceeds the levels of susceptibility for both criteria (150 square feet and 365, respectively); Treatment Stands 1, 5, 7, and 9 exceed the basal area level for minimizing the risk of new or continued mortality from either insect activity or drought effects. The density of trees in these stands would result in increased inter-tree competition for limited resources (sunlight, moisture, nutrients), leading to a stand that is less resilient to withstand natural events.

There are approximately 1,168 acres of the project area that are not part of the proposed treatment stands. Vegetative recovery for these areas would be the same as under the proposed action (see discussion below under “Alternative 2—Proposed Action”). Approximately 271 acres were burned at a high intensity and would revegetate with shrubs and grass for the foreseeable future (20 or more years). These areas are along the upper slopes of Angora Ridge and the natural succession leading to conifer regeneration would take several decades to become established due to the lack of conifer seed sources. Approximately 462 acres burned at moderate intensity and remaining conifer stocking is patchy. Conifer recovery would take several decades to fully recover, however, the proximity to seed sources from surviving trees or adjacent stands would be faster than in the areas that burned under high intensity. There are approximately 435 acres of stands burned under low intensity. These areas would retain their existing overall conditions in terms of species composition and densities.

An additional indirect effect of taking no action is the creation of a landscape that would be more difficult to actively manage in the near future. This condition is relevant to the areas of high and moderate burn intensity. These areas would be dominated in the understory by woody brush (between 40% and 70% crown cover) and would be up to 6 feet high within 10 years of the fire. These areas would eventually also have very high amounts of downed logs that would have fallen as a result of the fire. Due to the heavy fuel and existing brush, these areas would be logistically difficult to manage with future possible prescribed fire or mechanical thinning or brush removal. The downed logs would create fire hazards for any remaining desirable leave trees or newly established conifers, and would also make mechanized treatment extremely expensive and inefficient.

Tree densities in the conifer stands that survived the fire would continue to increase, leading to increased mortality from competition for water, soil nutrients, and light. Individual tree health and vigor would decrease, and the stands would become more susceptible to disease, and insects. The dense forest conditions and dead trees would lead to a more rapid buildup of fuels across the landscape and increase risk of wildfires that damage wildlife habitat and threaten homes and communities.

Cumulative Effects

The cumulative effect of the no-action alternative in combination with existing and proposed fuel treatments occurring on and in the vicinity of the project (i.e., South Shore Project and state and private lands projects) would not increase the overall effectiveness of existing fuel reduction treatments or improve forest health at the landscape scale. Fuel loading would continue to increase over time as seedlings mature, dead trees fall, and surface fuels accumulate in combination with live ladder fuels such as trees and shrub. Growing space for live trees that survived the fire would continue to decrease leading to decreased tree vigor and susceptibility to drought and insect attack in unthinned stands. There would be minor cumulative effects to vegetation composition under the no action alternative. As of May 2010, 670 acres within the project area have been reforested with a mix of conifers including Jeffrey pine, sugar pine, red fir, and incense cedar. An additional 295 acres are planned to be planted over the next few years. Reforestation would also occur naturally in the project area and adjacent stands but may not include a mix of tree species that are well adapted to drought, low intensity wildfire (e.g. regenerating white fir and lodgepole pine), or provide additional habitat such as aspen. Within the South Shore Project tree species would be preferentially thinned by removing more white fir and lodgepole pine while retaining Jeffrey pine, sugar pine, and promoting growing space for aspen. The no-action alternative would not include the aspen planting.

Alternative 2—Proposed Action

Direct and Indirect Effects

Under the proposed action, development of vegetation would be managed by applying treatment prescriptions 2 to 4 years following the fire. Proposed prescriptions are outlined below in Table 3.2-4. See Chapter 2, “Alternatives, Including the Proposed Action,” for a discussion of the proposed action and associated design features regarding the removal of dead trees, thinning of residual conifer stands, and treatment of activity-related fuels.

Table 3.2-4. Prescriptions in Treatment Stands

Treatment Stand No.	Prescription
1	Remove all snags, except 4 snags per acre, > 16-inch dbh. Dispose of slash. Thin live trees to 50 square feet of basal area per acre. Dispose of slash.
3	Remove all snags, except 4 snags per acre, > 16-inch dbh. Dispose of slash.
6, 8, 11	Remove all snags, except 4 snags per acre, > 16-inch dbh. Dispose of slash.
2, 12, 13	Remove all snags, except 4 snags per acre, > 16-inch dbh. Dispose of slash.
4, 9	Remove all snags, except 4 snags per acre, > 16-inch dbh. Dispose of slash. Thin live trees (3- to 24-inch dbh) to 80 square feet of basal area per acre. Dispose of slash.
5	Remove all snags, except 4 snags per acre, > 16-inch dbh. Dispose of slash. Thin live trees (3- to 24-inch dbh) to 60 square feet of basal area per acre. Dispose of slash.
7	Remove all snags, except 4 snags per acre, > 16-inch dbh. Dispose of slash. Thin live trees (3- to 24-inch dbh) to 50 square feet of basal area per acre. Dispose of slash.

The direct and indirect effects of mechanical and hand thinning on live trees between 3 and 24 inches in diameter, mostly in areas that burned with low severity, would change species composition, with a greater representation of Jeffery pine and sugar pine because of the focus on removing white fir and lodgepole pine. In areas that are treated by hand piling and burning, it is expected that residual tree mortality and crown scorch would be less than 5% and 10% respectively. Mortality as a result of pile burning will be minimized by implementing Project Design Feature 4 (Section 2.3.2) and is also expected to achieve stand density objectives. The composition of each thinned stand would more closely mirror the historical forest. The average diameter of the remaining conifers would increase because the removal of smaller trees would open up space for the remaining trees to grow larger. The canopy cover would decrease in the short run because of the removal of leaf mass but would recover to pre-thinning levels in about 20 years as the remaining trees took advantage of the space to grow larger crowns. This change of species composition to include more Jeffrey and Sugar pine in combination with a decrease in existing tree density would create stand conditions that would be more resilient to drought. This means that the existing stands of trees would be more vigorous and more likely remain in a forested condition if winter precipitation amounts change or decrease.

The average basal area per acre and stand density index for each thinned stand would be at or below the thresholds of 80 square feet and 230, respectively. Often, stand averages appear to indicate that there is little or no need to treat the vegetation or fuels. The problem occurs because the average includes areas with a sparse-to-dense stocking of trees or loading of fuel. The result is a stand average that often gives a false impression, indicating that there is no need for thinning or reducing the loading of fuel. This problem is evident in three of the five stands proposed for thinning (Treatment Stand 1 with 55 square feet, Treatment Stand 5 with 70 square feet, and Treatment Stand 7 with 56 square feet of basal area per acre).

An approach to solving this problem is to replace stand averages with ranges within a stand because a typical stand is made up of plant aggregations ranging in size from 0.1 acre to 2 acres. Therefore, the aggregations with basal areas per acre of more than 100 square feet and/or stand density indexes of more than 270 would be thinned to bring the density in these aggregations down to the targets of 80 square feet and 230, respectively. The remaining aggregations would not be thinned. Overall, the result would be improved health and vigor for the remaining trees; less susceptibility to insects, diseases, drought, and future fires; and a greater opportunity for the trees to add leaf mass and, in turn, grow in height and diameter, thereby contributing to the restoration of the stand to historical forest conditions. The largest of the remaining trees, especially those that are more than 24 inches in diameter, are important because their thick bark makes them resistant to future fires, and they contribute significantly to the aesthetics of the area.

Greenleaf manzanita, huckleberry oak, bitterbrush, and at least two species of ceanothus are expected to occupy the stands regardless of whether an area is thinned, planted, or treated. It is difficult to predict the timing or intensity of the invasion because, as described previously, it would depend on 1) whether the shrubs sprout or not, 2) nearby seed sources for new shrubs and grass plants, 3) the availability of moisture, and 4) the quality of the soil. Nevertheless, the stand not used by trees would undoubtedly be used by brush and grass, as is empirically evident from past fires in California.

Regarding the direct and indirect effects of fire, *Aspen: Ecology and Management in the Western United States* makes it clear that the few acres in the burn area with aspen stands have benefited from fire (Project Record Document E30). This is evident from the following quotes on the effects of fire (Uones and Trujillo 1975a; Patton and Avant 1970; Pearson 1914; and Stahelin 1943 in Project Record Document E30.)

> Although aspen forests do not burn readily, aspen trees are extremely sensitive to fire.
>
> A fire intense enough to kill the aspen overstory will stimulate abundant suckering . . . but some suckers will arise after any fire.
>
> It appears that a moderate intensity fire that kills most or all the overstory will stimulate very adequate suckering and will have the least effect on subsequent sucker growth.
>
> Even a mere scattering of aspen in a coniferous stand commonly will restock the area with a new aspen forest after a severe fire.

The anticipated condition of forest vegetation in 20 years, after applying the aforementioned prescriptions (see Table 3.2-4), using the vegetation development indicators of species composition, average diameter class, percent canopy cover, basal area per acre, and the stand density index, is shown in Table 3.2-5, below.

Table 3.2-5. Condition of Forest Vegetation in Treatment Stands in 20 Years

Treatment Stand No.	Acres	CWHR* Species Type	CWHR Diameter Class	Average Canopy Cover (%)	Basal Area per Acre	Stand Density Index
1	132	Sierra Mixed Conifer	5	20	83	122
2	147	Jeffrey Pine	2	13	25	57
3	72	Shrubs		8	22	37
4	15	Jeffrey Pine	5	28	104	148
5	269	Jeffrey Pine	5	33	96	172
6	72	Sierra Mixed Conifer	5	15	52	80
7	67	Jeffrey Pine	5	29	82	151
8	60	Jeffrey Pine	5	15	33	70
9	38	Jeffrey Pine	5	31	98	136
11	170	Shrubs		4	10	20
12	356	Sierra Mixed Conifer	4	25	74	111
13	143	Jeffrey Pine	2	13	27	60

* CWHR = California Wildlife Habitat Relationships (www.dfg.ca.gov/biogeodata/cwhr/).

Comparing the indicators in Table 3.2-1, which delineated the current condition of forest vegetation, with those in Table 3.2-6 illustrates the effect of thinning in Treatment Stands 1, 4, 5, 7, and 9 on the growth of the trees that survived the fire. Under the proposed action, the stand density indices for each of these stands would be within or approaching the desired stand density index. Treatment Stand 4, which had a stand density index of 320, would be more resilient to possible insect activities, as its index would be reduced to 148. The basal areas in these stands would also be moving toward desired levels, reflecting the reforestation and thinning activities.

In the stands that were not treated under the proposed action (approximately 1,168 acres), vegetative recovery would be the same as under the no-action alternative. Approximately 271 acres were burned at a high intensity and are revegetating primarily with shrubs and grasses. These areas are along the upper slopes of Angora Ridge and conifer regeneration would take several decades to become established due to the lack of conifer seed sources. Approximately 462 acres burned at moderate intensity and remaining conifer stocking is patchy. There are approximately 435 acres of stands burned under low intensity. These areas would retain their existing overall conditions in terms of species composition and densities.

Cumulative Effects

The cumulative effects of planting depend on the survival and growth of the trees planted under the Angora Restoration CE. It is estimated that 50 to 60% of the planted trees would survive, based on local experience, resulting in an average of 110 surviving planted trees per acre after 5 years. The stands that have been or will be planted generally have deep and productive forest soils, resulting in moderate site quality (R5 Site Index III). Their potential growth is predicted by growth models for Ponderosa pine (e.g., Yield of Unthinned Plantations in Northern California) (Project Record Document E29). For a moderate quality site, the following would be expected:

Table 3.2-6. Expected Growth of Planted Trees

Age from Planting	Mean Height (feet)	Mean Diameter (inches)
10	6	1.6
15	12	3.9
20	20	6.1

The cumulative effect of the proposed action in combination with other existing and proposed vegetation and fuel treatments would increase the overall effectiveness of fuel reduction and improve forest health on the landscape scale. The acres of mechanical and hand thinning in the proposed action area would be a minor addition to other the past, present, and reasonably foreseeable thinning projects in vicinity of the project area. The fuel treatments under the proposed action would combine with existing treatments to create a relatively open forest structure where fuel amounts and arrangements have been altered to encourage low-intensity surface fires, which may be effectively suppressed by fire management personnel. Reforestation with a mix of conifer species as well as planting aspen would create a diverse stand structure with species that are more resilient to drought, wildfire, disease, and insect attack. This, in turn, would positively influence the long term effectiveness of fuel treatments in terms of establishing lower fuels and more resilient vegetation structure that would meet Forest Plan standards for the WUI to reduce wildfire intensity and increase suppression capabilities across the Defense Zone.

Thinning and prescribed burning would retain or promote a higher component of pine within mixed conifer and white fir stands. Lower stand densities in the thinned stands will also promote the health of pines since pines do not grow well at the higher densities where white and red fir can persist. Thinning and prescribed burning adds to past activities and cumulatively reduces fuel loads and fuel ladders while contributing to a reduced risk of high-intensity wildfires as well as reducing stand densities to improve overall health of the forest.

3.2.4 Analytical Conclusions

This section provides a summary of the effects analysis to vegetation and forest health comparing both the no action and proposed action alternatives.

For Alternative 1 (no action), vegetation will re-establish initially and include a higher proportion of shrub species over the burned area. The on-going reforestation will also establish a mixed conifer forest with desired species levels. Conifers will also re-establish naturally where fire severity was low to moderate and an existing seed source is available. Monitoring has shown that white fir and lodgepole pine have initially established through natural regeneration, while Jeffrey pine, sugar pine, and incense cedar are not as abundant. Therefore, white fir and lodgepole pine would be the dominant conifer species. Aspen along Angora Creek will continue to thrive in the absence of competing conifers and the increased water availability. Aspen in other areas would continue to decline in health due to the presence of competing fir and lodgepole pine. Over several decades, the new coniferous forest will once again be at risk from damage from wildfire as the fuel loadings and resistance to control increase.

For Alternative 2 (proposed action) vegetation will continue to be established through natural means. White fir and lodgepole pine would naturally regenerate but would not occur at the same cover and density that existed pre-fire. Shrub species would be established through natural regeneration but would exist at lower densities and cover within the planted areas. Aspen would increase in area due to conifer thinning and aspen planting. Tree densities would be managed at lower levels and stand vigor and resiliency would improve.

Section 3.3
Soil and Watershed Resources

3.3 Soil and Watershed Resources

3.3.1 Introduction

The Angora Fire increased hydrophobicity of the soils and decreased ground and canopy cover. Since the fire burned approximately 3 years ago, the potential for large-scale sediment delivery has greatly reduced due to natural recovery. While high-severity burn areas will continue to provide sources for erosion and sediment, sediment production will continue to decrease at an increasingly rapid rate over the next 2-5 years, when natural vegetation reoccupies burn areas, sediment volumes will return to normal. (Project Record Document E8). In addition to increased sedimentation as compared to pre-fire conditions, increases in runoff from precipitation events are expected. Increased runoff will result in more water available to the drainage systems; therefore, an increase in the flow and the presence of perennial and seasonal streams is expected to occur until natural vegetation reoccupies burn areas due to higher water tables and runoff.

The Lower Upper Truckee River, within one of the five watersheds affected by the Angora Fire, is a 303(d) listed stream. This listing is given to impaired waterbodies, varies based on water quality concerns, and is designated by the Lahontan Regional Water Quality Control Board. The entire Lake Tahoe Basin is affected by this listing as a result of declining lake clarity resulting from suspended sediment and phosphorus. In addition, Upper Truckee River is listed for nutrients and metals. The Upper Truckee River watershed is approximately 34,560 acres (54 square miles). The Angora Fire area (which is also the project area) covers approximately 9% of the Upper Truckee watershed. The Angora Fire area could continue to affect sediment and nutrient contributions to nearby surface waters as a result of increased surface erosion and mobilization of surface soil nutrients in ash, but effects will diminish over time and sediment and nutrient loads are expected to return to normal within 5-6 years. The majority of the project area drains into the Upper Truckee River. There are about 628 acres on the northeast side of Tahoe Mountain that drain into the Tahoe Keys. Approximately 11 acres drain into the Taylor Creek watershed, which includes Fallen Leaf Lake.

The elevation range in the project area is from 7,290 feet at the lookout at Angora Ridge, on the west perimeter, to 6,300 feet at State Highway 89, on the north end of the project area. Average annual precipitation ranges from approximately 20 to 60 inches in relation to elevation and occurs in the form of snow. Rain-on-snow events are infrequent, and when they occur, they can dramatically affect landscape and stream channels. These events often contribute disproportionate amounts of pollutants to surface waters, including Lake Tahoe.

In addition to supporting native vegetation and wildlife, soils play a critical role in supporting watershed and ecosystem health through the functions of accepting, storing, and releasing water. The soils analysis for this project is limited to the soils in the analysis area. The activity area, as defined and discussed below, will be used as the geographic basis for analysis for the action alternatives. For the no-action alternative, the entire analysis area will be used to analyze the impacts of a potential wildfire.

The temporal scope for assessment of soil resource environmental effects includes short term (1–10 years following vegetation treatment) and long term (10–20+ years following vegetation treatment) for this analysis. This timeframe would capture both the immediate effects of the project activities and the expected impacts at the point where they are no longer discernable from other activities.

The need to protect and improve the quality of the soil resource and avoid permanent impairment of productive capability of NFS lands is governed by the Multiple Use and Sustained Yield Act of 1960, the National Environmental Policy Act of 1969, the Forest and Rangeland Renewable Resources Planning Act of 1974, and the National Forest Management Act of 1976.

The LTBMU Land and Resource Management Plan (Project Record Document E31) provides guidance specific to the Lake Tahoe Basin. Standards for maintaining soil productivity are found on pages IV–39. Soil function in riparian conservation areas (RCAs) is addressed by Standards 111 and 122 in the Sierra Nevada Forest Plan Amendment (Project Record Document E8).

Policies that guide vegetation management practices in order to sustain soil quality are found in the national and regional Forest Service Manuals and Handbooks. Soil quality standards and indicators are applied to activity areas. For this analysis, *activity areas* are defined as the individual treatment stands and include vegetation treatment stands, associated landings, burning of hand piles, and stream and meadow restoration (see Chapter 2). The activity area is considered an appropriate geographic unit for assessing environmental effects to soils because soil productivity is a site-specific attribute of the land; soil productivity of one area is not dependent on the productivity of an adjacent area. Thus, the activity area is used in this analysis as the geographic unit for assessing direct, indirect, and cumulative soil environmental effects for the action alternative.

Soil quality standards are intended to apply on an area basis. This means that detrimental soil conditions, as defined by the standards, should not exceed a given percentage of the activity area. For most of the Forest Service regions, this percentage is 15%. Region 5 standards apply to all land dedicated to growing vegetation; the decision on what percentage of the activity area should meet the standards was considered a land allocation decision that should be made by the individual forests. For monitoring done to evaluate this project, a threshold of 15% will be used.

Soil quality standards do not apply to classified roads and trails because these lands are not dedicated to growing vegetation. Soil analysis for changes to the road and trail system is primarily limited to erosion in the general forest that may result from road and trail runoff. Decommissioning of roads and trails generally restores land to vegetation production; this may be a short term or long term result, depending on the methods used for decommissioning.

Indicators

This section discusses the elements of the existing condition that will be analyzed in the ensuing effects analysis to quantify the nature, extent, and duration of the no-action and proposed action alternatives. The Region 5 soil quality analysis standards are not a set of mandatory standards or requirements, but rather provide thresholds and indicators for key elements that represent desired conditions for the soil resource. The Region 5 standards also include threshold values for coarse woody debris (material greater than 3 inches in diameter). When the standards were written it was believed that coarse woody debris contributed to soil productivity through nutrient recycling. Current science is finding that not to be the case; coarse woody debris does not contribute significantly to soil productivity in Sierra Nevada forests (Project Record Document E32). Therefore, coarse woody debris is not used as an indicator for this analysis. Because the proposed action does not have the potential to impact soil buffering capacity, soil buffering capacity is also not used as an indicator for soils analysis.

Impacts to soil hydrologic function would occur primarily as an indirect effect of impacts to porosity, so these indicators are discussed together. The analysis will also consider the potential for detrimental impacts to the soil resource from severe burning.

The following soil quality indicators are used as the basis for the effects analysis and are defined and discussed below:

- Soil Porosity and Hydrologic Function
- Effective Soil Cover
- Surface and Subsurface Organic Matter
- Severe Burning

Soil Porosity and Hydrologic Function

Porosity is the space between individual soil particles. Maintenance of natural soil porosity is important for maintaining healthy native plant communities and for maintaining the hydrologic function of the soil. Soil compaction is a physical change in soil properties that results in a decrease in porosity and an increase in soil bulk density and soil strength (Project Record Document E33). Potential direct effects of compaction include reduced movement of water and air through reduction in size, continuity, and total volume of pores, as well as a potential loss to soil structure as measured by a decrease in the size, strength, and number of soil aggregates. Potential indirect effects are multiple:

- Severe compaction can inhibit root growth when the soil becomes too dense for roots to penetrate easily; this may reduce both root and top growth.
- Compaction decreases infiltration and hydraulic conductivity, the movement of water into and through soils, which in turn increases surface runoff and erosion potential.
- Soil compaction decreases the transmission of water, nutrients, and air to roots.
- Conversely, with slight to moderate levels of compaction on coarse-textured soils, water storage may be increased, making water and nutrients available to plants throughout a longer period during the growing season (Project Record Document E34).
- Changes in moisture and aeration may reduce soil organism activity, reducing rates of nutrient and organic matter cycling.

Soil hydrologic function describes the ability of water to move into and through soils. Infiltration is the movement of water into soils, while hydraulic conductivity (sometimes called permeability) is the movement of water within soils. Soil hydrologic function is primarily controlled by physical soil properties such as texture, structure, and porosity. Soil texture—the relative distribution of sand, silt, and clay—is not affected by forest management activities. Soil structure—the arrangement of individual soil particles into aggregates—and soil porosity can both be impacted by forest management activities that cause compaction. Infiltration can also be reduced when the soil surface becomes hydrophobic (water repellent). Water repellency results when soil particles are coated with compounds derived from plant material decomposition or severe burning.

Effective Soil Cover

The presence of effective soil cover generally indicates that the soil surface is adequately protected from accelerated erosion. Effective soil cover is defined as live vegetative plant canopies, plant litter and duff, and rock fragments equal to or greater than 0.5 inch in diameter.

Surface erosion is the detachment and transport of individual soil particles by wind, water, or gravity (Project Record Document E33). Accelerated erosion can impair site productivity and water quality. The topsoil (A horizon) is the most fertile and biologically active part of the soil profile due to its enrichment by organic matter in varying stages of decomposition. Loss of all or part of this horizon through erosion impairs the ability of the soil to support natural vegetation communities and often imparts a competitive advantage to non-native invasive species (weeds).

When eroded soil is deposited in water bodies, it can impact water quality and aquatic habitats. Fine particles such as clays and colloidal organic matter can decrease the clarity of Lake Tahoe because they tend to remain in suspension rather than sinking to stream or lake bottoms.

Surface and Subsurface Organic Matter

Soil productivity, nutrient cycling, and pollutant filtering capacity are, in part, dependent on the chemical and biological properties of soils, especially organic matter. Decomposed subsurface organic matter has a role in aggregate formation and promotes the transfer of air and water through soils, provides nutrients that are available to plants, and increases water-holding capacity. Organic matter also serves as a major reservoir for terrestrial carbon.

Climate is usually the most important factor for controlling organic matter accumulation and decomposition under natural conditions, although organic matter is easily influenced by human activities because it is concentrated near the ground surface. Surface organic matter abundance is influenced by mechanical site disturbance, through thinning and harvest operation and by repeated foot or vehicle traffic. Thinning operations remove organic matter by removing vegetation that would otherwise decompose on site; the amount removed depends on the intensity of treatment. Foot and vehicle traffic may pulverize organic matter, making it more susceptible to erosion by wind and water. Subsurface organic matter may be lost through erosion, soil displacement, or severe burning.

Potential for Severe Burning from Wildfire

This indicator is intended to evaluate the risk of future impacts from wildfire. Severely burned soil is a condition where most woody debris and the entire forest floor are consumed down to bare mineral soil. A range of detrimental soil conditions may result: soil humus losses, structural changes, hydrophobic characteristics (water repellency), and sterilization are potential effects of severely burned soil. Soil may have turned red due to extreme heat; in wildfires in the Sierra Nevada, about 1–2% of the area may have severely burned soil (Project Record Document E35). Fine roots and organic matter are charred in the upper 0.5 inch of mineral soil (Project Record Document E34).

The degree of soil heating is dependent the duration of the fire and soil moisture. Large, concentrated fuel sources such as logs, stumps, or large slash piles burn longer and produce greater heat at greater depths than smaller, less concentrated fuels. Soil moisture limits soil temperature increases to about 95° C until all the water in the soil has been evaporated (Project Record Document E36). Temperatures above 400° C are usually associated with reddened soil color resulting from chemical transformations of iron-containing minerals (Project Record Document E35). Temperatures that alter clays and soil minerals are too hot to permit the formation of a water repellent layer (Project Record Document E38), so these impacts do not occur in the same place.

Fire produces changes in soils that affect plant growth; humus losses alter nutrient contents, and intense soil heating can release some nutrients and temporarily increase the soil pH, changing nutrient availability in mineral soil. When soil microorganisms and invertebrates in the surface layers are killed, a wide variety of ecological services are decreased or suspended until these communities recover; this is sometimes described as sterilization.

Soil structural changes and water repellency impact soil-plant water relations and soil hydrologic function. Soil aggregate structure collapses when the organic matter that served as a binding agent is destroyed; this decreases porosity. If the soil surface is bare, raindrops may displace soil particles and ash, partially or totally sealing surface soil pores; this decreases infiltration and increases surface runoff and erosion potential. Soil may be lost through erosion when large areas of bare mineral soil are exposed by fire, potentially impacting both soil productivity and water quality.

3.3.2 Existing Conditions

Soil Resource

Soils in the project area developed from glacial and alluvial materials derived primarily from granitic rocks, but with some metamorphic and volcanic rocks (Project Record Document E38). Soils are generally coarse textured, with coarse sand, loamy coarse sand, and sandy loam surface layers. There exist in the project area six soil map units of high to moderate concern. These are Tahoe complex 7041 and 7042; Watah peat 7071; Cagwin Rock complex 7412 and 7413; and Celio Loamy coarse sand 7431 (this map unit does not occur in areas proposed for treatments).

The Tahoe soils have organic surface layers derived from decomposed plants. Tahoe complex soil map unit 7041 is associated with occasional to frequent annual flooding and ponding; it is described as having very high runoff and very poor drainage. This soil map unit is associated with Treatment Stands 2, 12, and 13 comprising 1.3, 2.9, and 3.4 acres of the unit, respectively. While Tahoe complex 7042 is located in the project area, there are no treatment stands associated with this unit. Increased water availability in areas with diminished vegetation from the Angora Fire in the vicinity of Tahoe soils would create a higher potential for flooding and ponding to occur.

Watah soils are organic soils primarily derived from decomposed peat. Fens are associated with this soil type. Both Watah and Tahoe soils are associated with flooding, ponding, poor drainage, and a high water table. Water availability is greater in areas where the Angora Fire diminished vegetation, and these soils have a higher potential for flooding and ponding. Treatment Stand 5 is associated with roughly 2.3 acres of Watah soil.

Cagwin-Rock outcrop complex 7412 occurs on slopes of 15 to 30%, and Cagwin-Rock outcrop complex 7413 occurs on slopes of 30 to 50%; both soil units are extremely stony. The concern associated with these soil units is their moderate runoff rates, which could pose a problem in areas of high and moderate burn severity as runoff rates would be increased as a result of the Angora Fire. Treatment Stands 3, 4, and 5 contain both soil units. Treatment Stand 3 is associated with 1.4 acres of 7412 and 3 acres of 7413; Treatment Stand 4 is associated with 4.4 acres of 7412 and 0.4 acres of 7413; and Treatment Stand 5 is associated with 17 acres of 7412 and 0.3 acres of 7413.

Celio loamy coarse sand 7431 occurs in the project area and is subject to occasional ponding and a high runoff rate. This soil does not occur in any treatment stands.

The analysis area includes 27 soil map units. See Figure 3.3-1 for a map showing the locations of map units with more than 5 acres. Each map unit usually includes two or more individual soil types, or components. The acres of each soil map unit in the proposed treatment stands are listed in Table 3.3-1. Detailed information about the soils may be found in the soil survey of the Tahoe Basin area (Project Record Document E39).

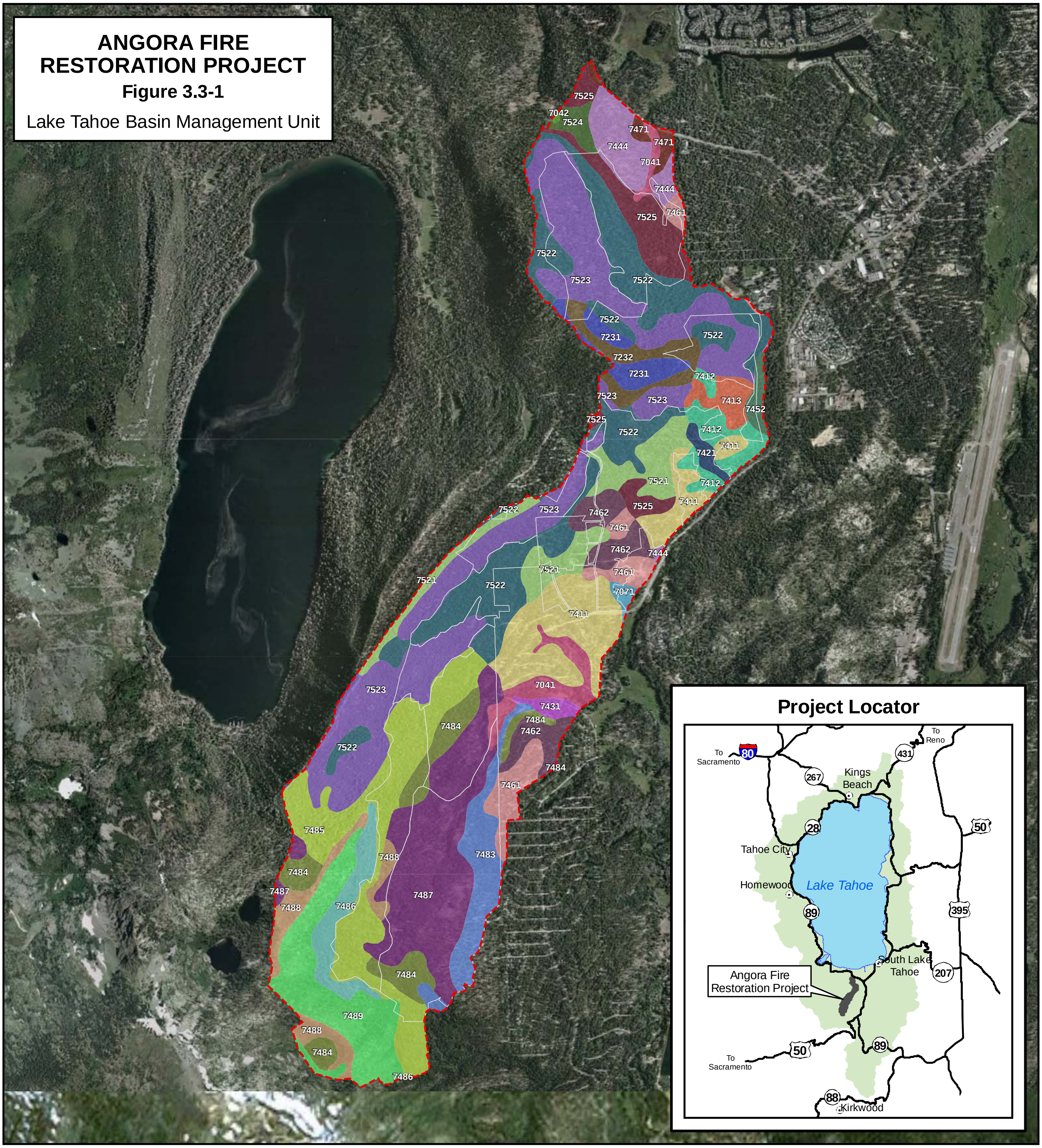
Table 3.3-1. Acres of Soil Map Units in Project Area and Within Treatment Stands

Map Unit Symbol	Map Unit Name	Project Acres	Acres in Treatment Stands
7041	Tahoe complex, 0 to 2% slopes	64	8
7042	Tahoe complex, 0 to 5% slopes, gravelly	1	0
7071	Watah peat, 0 to 2% slopes	8	2
7231	Waca very gravelly medial coarse sandy loam, 9 to 30% slopes	47	2
7232	Waca very gravelly medial coarse sandy loam, 30 to 50% slopes	57	13
7411	Cagwin-Rock outcrop complex, 5 to 15% slopes, extremely stony	209	57
7412	Cagwin-Rock outcrop complex, 15 to 30% slopes, extremely stony	59	23
7413	Cagwin-Rock outcrop complex, 30 to 50% slopes, extremely stony	33	13
7421	Cassenai gravelly loamy coarse sand, 5 to 15% slopes, very stony	14	14
7431	Celio loamy coarse sand, 0 to 5% slopes (does not occur in any areas proposed for treatment)	14	0
7444	Christopher-Gefo complex, 0 to 5% slopes	78	5
7452	Gefo gravelly loamy coarse sand, 9 to 30% slopes	17	6
7461	Jabu coarse sandy loam, 0 to 9% slopes	85	31
7462	Jabu coarse sandy loam, 9 to 30% slopes	86	41
7471	Marla loamy coarse sand, 0 to 5% slopes	17	0
7483	Meeks gravelly loamy coarse sand, 0 to 5% slopes, very stony	105	94
7484	Meeks gravelly loamy coarse sand, 5 to 15% slopes, extremely boulder	113	71
7485	Meeks gravelly loamy coarse sand, 15 to 30% slopes, extremely boulder	270	170
7486	Meeks gravelly loamy coarse sand, 30 to 70% slopes, extremely boulder	65	1
7487	Meeks gravelly loamy coarse sand, 5 to 15% slopes, rubbly	302	291
7488	Meeks gravelly loamy coarse sand, 15 to 30% slopes, rubbly	72	14
7489	Meeks gravelly loamy coarse sand, 30 to 70% slopes, rubbly	179	1
7521	Tallac gravelly coarse sandy loam, 5 to 15% slopes, very stony	138	91
7522	Tallac gravelly coarse sandy loam, 5 to 15% slopes, very stony	395	240
7523	Tallac gravelly coarse sandy loam, 30 to 70% slopes, very stony	514	265
7524	Tallac gravelly coarse sandy loam, moderately well drained, 0 to 5% slopes	20	0
7525	Tallac gravelly coarse sandy loam, moderately well drained, 5 to 9% slopes	111	90

ANGORA FIRE RESTORATION PROJECT

Figure 3.3-1

Lake Tahoe Basin Management Unit



Legend

Angora Fire Restoration Project

Proposed Stands

Soils Map Unit*

7041	7232	7444	7484	7521
7042	7411	7452	7485	7522
7071	7412	7461	7486	7523
7231	7413	7462	7487	7524
	7421	7471	7488	7525
	7431	7483	7489	

*See Table 3.3-1 in the EA for Map Unit Name

N

0 0.25 0.5 1 Miles

Source: USFS & ESRI USA Imagery (07-15-05; 0.5m)

Treatment Stand 5 is of most concern from a soils perspective as it contains sensitive Watah soils on the flat area subject to flooding, ponding, poor drainage, and a high water table. Cagwin-Rock outcrop complex soil units surround these areas with moderate runoff on slopes from 15 to 30%. The Angora Fire effects are still present in these areas and have resulted in diminished vegetation and increased runoff rates.

Soil Interpretations

This section discusses the characteristics of the soils that would potentially be impacted primarily by ground-based machinery during the removal of dead and live trees. The Meeks soil unit (see Table 3.3-1) is the only soil unit identified as being potentially unsuitable for mechanized equipment due to the high rock content of the soil. The high rock content can limit mechanical operations due to outcrops or concentrations of rock that do not allow for efficient mechanical equipment movement. Although this map unit does exhibit high rock content, the soils are productive, as reflected by the generally dense coniferous forest that existed prior to the Angora Fire. Of the estimated 1,398 acres to be treated for fuel removal, 447 acres would be treated with aerial removal methods, or, if aerial systems are not used due to feasibility, the fuel treatment would be accomplished by hand treatment with chainsaws and piling and burning. This type of removal has very low impacts to the soil surface. The rest of the treatment acres would be treated with a ground-based removal system. There are 377 acres of this map unit that would be treated with ground-based machinery. As required by the project design features, ground-based machinery would only be used when soil moisture conditions are suitable, as determined by a Forest Service watershed specialist. Implementation of design criteria and BMPs would ensure that falling and skidding patterns are designated in advance of implementation to limit the disturbed area. The application of BMPs will also ensure that soil disturbance is consistent with soil quality standards to avoid significant effects.

For the purpose of this analysis, the Tahoe, Watah, Marla, and Celio soils are considered SEZ soils. Celio soils are not always associated with SEZs, but have a seasonal high water table. Watah is a peat soil not suitable for mechanical treatment due to wetness, vegetation, and habitat sensitivity, and would be flagged and avoided. There are no mapped acres of these soil types located within treatment stands with the exception of a small area of Tahoe complex (7041) in Treatment Stand 1. The Tahoe complex is often too wet for mechanical operations at any time of year, and thus would likely be flagged and avoided during project implementation.

The remaining soils have a low risk of compaction. These soils are coarse textured, with high percentages of sand and low percentages of silt and clay.

Existing Conditions: Status of Indicators and Site-Specific Soil Evaluations

Following the Angora Fire, qualitative soil transect data were collected in areas of the fire that had also been previously included in past projects. These projects included the Angora Hazard Reduction Project (1995–1999) and the Tahoe Mountain Timber Sale (1994–1996). These projects included treatment methods that are being proposed in this action, including over-the-snow removal of trees by mechanized skidders, hand thinning, hand-piling and burning of piles, and cut-to-length operations. The data were collected in the fall of 2008 and reflect conditions a full winter, spring, and summer after the fire in areas with low to moderate burn severity. Transects also cover the full range of burn severity levels (low, moderate, and high). Evaluations of soil conditions in these areas inform this analysis by providing site-specific conditions and assisting in assessing the direct, indirect, and cumulative effects of past actions in conjunction with this proposed action. The purpose of these surveys was to determine existing conditions relative to the following factors: soil disturbance, hydrophobicity, amount of groundcover, and disturbance to the soil surface. These data provide information regarding the conditions of the indicators used to analyze effects. In addition, most of the high burn severity areas that were susceptible to erosion received an aerial hydromulch treatment, resulting in 85% cover that was effective through 2008.

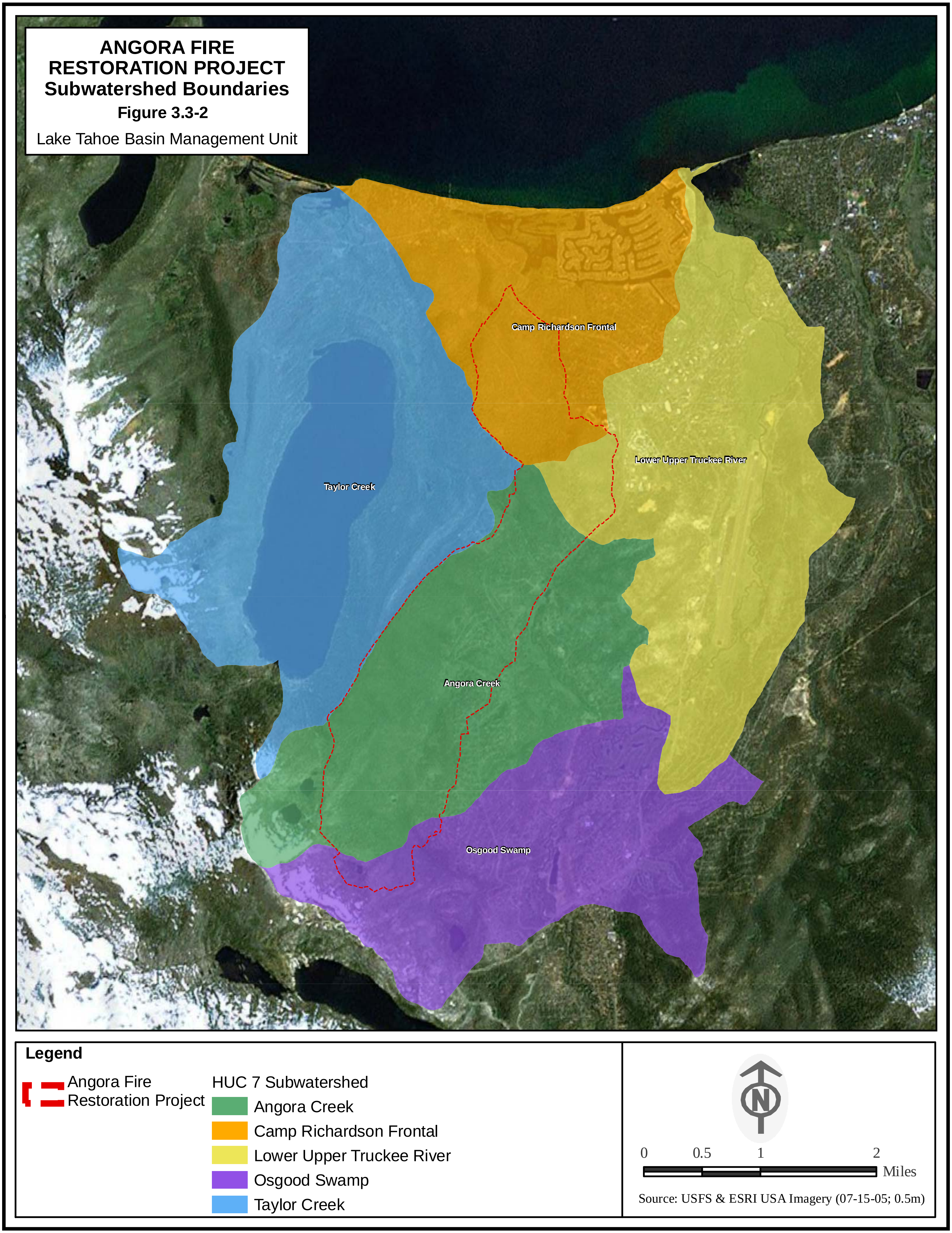
Table 3.3-2. Soil Conditions and Associated Indicators

Soil Characteristic (Indicator)	Results and Discussion
% Soil Cover (Effective Soil Cover and Severe Burning; Surface and Subsurface Organic Matter)	The soil cover averages 58% in the areas where the data were collected and is almost entirely associated with organic matter, providing protection from potential impacts from precipitation. Information collected after the Angora Fire indicated that most of the area lacked adequate ground cover to reduce potential for erosion. Approximately 670 acres of high-severity burn were hydro-mulched as part of the Burned Area Emergency Rehabilitation activities. This hydromulch greater than 85% soil cover that continued to be effective through 2008. Since the fire, soil cover and surface organic matter has continued to increase due to accumulation of needles and limbs from live and dead trees and the gradual re-establishment of understory vegetation.
Evidence of Compaction (Soil Porosity and Hydrologic Function)	77% of the data points showed no evidence of severe compaction (using a spade penetration assessment). Due to steeper slopes and protected sensitive areas (primarily SEZs), the majority of the project area has not been impacted by recent ground-based machinery used in thinning or fuels management operations.
Evidence of Hydrophobicity (Severe Burning; Soil Porosity and Hydrologic Function)	77% of the data points showed no signs of hydrophobicity, which can be a result of high intensity surface fires (from the Angora Fire). Only 9% of the data points showed severe hydrophobicity. However, soil investigations immediately following the Angora Fire indicate that most of the fire area showed signs of hydrophobicity on the soil surface, primarily on the areas of high burn severity.
Disturbance of Soil Surface (Erosion potential; porosity and hydrologic function in high disturbance class))	79% of the data points showed no or minimal soil disturbance. Approximately 7% of the data points showed signs of a highly disturbed soil surface.

Watershed Resource

Watershed Descriptions

The project area has the potential to affect five subwatersheds. These include: Angora Creek, Lower Upper Truckee, and Osgood Swamp subwatersheds that drain east into the Upper Truckee River; Taylor Creek which drains into and includes Fallen Leaf Lake and then drains into Lake Tahoe; and Camp Richardson Frontal which drains off Tahoe Mountain into a meadow south of Pope Beach. Figure 3.3-2 displays the subwatersheds associated with the project. Table 3.3-3 provides


ANGORA FIRE
RESTORATION PROJECT
Subwatershed Boundaries
Figure 3.3-2
Lake Tahoe Basin Management Unit
Camp Richardson Frontal
Lower Upper Truckee River
Taylor Creek
Angora Creek
Osgood Swamp
Legend
Angora Fire Restoration Project
HUC 7 Subwatershed
Angora Creek
Camp Richardson Frontal
Lower Upper Truckee River
Osgood Swamp
Taylor Creek
N
0
0.5
1
2
Miles
Source: USFS & ESRI USA Imagery (07-15-05; 0.5m)

information on the drainages and waterbodies in the project area. There are approximately 12 miles perennial, and 46 miles of intermittent and ephemeral streams in the project area based on GIS data. Within the burn area, a shift toward wetter ground conditions has already occurred due to the reduction in trees and other vegetation that help trap soil moisture and utilize it through evapotranspiration during the growing season. This current trend would continue until vegetative re-growth occurs. It is likely that previous (prior to the fire) intermittent streams have become perennial and other seasonal streams would carry more water for several years following the fire until the area is fully revegetated.

Table 3.3-3. Potentially Affected Watersheds and Water Bodies

Hydrologic Province	River Basin HUC 4	HUC 5 Watershed	Subwatersheds (Hydrologic Unit Code 7)[1]			Stream miles[2]			
			Watershed Name #	Total Acres	Acres in Project	Perennial	Seasonal	Ephemeral	Total
Central Lahontan	Lake Tahoe 16050101	Upper Truckee River 1605010101	Lower Upper Truckee 16050101010109	4292	234	0.0	0.0	1.3	1.3
			Angora Creek 16050101010108	3694	2052	4.4	0.0	14.2	18.6
			Osgood Swamp 16050101010107	3146	147	0.8	0.0	1.2	2.0
		Tahoe West Shore Frontal 1605010104	Taylor Creek 16050101040304	4985	11	6.5	0.0	>5.5	>23
			Camp Richardson Frontal 16050101040305	2658	628	0.0	0.0	5.7	5.7

1 The term *Hydrologic Unit Code* refers to subwatersheds of varying sizes. HUC 7 subwatersheds are used as the basis for analysis in this report.
2 Miles are approximate.

The Upper Truckee River Hydrologic Unit Code (HUC) 5 watershed contains three of the five HUC 7 watersheds associated with the proposed action. These watersheds include Lower Upper Truckee, Osgood Swamp, and Angora Creek watersheds. The Tahoe West Shore HUC 5 watershed contains the remaining HUC 7 watersheds, Camp Richardson Frontal, and Taylor Creek watersheds.

The Upper Truckee River watershed drains approximately 56.5 square miles. Several of the channels within the Upper Truckee River watershed have been modified from their natural conditions by human activities, including residential, commercial, and industrial development; road construction; golf courses; railroad grades; livestock grazing; irrigation and ditching in floodplains; an airport; constructed berms along channel edges; and historic logging. In addition, natural sediment transport and channel hydrologic processes have been affected by placement of fill in the floodplain/meadow areas and construction of other structures such as bridges, culverts, and pipelines (i.e., sewer and water) that can affect hydrologic function.

Historic land use has resulted in channel straightening and deepening, reducing over bank flows and decreasing the seasonal elevation of shallow groundwater in the surrounding meadows. Channel relocation, denuded meadows and stream banks, and increased runoff and sediment transport are impacts also associated with historic land use. Floodplains along affected channel sections no longer function properly, and incised channel segments contribute to sedimentation in downstream reaches (Project Record Documents E40–E45). The majority of channel degradation has occurred in the lower portions of the channels outside of the project area.

With the exception of lands affected by high and moderate-severity burn, headwaters of Upper Truckee River watershed are functional, stable, and largely unaltered. These areas provide valuable water storage and habitat function. A number of restoration projects have been completed within the Upper Truckee River watershed that improved the functionality of floodplains adjacent to the channels, increased the potential for water quality improvements as water passes through restored reaches, and resulted in attenuated peak flood flows.

Beneficial Uses

Several beneficial uses have been identified in the Lahontan Basin Plan for the South Lake Tahoe Hydrologic Area (Project Record Document E46). Uses specific for the project area include:

- Municipal and domestic supply
- Agricultural supply
- Ground water recharge
- Freshwater replenishment
- Water contact recreation
- Non-contact water recreation
- Commercial and sport fishing
- Cold freshwater habitat
- Wildlife habitat
- Preservation of biological habitats of special significance (Osgood Swamp)
- Rare, threatened, or endangered species (Taylor Creek Meadow Marsh)
- Migration of aquatic organisms
- Spawning, reproduction, and development[1]
- Water quality enhancement
- Flood peak attenuation/flood water storage.

[1] Applies to waters that support high quality aquatic habitat necessary for reproduction and early development of fish and wildlife.

Water Quality Limitations

Lahontan Water Board and TRPA have identified stringent water quality limitations for the Lake Tahoe Basin as a result of continued reduction in lake clarity. Discharge limitations to surface waters presented in Table 3.3-4 are identified, in either one or both, of the Lahontan Basin Plan and the TRPA Code of Ordinances. These discharge limitations apply to water discharges entering any surface water feature in the Lake Tahoe Basin, and therefore apply to the Angora Fire Restoration project.

Table 3.3-4. Surface Water Discharge Limitations

Constituent Maximum	Concentration
Total Nitrogen as N	0.5 mg/L
Total Phosphate as P	0.1 mg/L
Total Iron	0.5 mg/L
Turbidity	20 NTU [1]
Grease and oil	2.0 mg/L
Suspended Sediment	250 mg/L [2]

Mg/L = milligrams per liter
NTU = nephelometric turbidity units
1 California State Water Resources Control Board, Lahontan Region 2005 as cited in Project Record Document E1
2 TRPA December 2004, Tahoe Regional Planning Agency Code of Ordinances as cited in Project Record Document E1

2006 Clean Water Act Section 303(d) - Impaired Waterbodies

Lake Tahoe's water clarity has declined as a result of nutrient and sediment transport to the lake from tributary streams and adjacent urban areas. A total maximum daily load (TMDL) is currently under development for Lake Tahoe that has identified various pollutant sources and their contribution to lake clarity. Sources identified include urban development, dirt roads, particulates in the air from road sanding, and stream bank erosion. NFS lands are not identified as a large contributor per acre in the TMDL development process. This is important since approximately 80% of the Lake Tahoe Basin is "forested upland"; most forest soils are in a state of relatively high hydrologic function (Project Record Document E47).

Lake Tahoe and the Upper Truckee watershed are also listed for nutrients (nitrogen), metals (iron), chloride, and/or pathogens. The proposed action would not affect nitrogen, metals, chloride, or pathogen concentrations.

3.3.3 Description of Subwatershed Conditions

Angora Creek Watershed

The Angora Creek watershed is the watershed most affected by the 2007 Angora Fire. Approximately 2,053 of the 3,695-acre watershed burned, leaving 44% of the headwaters unburned.

In the watershed, 22% was affected by high-severity burn, 22% moderate-severity burn, and 11% low-severity burn. There are approximately 4.4 miles of perennial streams and 14.4 miles of ephemeral streams in the subwatershed that were affected by the fire. Table 3.3-5 displays acres by burn severity in the Angora Creek watershed.

Table 3.3-5. Angora Creek Watershed Burn Severity Acreage

Angora Creek Watershed Burn Severity	Acres
High	817
Moderate	818
Low	418
Unburned	1,642

Light and moderate burn severity areas had a temporary loss of ground cover, which was replaced by needle fall. Conifer mortality was high in these areas. In areas with high-severity burn, ground cover was completely consumed and vegetation killed. The Angora Fire resulted in mostly high burn severities along the Angora Creek SEZ and affected stream shade, fine sediment input, and local fish populations. A fish kill due to excessive ash deposition and stream temperatures was observed immediately post-fire. Recent observations indicate that riparian vegetation and brook trout populations are recovering.

Stream restoration projects in the Angora Creek watershed have been implemented with the goal of improving aquatic habitat and water quality. Several restoration projects have been completed in the Angora Creek watershed, including an El Dorado County restoration project in 2005–2006 involving replacing a low water crossing that acted as a fish passage barrier. This project constructed 2,300 feet of channel and included 4.5 acres of SEZ enhancement. The California State Parks Department also restored Angora Creek through the sewer reach (2002) and the golf course reach (1997–98), resulting in a combined restored stream length of approximately 8,000 feet. The completed channel and SEZ restoration projects were designed and implemented with the goals of improving the functionality of floodplains adjacent to the stream channels and increasing the potential for water quality improvements as water passes through restored reaches and associated attenuated peak flood flows.

Erosion control projects have decreased the amount of fine sediment generated from developed lands. Urban lot fuel reduction on NFS and California Tahoe Conservancy lands has also occurred to treat fuels on these lots with the exception of management in SEZs. Fuel management on urban lots has not created any measurable amounts of fine sediment input into streams.

Camp Richardson Frontal Watershed

Roughly 628 acres of the 2,658-acre watershed burned, leaving 76% unburned. In the watershed, 6% was affected by high-severity burn, 11% moderate-severity burn, and 6% low-severity burn. There are 5.7 miles of ephemeral streams in the subwatershed that were affected by the fire. Table 3.3-6 displays acres by burn severity in the Camp Richardson Frontal watershed.

Table 3.3-6. Camp Richardson Frontal Watershed Burn Severity Acreage

Camp Richardson Frontal Watershed Burn Severity	Acres
High	171
Moderate	291
Low	166
Unburned	2,030

The Camp Richardson Frontal watershed is mostly developed and does not contain any perennial or seasonal creeks as currently mapped.

Lower Upper Truckee Watershed

Approximately 234 of the 4,292-acre watershed burned, leaving 94% unburned. In the watershed, 1% was affected by high-severity burn, 3% moderate-severity burn, and 2% low-severity burn. There are 1.3 miles of ephemeral streams in the subwatershed that were affected by the fire. Table 3.3-7 displays acres by burn severity in the Lower Upper Truckee watershed.

Table 3.3-7. Lower Upper Truckee Watershed Burn Severity Acreage

Lower Upper Truckee Creek Watershed Burn Severity	Acres
High	40
Moderate	121
Low	73
Unburned	4,058

Osgood Swamp Watershed

Approximately 147 acres of the 3,146-acre watershed burned, leaving 95% unburned. Less than 1% of the watershed was affected by high-severity burn, 2% moderate-severity burn, and 2% low-severity burn. Table 3.3-8 displays acres by burn severity in the Osgood Swamp watershed.

Table 3.3-8. Osgood Swamp Watershed Burn Severity Acreage

Osgood Swamp Watershed Burn Severity	Acres
High	23
Moderate	57
Low	66
Unburned	3,000

Osgood Swamp is a wetland within the Osgood Swamp watershed. The swamp contains special aquatic features containing sphagnum moss species. Osgood Swamp drains a perennial spring fed stream, of which 0.8 miles are in the project area. An additional 1.2 miles of ephemeral streams are associated with the Osgood Swamp watershed in the project area.

Taylor Creek Watershed

The Taylor Creek watershed was the watershed least affected by the Angora Fire in 2007. Roughly 11 acres of the 4,985-acre watershed burned, leaving 99.8% of the watershed unburned. In the watershed, 0.08% was affected by high-severity burn, 0.1% moderate-severity burn, and 0.02% low-severity burn. There are no streams in the project area that were affected by the fire. Table 3.3-9 displays acres by burn severity in the Taylor Creek watershed.

Table 3.3-9. Taylor Creek Watershed Burn Severity Acreage

Taylor Creek Watershed Burn Severity	Acres
High	4
Moderate	6
Low	1
Unburned	4974

Taylor Creek, at its outfall to Lake Tahoe, drains approximately 18.4 square miles, including the area draining into Fallen Leaf Lake. Taylor Creek is steep and confined upstream of its Highway 89 crossings. Just downstream of the highway, the creek flows over a pronounced break in the slope, separating the upper source and transport zones from the lower depositional areas. The steep upper watersheds have relatively high natural erosion rates compared to other parts of the Tahoe Basin. Episodic disturbances (e.g., landslides and debris flows) are expected to continue to generate large volumes of sediment. Fallen Leaf Lake traps most of the sediment from the upper portion of the Taylor Creek watershed. Most of the sediment in Taylor Creek downstream of Fallen Leaf Lake appears to come from erosion on outside bends of the stream channel, combined with fine sediment from trails and footpaths adjacent to the creek.

3.3.4 Direct, Indirect, and Cumulative Effects

Soils

Impacts to soil quality are considered for direct and indirect effects in this section. Soil quality considerations include potential effects from erosion, reduction in porosity through compaction, soil cover, organic matter, and potential effects from severe wildfire.

A review of the literature and input from our public indicates that there is a wide-range of views about the potential effects of proposed actions in a post-fire environment. Mclver and Starr have compiled a literature review and annotated bibliography which summarizes most of the major studies published on logging after wildfire (Project Record Document E48). The authors describe the environmental effects that are likely to occur when intensely burned sites are logged, with 16 major conclusions, six of which concern soil effects:

1. intense wildfire causes significant and fairly predictable changes in soil and vegetation structure, which often leads to severe erosion;

2. the scope and scale of immediate environmental effects of management in a post-fire environment depends on several specific features of burned stands, including burn intensity, slope, soil texture and composition, the presence or building of roads and post fire weather conditions. Effects of logging systems occur within the context of these site-specific factors;
3. log retrieval systems differ substantially in their immediate effects on soils in the post-fire environment, and are similar to those observed in green tree stands. In general ground-based skidding causes the greatest immediate soil effects, followed by cable system and helicopter retrieval;
4. proper recovery and rehabilitation techniques by managers may be capable of mitigating soil loss and erosion problems associated with post-fire logging;
5. logging residue can decrease erosion in post-fire logged sites by impeding overland flow; and
6. skid trails formed in post-fire stands can influence productivity of trees growing directly on them.

The “Beschta report” (Public Record Document E49) is commonly quoted by our publics as a document that provides the scientific framework of principles and practices that should be used to guide salvage logging and post-fire treatments. In relation to soils, this report recommends that management of a post-fire landscape should be consistent with the principle of protecting the soil and recommends that no management activity should be undertaken which does not protect soil integrity in terms of soil loss and compaction. The report also recommends that salvage logging should be prohibited in sensitive sites, which for soils are defined to include severely burned areas, erodible sites, fragile soils, riparian areas, steep slopes, and any site where erosion may be accelerated. Beschta further defines this recommendation in more detail in his discussion paper with Dr. George Ice (Public Record Document E50). In this discussion Beschta recognizes that the exact characteristics of a sensitive area may vary across a burned landscape. He also acknowledges that salvage logging can sometimes be accomplished from the existing road network. In such situations Beschta makes the following statement:“Thus new roads would not be required and road drainage upgrades could be accomplished during the salvage operations; in such a situation a simple rule of excluding salvage logging in all burned areas would not seem prudent.” In the same discussions he noted that ground-yarding systems, particularly on steep terrain, may significantly increase sediment production from high burn severity areas. He also recognized that there are exceptions to this general concern such as areas where hydrophobic soils are formed during the fire. In these situations, the use of ground-based yarding systems may assist in disrupting the surface hydrophobic conditions.

The proposed action has been designed to address these concerns, and to protect soil properties. The project design features (Chapter 2) and BMPs (Appendix A) include the following:

- Avoidance of ground-based logging on slopes greater than 30 percent
- Use of existing landings where practical
- Operating on dry soils or with a winter logging plan to prevent compaction and erosion
- Subsoiling some landings to restore soil porosity
- Construction of waterbars on cable corridors, forwarder trails, skid trails, and temporary roads
- Use chipping or masticating where practical for slash disposal to increase ground cover

- Improve existing road conditions to reduce erosion and improve drainage,
- Retain and protect some existing down logs
- Locate all hand piles 50 feet from perennial or intermittent streams in order to minimize exposure of bare soils adjacent to streams.

The potential for significant impacts to the soil resource is primarily associated with the fuel removal treatments by either ground-based or aerial systems, particularly in areas of steep slopes and/or high burn severity where ground cover is limited and hydrophobicity is a concern. Table 3.3-10 summarizes the number of acres that are being proposed for treatment via fuel removal by burn severity and also summarizes the total acres in the project area by burn severity. This table shows the scope and magnitude of potential impacts and also provides a context for the application and effectiveness of the prescribed design features (including BMPs) in avoiding significant impacts.

Table 3.3-10. Summary of Acres by Fuel Removal Method and Burn Severity

High Severity	Total Acres in Project Area	1,056
	Acres of Treatment	Ground: 388 Aerial: 354
Moderate Severity	Total Acres in Project Area	1,293
	Acres of Treatment	Ground: 489 Aerial: 152
Low Severity	Total Acres in Project Area	723
	Acres of Treatment	Ground:160 Aerial: 0

Approximately 50% of the burned area would be subject to fuel removal and of that only 24% of the burned area would be treated in areas of high severity, where groundcover and hydrophobicity from the effects of the Angora Fire are of concern (Table 3.3-10). The remaining 50% of the burned area would have no treatment under this proposed action and would continue to recover under the current natural processes.

Alternative 1—No Action

Direct and Indirect Effects

Under the no-action alternative, no new management actions are proposed, so no immediate soil effects would occur. The soil surface on areas of high burn severity and/or steep slopes would continue to have potential for surface erosion due to the lack of groundcover and exposed soils, but erosion potential would decrease over time, as revegetation progresses. The loss of surface organic matter from the Angora Fire would be replaced at a slower rate as compared to the proposed action as limbs and dead trees fall and accumulate over an estimated 10 to 20 years. Over the long term (20 years or more), these sites would have greater amounts of surface organic matter due to the eventual decomposition of all of the dead material currently on site.

However, the no-action alternative could potentially have effects similar to past wildfires in the long term, which resulted in substantial soil loss from erosion and short-term increases in soil solution concentrations and/or leaching of mineral forms of nitrogen, sulfur, and phosphorous. This potential is due to the reoccurrence of high fuel loadings as the area is revegetated and the dead trees fall. In 25 years, regrowth of brush combined with existing dead and down fuels would once again put the project area at risk for a high intensity wildfire. Loss of topsoil due to erosion would reduce long-term soil productivity as surface and subsurface organic matter would be lost. This potential long-term effect on productivity would be partially offset immediately after a future fire, as burning of organic matter leads to a short-term “flush” or release of nutrients into the soil surface, helping to promote vegetative recovery.

Cumulative Effects

The no-action alternative would not result in any additional soil impacts so would not contribute any cumulative effects. A wildfire could burn through untreated forest stands, however, the extent and severity of wildfires are not predictable; therefore, there are no measurable or predictable cumulative effects.

Alternative 2—Proposed Action

Direct and Indirect Effects

This section discusses the direct and indirect effects associated with the areas that are primarily treated under the fuel removal treatments. Impacts to soils from potential future wildfire under the proposed action alternative would likely be less than under the no-action alternative.

Soil Porosity and Hydrologic Function: Design criteria associated with treatments that cause compaction, such as skidding and yarding, would serve to maintain soil porosity and hydrologic function. During implementation, the Forest Service would emphasize the use of low ground pressure mechanical equipment (see Chapter 2).

As discussed above, soil transects were collected in areas of the proposed project where past activities were similar to the treatments and site conditions in the proposed action. The results of the soil transects (Table 3.3-2) indicate that hydrologic function, compaction, soil cover, and organic matter were not significantly affected by these recent and similar activities. In addition, monitoring by the Forest Service of the Ward Fuel Reduction Project evaluated groundcover and compaction (bulk density and saturated hydrologic conductivity) after an upland forested area was treated for fuel removal using low-ground-pressure mechanized equipment (a cut-to-length method) (Project Record Document 51). There was no significant change in the percent of ground cover or the depth of ground cover pre- and post-project, and soil quality standards were met. The type of ground cover changed from predominantly duff, needles, and decaying wood to coarse slash, generally under 3 inches in diameter, scattered over the relatively undisturbed pre-project duff layer. The results also indicated a decrease in soil porosity of only 2.5%, as measured by the change in soil bulk density. This value is well below the 10% threshold included in the regional soil quality guidelines.

The Forest Service also conducted monitoring of the effects on soil characteristics from ground-based low pressure mechanized equipment in the *Heavenly Valley SEZ Demonstration Project – 2007 Soil Monitoring Report* (Project Record Document E15). These monitoring results are particularly relevant to the proposed project, as the Heavenly Valley Project (HVP) occurred within SEZ areas that had been burned by a recent wildfire. The kinds of equipment used in the HVP are similar to those being emphasized by the Forest Service for implementation of the proposed project (cut-to-length forwarder/harvester). The results of the HVP monitoring indicated there was no significant decrease in bulk density (and hence porosity) and that post-project ground cover exceeded the regional soil quality standards. Characteristics of SEZs in the project area would be compared to those in the HVP and mechanical treatments would be prescribed only in SEZs with an equal or lower risk rating (see Appendix B).

Areas with wet soils or other sensitive features would be flagged for hand treatment prior to commencement of mechanical operations and soil moisture would be evaluated prior to treatments (see the soil moisture table in Appendix B); if soil moisture is too high, treatment would be postponed until later in the season. These measures would ensure that soil moisture conditions are appropriate to support mechanized equipment and minimize risk of soil compaction in excess of the soil quality standards. Although the soils are inherently less susceptible to compaction due to minimal amounts of clay and silt (lower bulk densities), excessive moisture conditions can make soils more susceptible to compaction and potentially damage soil structure. Treatment Stand 5 has the highest potential for impacts from flooding, ponding, poor drainage, and a high water table. Design criteria specifically suited to this stand would include avoidance of Watah peat areas and control of drainage away from sensitive soils. Watah soils are generally associated with fens, and thus would be buffered (see botany report). Special erosion control measures would be implemented to reduce potential for increased runoff from skid trails, temporary roads, landings, and other treatments that have the potential to concentrate water.

Over-the-snow mechanical treatment would have minimal effects on the soil resource because it would be implemented with design features and BMPs for winter road use; for example, the ground conditions in the treatment areas would need to meet specific criteria regarding the suitability for over-the-snow activities (BMP 1-13), as determined by a watershed specialist. There would be little to no soil compaction, as mechanized equipment would be “buffered” by a snow/frozen soil layer and approved in advance by a watershed specialist (as per the design features), so impacts to porosity and soil hydrologic function would be insignificant. Heavy equipment operation would not disturb the soil surface, so effective surface and subsurface organic matter would not be affected.

Soil Cover / Surface and Subsurface Organic Matter: The results of the *Ward Soil Monitoring Study* also indicated that use of cut-to-length and other low ground-pressure based mechanized equipment (as will be emphasized during project implementation) exceeded soil quality standards. There would be an immediate increase in the amount of dead and downed woody debris on the soil surface from the fine limbs of felled trees (Project Record Document E4), which would be chipped or masticated in treatment units where a cut-to-length logging system is employed. This downed organic matter would begin to restore the health of the soil through increased amounts of surface organic matter that would decompose, increasing the biological functions in the soil profile and eventually increasing subsurface organic matter.

Long term recovery of surface and subsurface organic matter would be enhanced by natural revegetation of conifers, brush, and grass. Over time, needle cast would build up a new duff layer, promoting healthy communities of vertebrate and invertebrates in the duff and topsoil. Nutrient cycling would be enhanced by duff layer replacement as well as decomposition of fine roots, which would help build the topsoil. The biological activity of roots and soil organisms would also have a mitigating effect on compaction in the topsoil over the long term.

The increase in effective ground cover is expected to reduce the potential for erosion within the treatment stands. Increased soil cover is particularly important in areas of high burn severity because these areas have much less surface organic matter than before the Angora Fire. Of the 12 proposed treatment stands, seven have high amounts of high-severity burn. The increase in surface organic matter is also important on steeper slopes, where runoff and erosion potential would be greater. The proposed action would also increase surface roughness that would slow runoff, thus providing more opportunity for infiltration. This in turn would reduce erosion potential, as runoff energy would be decreased or dissipated. Limiting mechanized treatments to slopes of less than 30% would also limit erosion.

The proposed action would result in temporary disruption of the vegetation recovery in progress in the Angora fire area. Shrubs and herbaceous plants have repopulated the fire area, providing up to 100% surface cover in some areas, most notably SEZs. In addition to surface cover, vegetative recovery also provides the long-term benefit of increased subsurface organic matter through decomposition of fine roots and soil organisms. To the extent that vegetation is damaged by logging equipment, site recovery would be temporarily inhibited. Past monitoring on LTBMU lands suggests that this impact would be limited to less than 15% of the treatment areas.

Severe Burning: This alternative would reduce potential for adverse soil effects from possible severe burning in future wildfires. As described in Section 3.1, “Fire and Fuels,” future potential wildfire behavior would be of lower intensity with lower flame lengths as compared to the Angora Fire with minimal impacts to the soil resource because there would not be consumption of large amounts of duff and litter that protects soil. Over the long-term, projected fuels loading would be reduced to 10 to 15 tons per acre over the treatment areas; this maintains soil organic matter and also reduces the potential for large-scale high-severity wildfire. Design features for prescribed burning would limit the effects to less than significant by controlling fire intensity and limiting the burning of slash piles within sensitive areas such as SEZs.

Permanent Roads and Trails: Of the 6.4 miles of new road construction and 8.9 miles of new trail construction, 5.2 miles would be located on existing road or trail prisms (needing re-construction) that are a result of past unmanaged access to the area. These existing road prisms previously had no proper design or regular maintenance and commonly had erosion problems associated with them. Converting these 2.6 miles to system roads with proper design and drainage features and controlled access would reduce surface erosion and runoff and reduce potential sedimentation impacts to downstream beneficial uses. There would be 0.3 miles of road and 1.4 miles of trail relocated out of SEZs. The new road and trail construction/relocation would be designed to have minimal impacts to soil and water quality and would receive proper maintenance on a regular basis to ensure soil and water control measures are properly maintained. An estimated 1.9 miles of road prisms and 16.7 miles of trail prisms would be decommissioned/restored by eliminating public access and reducing the existing impacts by measures such as ripping the compacted road surface and revegetating with native species. These measures would further reduce existing impacts by reductions in sedimentation and improved infiltration of precipitation and runoff. The entire classified road system would provide for improved long-term management access to the area and would reduce impacts from uncontrolled public use, which in the past has led to damage to stream courses and riparian areas from sedimentation.

The proposed relocation of needed roads and trails would reduce the potential for soil losses from road surface erosion, concentrated road drainage flows, and road facility failures during storm events. The activities prescribed in the proposed action are all designed to reduce the potential impacts on soils and sediment production through controlling road drainage, improving road surface stability, addressing increased runoff from the fire and the proposed action, and repairing or eliminating past problem areas through decommissioning or restoration.

Temporary Roads and Landings: Approximately 7.7 miles of temporary roads would be used on the project area to remove trees and to implement the restoration of Angora Creek and place woody debris along the channel. An estimated 23 new landings and 27 existing landings would be utilized. These temporary roads and landings would have a short-term impact from compaction. After implementation, the temporary roads and landings would be treated with such measures as subsoiling to eliminate compaction; re-contouring to reduce water channeling and encourage vegetative re-growth; removal of drainage structures and re-establishment of natural drainage patterns; and spreading of mulch or slash to protect the soil surface to further reduce erosion and encourage re-growth of natural vegetation.

Stream and Aquatic Habitat Restoration: The potential impacts to the soil resource from the channel reconstruction, meadow restoration, wetland restoration, and placement of large wood in Angora Creek would be primarily associated with the use of temporary roads for mechanical equipment to access the project sites. These temporary roads could lead to compaction of the road surface and a short-term increase in sedimentation due to road runoff. Design features have been included in the proposed action to fully mitigate these very short-term effects. Temporary roads would be returned to natural conditions through a combination of treatments such as ripping and seeding with native vegetation and covering exposed soil surfaces with slash or mulch. The stream and aquatic habitat restoration design features would restore soil cover and hydrologic function in the activity areas at least to pre-project conditions. In the long term, soil hydrologic function would be improved in these parts of the project area.

There is adequate sod within the project area for channel reconstruction. Sod harvesting areas (for revegetating newly created channel banks) and placement areas (in the newly created channel) would be stabilized employing design features (numbers 81, 82, 85) and effects would become neutralized to acceptable levels with regard to water quality and vegetative growth within 5 years of project completion. Water quality may have short-term increases in sediment production as a result of channel restoration actions that disturb the soil surface. However, design features would minimize disturbance and reduce sediment transport so that these effects are minimized. The long term effect of this disturbance, correcting the erosive channel configuration, and implementing design features during treatment are expected to improve water quality in these stream and aquatic habitats.

Summary: The proposed action would maintain adequate soil porosity and hydrologic function through the design feature that ensures adequately dry soil conditions during vegetation management operations, and through limiting total disturbed area (BMP 1-10, 11).

The proposed action would increase downed fine and coarse woody debris and organic matter in the short term, as compared to taking no action. This effect is due to the remaining limbs and tops of trees that would be felled and removed. Due to the removal of trees, there would be a short-term reduction in cover that is currently provided by the young vegetation that has re-occupied the site. This vegetation would recover in 1 to 2 years. Over the long term, revegetation of conifer trees, grasses, and brush would enhance recovery of soil health through nutrient cycling and forest floor replacement, as fine roots decompose and needle cast rebuilds the duff layer.

Numerous design features for all phases (vegetation and fuels, roads and trails and stream and aquatic habitat restoration) of the project address control of erosion through control of runoff and through maintaining or providing ground cover in disturbed areas, such as slash, wood chip, or masticated material. Design features also prescribe water body buffers and flagging and avoiding special aquatic features to minimize soil disturbance in sensitive areas during fuel reduction activities. Large logs would generally be left in place unless the fuel loading exceeds desired levels. Large woody material serves to break up surface water flow, capture sediment, and reduce erosion potential. Soil cover would be provided within these areas if residual post-treatment levels do not meet soil quality standards. Overall, erosion from the road and trail system would be decreased by the proposed improvements to the transportation system in the project area.

The fuel removal portion of the proposed action would decrease the likelihood of significant effects to soils from wildfire.

Project-wide, significant effects to the soil resource would be avoided through implementation of the prescribed design features and BMPs, and Regional Soil Quality Standards would be met.

Cumulative Effects

Cumulative effects to the soil resource would be limited to proposed treatment stands and the creation or elimination of roads and trails. Sedimentation and associated runoff from the road and trail system would be reduced as new construction activities recover and soil structure and function on restored roads and trails recovers to near-natural levels over time. Past and present vegetation treatment and recreational activity contribute to cumulative soil effects. Long term recovery of surface and subsurface organic matter would be enhanced by the reforestation that has already commenced in the project area.

Cumulative soil effects for vegetation treatments are present where previous activity areas overlap proposed activity areas. Approximately 293 of the 951 acres proposed for ground-based mechanical treatments were previously treated using ground-based methods within the past 20 years in the Angora hazard Reduction and Tahoe Mountain Hazard Reduction projects. Parts of the Angora hazard Reduction project were completed using over-snow operations. As discussed previously in this section, soil data were collected in areas that had also been treated by the Angora hazard reduction project and the Tahoe Mountain timber sale. These data helped to quantify the extent of impacts from past projects in conjunction with the proposed action. The data reveal that the surveyed sites average 58% soil cover, and compaction and the amount of disturbed soil surfaces were very low. Impacts from previous vegetation management projects were small enough that the cumulative effects of those projects plus the proposed action would not likely result in impacts that exceed the soil quality standards. Implementation of BMPs and project design features would prevent significant cumulative effects.

In addition, if wildfires occur in the treatment areas after project implementation, it is expected that fire intensity would be low (surface fire) with minimal damage to soil resources, thereby reducing the potential cumulative effects of future projects as compared to taking no action.

Cumulative effects to the soil resource would be less than significant under the proposed action.

Watershed and Hydrology

Impacts to water quality and riparian and wetland stability are considered for direct and indirect effects in this section. Water quality would include potential effects from sedimentation, potential impacts to beneficial uses, and potential impacts to clarity in Lake Tahoe. Riparian and wetland stability would include stream channel stability and potential impacts to floodplains, wetlands, and other special aquatic features. These resources are not independent of each other because impacts to water quality have the potential to affect and be affected by riparian and wetland stability.

Alternative 1—No Action

Direct and Indirect Effects

Direct and indirect effects would not change from the existing condition under the no-action alternative. Moderate and high-severity burn areas from the Angora Fire would continue to provide sources for erosion and sediment due to hydrophobicity and reduced groundcover, though approximately 670 acres of high-severity burn were hydro-mulched as part of the Burned Area Emergency Rehabilitation activities. Lands excluded from the hydromulch treatment included rocky areas and stream buffers. This hydromulch provided greater than 85% soil cover that continued to be effective through 2008 The potential remains to affect Lake Tahoe from sediment and associated phosphorus concentrations in surface waters because phosphorus binds to sediment particles and could be transported to the lake along stream channels. Any potential increases to TMDL for phosphate and turbidity would be maintained at current levels in the burn area and would not be reduced by treatments or increased rates of vegetation. Riparian areas would not be restored, and trails and roads would not be decommissioned or restored, forgoing the opportunity to reduce sedimentation and stabilize or improve aquatic habitat. The opportunity would be lost to improve riparian and wetland conditions by stabilizing stream banks and meadows through revegetation of riparian species and placing in-channel woody material. The need to reduce fuel loads and wildfire risk would be forgone, leading to a renewed future potential for large high-severity fire and its serious effects to water quality and riparian and wetland stability.

Cumulative Effects

This cumulative watershed effects (CWE) analysis provides a quantitative view of the five watersheds in the project area before the Angora Fire (2007), after the Angora Fire (2008), and 3 years after the fire at the time of the South Shore Project implementation in 2010. The Angora Fire and the South Shore Project in 2010 would quantify the existing condition of the watersheds prior to implementation of the Angora Fire Restoration Project. This also quantifies the no-action alternative. Table 3.3-11 displays the cumulative effects of past activities to provide a reference for the CWE analysis for the proposed action alternative.

The CWE analysis in Table 3.3-11 displays the effects of the Angora Fire on Angora Creek watershed (2008 risk ratio post-fire). The Angora Creek watershed received more impacts from the fire than the other watersheds in the project area at an increase risk ratio of 178.74%. Taylor Creek, Osgood Swamp, Lower Upper Truckee River, and Camp Richardson Frontal watersheds had risk ratio increases from the fire of 7.36%, 10.23%, 14.75%, and 69.11%, respectively.

Table 3.3-11. CWE Analysis: Pre-Angora Fire, Post-Angora Fire, and Post-Angora Fire with South Shore Projects (existing condition) for the Angora Fire Restoration Project Area

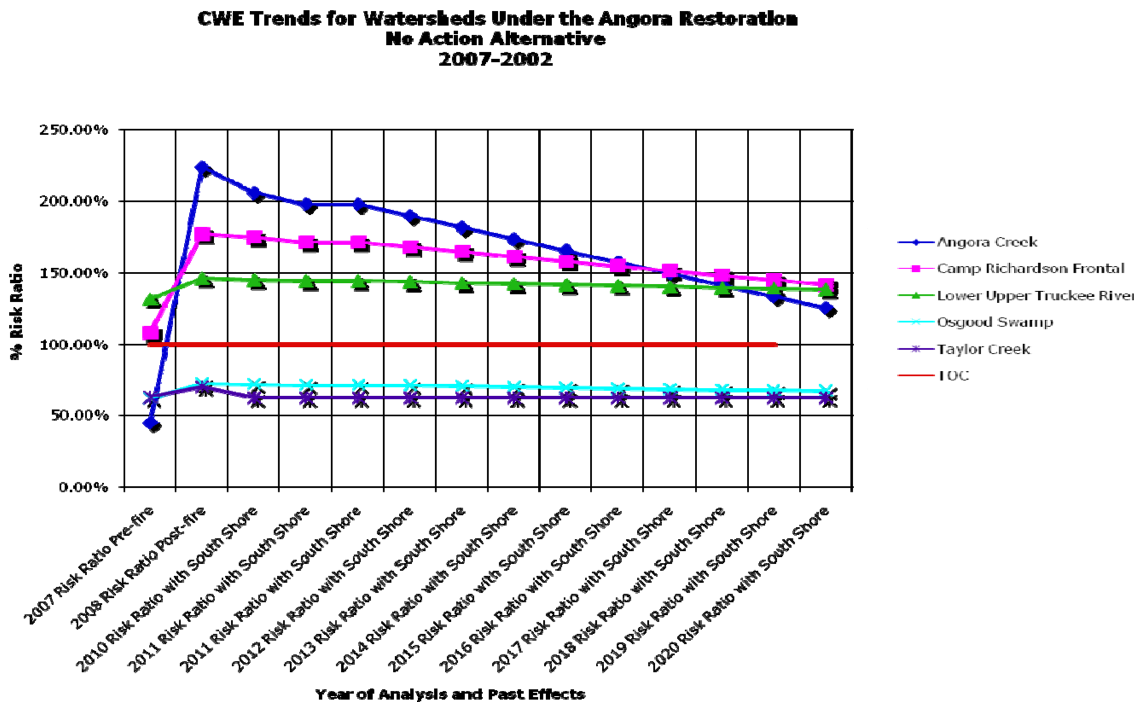
HUC 7 Name	Total Acres	Threshold of Concern (TOC) %	TOC Acres (allowable IC)	Pre-fire 2007 Risk Ratio	Post-fire 2008 Risk Ratio	Existing Condition and No-Action Alternative 2010 Risk Ratio with South Shore
Angora Creek	3693.6	14.44%	533.3	44.86%	223.60%	205.44%
Camp Richardson Frontal	2658	14.68%	390.1	107.77%	176.88%	174.71%

HUC 7 Name	Total Acres	Threshold of Concern (TOC) %	TOC Acres (allowable IC)	Pre-fire 2007 Risk Ratio	Post-fire 2008 Risk Ratio	Existing Condition and No-Action Alternative 2010 Risk Ratio with South Shore
Lower Upper Truckee River	4292.4	14.80%	635.1	131.30%	146.05%	144.89%
Osgood Swamp	3145.6	17.00%	534.7	62.22%	72.45%	72.07%
Taylor Creek	4985.1	8.28%	412.7	62.87%	70.23%	62.37%

Prior to the 2007 Angora Fire, Angora Creek watershed was below the threshold of concern (TOC) with a risk ratio of 44.86%, as were Osgood Swamp and Taylor Creek watersheds with risk ratios of 62.22% and 62.87%, respectively. Lower Upper Truckee and Camp Richardson Frontal watersheds were both over TOC for pre-Angora Fire with TOCs of 131.30 and 107.77%, respectively. Camp Richardson Frontal and Lower Upper Truckee River are over TOC from impervious coverage alone. These watersheds are located nearer to the lake, where the primary land use is urban development.

Figure 3.3-3 is a graphical representation of the no-action alternative from 2007 to 2020. Angora Creek and Camp Richardson Frontal watersheds provide the most dramatic increase in effects due to the high level of impact associated with Angora Fire, fire recovery, and treatments associated with the South Shore Project and subsequent recovery over time. TOC is shown at 100% risk ratio as a reference. Angora Creek watershed is not shown as fully recovering below TOC because the analysis does not remove landings or temporary roads associated with the South Shore Project.

Figure 3.3-3. CWE No-Action Alternative Analysis Trends



Alternative 2—Proposed Action

Direct and Indirect Effects

There would be a short-term increase in downed woody material (and associated surface cover) from the removal of trees; there would also be an increase in surface roughness and a reduction in hydrophobicity as the surface is disturbed, increasing infiltration. There would be a long-term benefit (20 years or more) because the potential for large and/or severe wildfires associated with high fuel loadings would be reduced when compared to taking no action. Impacts to riparian dependent resources would be less likely as large severe wildfires would be diminished. Therefore, these resources would be more resilient to wildfire effects than under the current condition.

Direct effects include potential for sedimentation, water concentration, and increased runoff from skid trails and landings in treatment areas, temporary roads and new construction, road crossings, and other disturbed sites. These sites would be the primary sources of accelerated erosion and water concentration, particularly at channel crossings. Project design features and BMPs would serve to mitigate effects that treatment in these areas would otherwise cause. Detailed measures are described in Appendix A, "Best Management Practices." These BMP measures include revegetation of disturbed sites, slashing, rocking, and providing ground cover treatment immediately after disturbance in addition to control of drainage associated with disturbances. These measures provide for soil protection and have been demonstrated to effectively reduce impacts from soil erosion and runoff. Administrative constraints on slope treatments and over-snow treatments would reduce potential for sedimentation to aquatic systems and to Lake Tahoe.

Over-snow treatment would have minimal effects on water quality and riparian and wetland stability because it would be implemented with design features and BMPs for winter road use and for conditions within the treatment areas. There would be little to no effect to unmapped stream courses or wetlands that may have developed as a result of increased runoff and decreased evapotranspiration resulting from the loss of live vegetation. Heavy equipment operation would not disturb stream banks. Disturbance of ephemeral drainages and depressions that could collect water would be minimal, as these areas would be avoided if wet conditions exist, and channeling of potential runoff would be avoided by designating locations of crossings per the design features of the proposed action. All new drainages would be identified during operations and would be given the same protection as those currently identified.

Restoration treatments (specifically channel reconstruction, riparian area planting, large wood placement in Angora Creek and its tributaries) would serve to reduce the effects of the Angora Fire and other pre-existing conditions on water quality. These actions would improve channel stability, increase the quality and amount of aquatic habitat, and induce fine sediment deposition.

Road decommissioning would reduce runoff and sedimentation associated with road drainage systems and sediment associated with road crossings and the road drainage system. This would reduce sediment to water resources by improving water quality and aquatic habitat. Restoration of Seneca Pond and Gardner Mountain Meadow would serve to restore riparian and wetland stability through the restoration of hydrologic function. Restoration of these areas would increase water availability through raising water tables and reconnection of floodplains with wetlands and stream courses.

There would be a positive effect from moving 0.3 miles of existing road prism and 1.4 miles of trail to outside of SEZs, decommissioning and restoring 1.9 miles of existing roads, and decommissioning and restoring 16.7 miles of trails. Most of these roads and trails have been created by users, and there are ongoing impacts associated with the location and designs of these roads and trails, as well as the unmanaged use associated with them. Reducing the impacts and eliminating the user-created roads and trails would reduce impacts to soil and water quality by improving infiltration, reducing sedimentation, and improving erosion control.

Cumulative Effects

CWE Modeling Assumptions

This section provides assumptions used in the modeling of CWE for the proposed action in addition to any past, present, and reasonably foreseeable future activity in the watersheds affected by the proposed action.

The ERA method assumes roads that remain in use do not recover. A 20-year linear recovery is assumed for ground-disturbing activities, such as vegetation management and landings. A 20-year recovery is also assumed for the Angora Fire, although it is likely that the recovery of soil hydrologic function after wildfire occurs more rapidly (3 to 5 years). Therefore, ERA calculations in areas burned by the Angora Fire provide a conservative estimate of the potential for disturbance and risk. A primary assumption of this analysis is that protection of beneficial uses at the HUC 7 watershed scale results in protection of uses at larger scales—in this case, downstream beneficial uses in Lake Tahoe. Other assumptions were made in CWE analysis for the Angora Fire Restoration Project, including:

- All proposed treatment activities would comply with regional BMPs and with project-specific design features.
- All aerial treatment acres include both helicopter removal and hand treatment; therefore, a combined coefficient of 0.02 is used for these acres.
- All ground treatment acres are whole-tree removal, with a 0.12 coefficient to analyze for the worst-case scenario.
- Existing landings are considered partially recovered. New landings are given the standard 0.80 ERA coefficient.
- Although many of the landings used for South Shore treatments would be decommissioned after project completion, at this time the exact number and location of landings is not known. Therefore, decommissioning was not credited in the CWE analysis, thus reducing impacts from landings.
- Landings for whole tree yarding are analyzed at 1 acre, and landings in aerial treatment areas are analyzed at 2 acres.
- Previously decommissioned roads use the coefficient for unpaved roads after subsoiling (0.08).
- New and existing temporary road decommissioning planned after project completion is not accounted for in the CWE analysis; therefore, watershed effects from this activity do not reduce the associated watershed impacts. However, all temporary roads would be decommissioned after use and recover after 20 years.
- Recommended ERA coefficients for wildfire at varying intensities (i.e., low, moderate, and high) are a range of values. The CWE analysis used the highest value in the range for fire severity for the Angora Fire as a worst-case scenario.
- The wildfires used in this analysis include the Angora Fire, which affected the Angora Creek, Camp Richardson Frontal, Lower Upper Truckee River, Osgood Swamp, and Taylor Creek watersheds in 2007; the Kiva Fire, which affected the Tallac Creek and Taylor Creek watersheds in 2002; the Cascade Fire, which affected the Taylor Creek watershed in 1994; and the Cathedral Fire, which affected the Taylor Creek watershed in 2006.
- Road widths in the project area are based on road designation (i.e., collector, local, etc.); values are presented in Table 3.3-12.

Table 3.3-12. Road width Designations and Widths for CWE Analysis

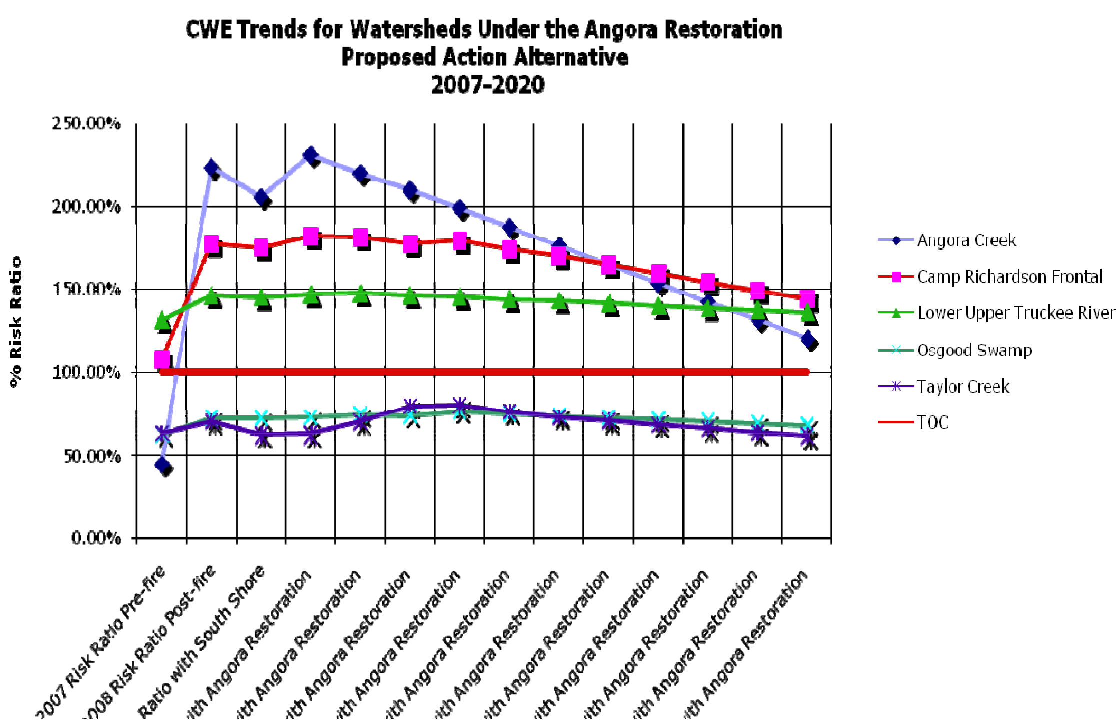
Road Designation	Road Surface Width in feet
Arterial	20
Collector	16
Local	14
State and Federal Highways	40
Private, City, County, and other	16
FS, Non-system	12
Trails	4

- Road width is increased to account for the impacts associated with the road prism proportionate with the CWE analysis for the South Shore Fuel Reduction and Healthy Forest Restoration Project.
- Road and trail segments on gentle slopes (<35%) were multiplied by 1.25.
- Road or trail segments on steeper slopes (>35%) were multiplied by 2.5.
- New roads and roads identified for decommission have the designation of "Local."

Figure 3.3-4 is a graphical representation of the proposed action alternative from 2007 to 2020. Angora Creek and Camp Richardson Frontal watersheds provide the most dramatic increase in effects due to the high level of impact associated with Angora Fire, fire recovery, South Shore Project, and treatments associated with the Angora Fire Restoration Project and subsequent recovery over time. TOC is shown at 100% risk ratio as a reference. Angora Creek watershed is not shown as fully recovering below TOC because the analysis does not remove landings or temporary roads from any affected watershed. Roads and landings are not removed at this time because the exact number and location of landings and temporary roads that would be decommissioned is not known.

With the added affects from the South Shore Project and a recovery of 3 years after the fire (2010 Risk Ratio with South Shore), the watersheds have relative risk increases from the post fire condition of 18.16%, 2.17%, 1.16%, 0.38%, and 7.86% for Angora Creek, Camp Richardson Frontal, Lower Upper Truckee River, Osgood Swamp, and Taylor Creek watersheds, respectively.

Figure 3.3-4. CWE Proposed Action Analysis Trends



Cumulative effects resulting from the addition of the Angora Fire Restoration Project are displayed in Table 3.3-13. This table also shows the existing condition (the no-action alternative) to provide a comparison of the existing condition to the proposed action alternative. The effects of the Angora Fire Restoration Project are included in the “2010 Risk Ratio with Proposed Action” column. Subsequent columns provide quantification of the recovery process of the Angora Fire Restoration Project in addition to all activity in the affected watersheds to the year 2020. Table 3.3-14 provides the amount of increased risk ratio resulting from the Angora Fire Restoration Project from the existing condition.

The Angora Fire Restoration Project does not exceed TOC in the Osgood Swamp or Taylor Creek watersheds. As discussed above, Camp Richardson Frontal and Lower Upper Truckee River were above TOC prior to the Angora Fire. Subsequent activity has minimal effects on these watersheds. Angora Creek does show significant recovery after proposed activity; however, due to CWE accounting, full recovery is not shown because the analysis does not remove landings or temporary roads.

Table 3.3-13. Angora Fire Restoration Project Area CWE Analysis (2010 through 2020)

HUC 7 Name	Total Acres	TOC %	TOC Acres (allowable IC)	2010 Risk Ratio with South Shore	2010 Risk Ratio with Proposed Action	2011 Risk Ratio with Proposed Action	2012 Risk Ratio with Proposed Action	2013 Risk Ratio with Proposed Action	2014 Risk Ratio with Proposed Action
Angora Creek	3693.6	14.44%	533.3	205.44%	231.06%	219.91%	209.71%	198.86%	187.48%
Camp Richardson Frontal	2658	14.68%	390.1	174.71%	181.82%	180.90%	177.21%	178.95%	173.71%
Lower Upper Truckee River	4292.4	14.80%	635.1	144.89%	146.61%	147.39%	146.06%	145.42%	143.84%
Osgood Swamp	3145.6	17.00%	534.7	72.07%	72.75%	74.23%	73.56%	76.41%	75.12%
Taylor Creek	4985.1	8.28%	412.7	62.37%	62.42%	69.72%	79.37%	79.93%	76.02%
HUC 7 Name	**Total Acres**	**TOC %**	**TOC Acres (allowable IC)**	**2015 Risk Ratio with Proposed Action**	**2016 Risk Ratio with Proposed Action**	**2017 Risk Ratio with Proposed Action**	**2018 Risk Ratio with Proposed Action**	**2019 Risk Ratio with Proposed Action**	**2020 Risk Ratio with Proposed Action**
Angora Creek	3693.6	14.44%	533.3	176.39%	165.02%	153.69%	142.48%	131.42%	120.37%
Camp Richardson Frontal	2658	14.68%	390.1	169.63%	164.46%	159.30%	154.14%	148.98%	143.81%
Lower Upper Truckee River	4292.4	14.80%	635.1	142.88%	141.38%	139.88%	138.44%	137.19%	135.96%
Osgood Swamp	3145.6	17.00%	534.7	73.88%	72.65%	71.41%	70.24%	69.08%	67.93%
Taylor Creek	4985.1	8.28%	412.7	72.79%	70.41%	68.15%	65.90%	63.66%	61.42%

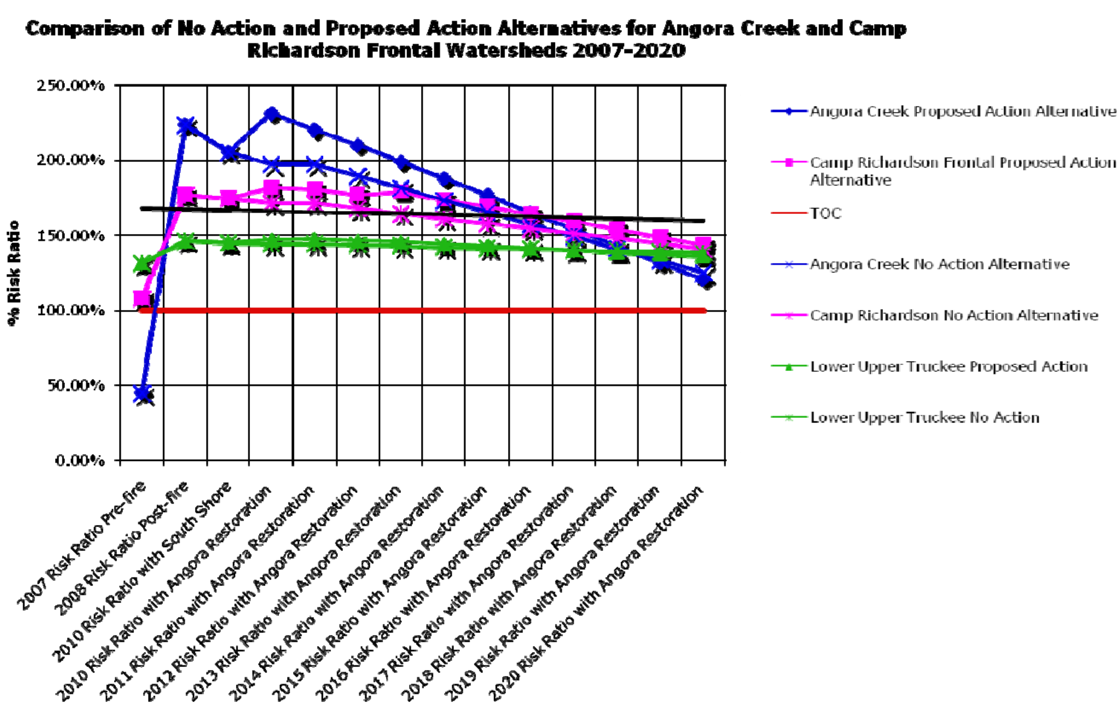
HUC = Hydrologic Unit Code, TOC = Threshold of concern, South Shore Project activities (proposed for 2010-2014), overlap with proposed Angora restoration project, IC = Impervious Coverage

Table 3.3-14. Increases in Risk Ratio for Watersheds Affected by Proposed Action

HUC 7 Name	2010 Risk Ratio with South Shore	2010 Risk Ratio with Angora Restoration	Increase in Risk Ratio
Angora Creek	205.44%	231.06%	25.62%
Camp Richardson Frontal	174.71%	181.82%	7.11%
Lower Upper Truckee River	144.89%	146.61%	1.72%
Osgood Swamp	72.07%	72.75%	0.68%
Taylor Creek	62.37%	62.42%	0.05%

Figure 3.3-5 displays the recovery trends for the no-action and the proposed action cumulative watershed effects for Angora Creek, Camp Richardson Frontal, and Lower Upper Truckee watersheds. Osgood Swamp and Taylor Creek watersheds are not shown because they are below threshold levels and there is almost no contrast between alternatives. The trends depart as either natural recovery from the fire and South Shore Project begins or the proposed action is implemented. Separation between lines for specific watersheds is reflective of the amount of activity occurring in that watershed. As displayed, Angora Creek watershed has the most activity, followed by Camp Richardson Frontal and then Lower Upper Truckee. It is important to note that the no-action and proposed action alternatives recover to the same point in 2020. The critical difference would be that the proposed action creates a more resilient landscape that is more adapted to withstand future effects from wildfires, thereby minimizing impacts to watersheds and hydrologic function and beneficial uses, including Lake Tahoe.

Figure 3.3-5. CWE Comparison of No-Action and Proposed Action Alternatives



Long-term cumulative effects are not expected from this project as displayed in Figure 3.3-5 and an analysis that included roads and temporary landings would be expected to fully recover to pre-fire conditions and possibly lower than pre-fire conditions as a result of the enhancements proposed by the proposed action. In the short term, it is expected that disturbances would result in increases in sediment available for transport into the aquatic systems; however, with implementation of mitigation, sediment would be maintained on site and would not affect beneficial use or add to sediment to waterbodies.

3.3.5 Analytical Conclusions

This section provides a brief summary of the conclusions of effects analysis for soil and water resources. It provides a summary of the environmental effects and their significance to soil and water resources from project activities.

Erosion would decrease more slowly and soil cover would be replaced more slowly under Alternative 1 than Alternative 2. Over the long term (20 years or more), surface organic matter would be greater under Alternative 1 than Alternative 2 due to the eventual decomposition of all of the dead material currently on site. Erosion impacts from the existing road and trail system would continue. The potential for another wildfire is greater under Alternative 1 than Alternative 2 because fuels and brush would not be removed. Increased potential for wildfire means increase potential for soil loss and damage.

Alternative 2 would maintain adequate soil porosity and hydrologic function during and after fuels reduction treatments through the design feature that ensures adequately dry soil conditions during vegetation management operations, and through limiting total disturbed area. Decreasing sediment input from eroding stream banks and hill slopes would also occur as a result of Alternative 2. This decrease in sediment input would occur from implementing stream channel, gully, and meadow restoration actions in Angora Creek, Gardner Mountain Meadow, and Seneca Pond.

Numerous design features for all phases (vegetation and fuels, roads and trails and stream and aquatic habitat restoration) of the project would provide erosion control. Design features would also minimize soil disturbance in sensitive areas during fuel reduction activities. Overall, erosion from the road and trail system would be decreased by the proposed improvements to the transportation system in the project area. The fuel removal portion of the proposed action would decrease the likelihood of significant effects to soils from wildfire.

Project-wide, significant effects to the soil resource would be avoided through implementation of the prescribed design features and BMPs, and Regional Soil Quality Standards would be met.

Prior to the 2007 Angora Fire, Angora Creek watershed was below the TOC as were Osgood Swamp and Taylor Creek watersheds. Independent of the fire Camp Richardson Frontal and Lower Upper Truckee River are over TOC from impervious coverage alone. These watersheds are located nearer to the lake, where the primary land use is urban development.

The Angora Creek watershed received more impacts from the fire than the other watersheds in the project area at an increased risk ratio of 178.74%. Taylor Creek, Osgood Swamp, Lower Upper Truckee River, and Camp Richardson Frontal watersheds had risk ratio increases from the fire of 7.36%, 10.23%, 14.75%, and 69.11%, respectively. Under Alternative 1 the potential remains to affect Lake Tahoe from sediment and associated phosphorus concentrations in surface waters because phosphorus binds to sediment particles and could be transported to the lake along stream channels. Also under Alternative 1 any potential increases to TMDL for phosphate and turbidity would be maintained at current levels in the burn area and would not be reduced by restoration treatments or increased amounts of upland and riparian vegetation. Therefore, there is potential for adverse affects to water quality from Alternative 1 due to both degraded stream channel and road and trail conditions persisting through time.

Alternative 2 incorporates design features for ground disturbing activities which have objectives of reducing potential negative effects to water quality. Design features incorporate standards for fuel reduction, as well as road, trail and stream activities in order to decrease the likelihood of sediment delivery to streams. Cumulative watershed effects analysis for Alternative 2 displays no exceedance to TOC in the Osgood Swamp or Taylor Creek watersheds and indicates significant recovery in Angora Creek after restoration actions. Alternative 2 has minimal effects to the TOC in Camp Richardson Frontal and Lower Upper Truckee River due to urbanization. Therefore, adverse effects will not occur as a result of implementing Alternative 2.

Section 3.4
Recreation and Scenic Resources

3.4 Recreation and Scenic Resources

3.4.1 Introduction

This section discusses the existing setting and potential impacts to both the scenic and recreation resources, since these forest user-related experiences are interwoven. Consistency with the visual quality objectives (Project Record Document E52) is used as one measure of effects, using professional judgment as the basic analytical approach. Indicators of effects to the scenic resource include meeting visual quality objectives (VQOs) of retention and partial retention identified in the Forest Plan; changes in foreground, middleground, and background views, and scenic stability. Concerns for scenic resources also include potential loss or reduction in value of scenic views of healthy forest landscapes.

3.4.2 Existing Conditions

The human-caused Angora Fire dramatically altered the recreation and visual landscape within the project area. Within this 3100-acre wildfire area, approximately 60% burned with a high vegetative severity (greater than 75% basal area mortality). An additional 20% of the area burned with moderate intensity. This created a mosaic of dead and live trees. Significant tree mortality changed a once natural appearing forest into a highly visually scarred area where dead trees and barren soil clearly dominate the landscape. The new and highly altered landscape lacks the coolness of forest shade and the color contrasts commonly found in a natural forest setting. Sounds are created by winds blowing through burned snags rather than forest foliage. Winter snowfalls stick to burned limbs rather than cling to the forest foliage, and this is visually harsh when compared to a natural forest setting. The resulting landscape does not meet the VQOs of retention and partial retention. Instead, the current condition has an unacceptably low scenic integrity. These conditions are particularly noticeable in foreground areas next to residential areas and along roads and trails.

The recreation experience has also been altered by the Angora Fire. Greater numbers of hazardous trees are present and visitors find the area less attractive, as it has fewer recreation opportunities. The potential exists for fewer recreation users to visit this area due to its unattractiveness with the exception of snowmobile use (see below).

The project area sits within the larger Lake Tahoe Basin, which is internationally recognized as a yearlong recreation destination area. Summer and winter are the key activity periods; however, local recreation users enjoy the forest yearlong. Public interest regarding recreation and visual resources is high. Many visitors have generational connections to Lake Tahoe, with families regularly sharing their favorite Lake Tahoe locations with younger generations.

Seneca Pond is an area to which locals have established a strong emotional connection. It is the only pond within the project area, and a NFS trail leads to it. The pond was improved by the Forest Service during the 1990's. It is also situated in the "backyards" of nearby residents and user-developed trails provide easy access to the pond. The pond is enjoyed by hikers, equestrians, and mountain bike users as a destination or as a stopping point for a quick break. Seneca Pond provides a wide variety of recreation and social benefits. It serves as a popular gathering spot for families, an informal place for community events, a reason to exercise, a route to walk pets and watch occasional wildlife, and a place where kids can enjoy water play. To those who know about it, Seneca Pond is a special place.

Recreation use throughout the project area is dispersed where roads, trails, and trailheads are the only developed facilities. Most recreation users follow the established roads and trails to enjoy the forest. Current activities are confined to non-motorized recreation such as hiking, mountain biking, equestrian use, physical exercise, relaxation, conversations, and viewing scenery. Snow play, including over the snow vehicle use in designated areas, is also popular. The level of snowmobile use has increased due to the openings that have been created by removing dead trees for hazard reduction immediately adjacent to the private homes. Where there was once dense coniferous forest, there are now open areas that are attractive and accessible to snowmobilers. This increased use has caused concern by some local residents about noise levels and concern for unregulated use. NFS lands adjacent to private lands are currently open to snowmobile use, consistent with regulations governing their use.

Local users have created their own trail systems, which originate from nearby residential areas. These unofficial routes create user patterns that serve some local residents, but these routes lack legal access for the vast majority of the public. While well-intended, these routes often create negative impacts on wildlife habitats, sensitive plant populations, water quality, and the general public. The existing condition for roads and trail is discussed in more detail in Section 3.10, “Transportation,” of this document.

3.4.3 Direct, Indirect, and Cumulative Effects

Alternative 1—No Action

Direct and Indirect Effects

Recreation

The no-action alternative would allow existing recreational activities to continue, without interruption or substantial changes. These activities include a wide variety of unconfined recreation such as hiking, mountain biking, exercise, photography, scenic viewing, wildlife viewing, snow play, cross-country skiing, and ecological study and appreciation. These activities are the result of recreation use patterns that have evolved over time and provide substantial social and economic public benefits, especially to local users.

Seneca Pond would continue to exist as the only pond on NFS lands within the project area and would continue to be enjoyed by hikers, equestrians, and mountain bike users who stop for a break. This pond serves as a popular destination for local residents as a gathering spot for families, and informal community events; a reason to exercise including pets; a cooling off place for trail users; and it provides the emotional benefits that water bodies are noted for. Wildlife, including non-native frogs, are seen at the pond. Kids enjoy water play here and the long-standing emotional attachments to Seneca Pond would continue. The social benefits of Seneca Pond widely vary and these benefits would continue under this alternative.

Recreation activities within other areas would continue as in the past with some change in the patterns and use levels due to the Angora Fire. The mix of classified and unclassified road and trail routes would continue, some without the benefit of design, maintenance, or environmental sustainability. The denuded forest has opened up, increasing opportunities for users to create additional unclassified trails; especially in special areas such as SEZs or key wildlife habitats. Local residents may explore the burn areas, especially in the more gentle sloped areas and along drainages where there are intermittent or perennial streams. As demonstrated by the existing network of user-created roads and trails, the potential development of additional roads and trails would likely have negative impacts from increased sedimentation and on riparian values. This is because the user-created routes are not properly located or designed to minimize impacts. The scope and location of effects from new user-created access routes is unknown; however, it is possible that the overall levels of use may drop when compared to levels of use prior to the Angora Fire, primarily due to the loss of its attractiveness as a forested area. The increase in snowmobile use that has occurred since the fire will continue in the short term. This use is expected to decline over the next 5 to 10 years as brush and other vegetation re-grow and begin to be more and more of an impediment to snowmobilers. The trail and road systems and the quality of the associated recreation experiences would gradually decline accordingly. Users would increasingly discover and use trails and roads that are on the approved National Forest Transportation System and are routinely maintained to enhance user experiences. The standing dead trees would present an increasing hazard to public safety. Trees killed by the Angora Fire (including branches) would begin to fall at higher rates between 5 and 10 years and longer for the larger trees due to decay. This would potentially cause serious public safety problems, especially for those unfamiliar with falling snags. Unexpected high winds can often occur and put even the most experienced in jeopardy. In addition to safety problems fallen dead trees would limit access to classified roads and trails only because of the difficulty in traveling through an area with large amounts of fallen trees.

Scenic

The distinctive visual features, visual integrity, and the landscape character of this area have been altered by the Angora Fire. The high-and medium-intensity burn areas (80% of the project area) have left a barren looking landscape. In the past, its landscape character has contributed to the overall visual qualities and uniqueness of the LTBMU. Now its condition detracts from the otherwise outstanding visual character of the surrounding areas. The visual result is a landscape that has an unacceptably low scenic integrity.

This alternative is inconsistent with the visual resource objectives in the approved Forest Plan, which states “schedule rehabilitation of sites that do not meet the Adopted VQOs.” The adopted VQOs within the project area consist of approximately 60% of the area in retention and 40% of the area in partial retention. Natural recovery to meet VQOs would be extremely slow within the high-intensity burn area (approximately 60% of the project) and the recovery period would range from several decades to over a century. This would result in a partially restored natural appearing landscape. Areas with moderate burn severity (25% to 75% basal area mortality) would gradually begin to restore their visual qualities in the long term; however, this recovery would only occur where seed sources were available. Low-intensity burn areas (less than 25% mortality) would recover in the short term without intervention. It is expected that the areas of high-intensity burn (where coniferous forest mortality was very high) would be approaching pre-fire conditions in approximately 100 years as natural processes restore the dominant coniferous forest landscape to its pre-fire condition.

The no-action alternative would have direct effects on the visual resources. Foreground and middleground view areas that once supported forest stands would continue to appear unnatural, as most viewers typically find a burned landscape visually displeasing. It is likely to take 2 or 3 decades for the burned landscape to transition to a view that is once again similar to the pre-Angora Fire condition in which the view is dominated by a green coniferous forest. This is because it will take that period of time for most of the dead trees to fall over and become less dominant in the view. There is also a potential indirect effect of leaving high volumes of fuel and allowing the heavy revegetation of shrubs and grasses, as these characteristics would potentially increase the risk of degradation or loss of scenic qualities through a repeat of another high-intensity wildfire. Risks to the public who venture off established trails and roads would continue to be high due to the large amounts of decaying and falling snags.

Cumulative Effects

As of May 2010, 670 acres within the project area have been reforested, and an additional 295 acres are planned to be planted over the next 2 years. Planted tree species are a mix of conifers including Jeffrey pine, sugar pine, red fir, and incense cedar. As these young trees grow and burned trees fall over, the visual quality of the burned area will transition to a forested landscape dominated by green conifers similar to that which existed prior to the fire. There would continue to be user-created trails and roads which would, in combination with the degraded scenic and recreational environment created by the Angora Fire, further degrade the conditions of streams and adjacent forested areas in close proximity to the private residences along the east side of the project area. An increasing network of user-created roads and trails would visually detract from the already compromised natural setting. When taken into consideration with the proposed Fallen Leaf Trail Access Travel Management Plan (ATM) and the Angora/Twin Peaks Road ATM, recreation access would remain the same while there would be greater amounts of unmarked trail routes in the local area due to current and increased amounts of unmanaged trails within the Angora burn area.

Alternative 2—Proposed Action

Direct and Indirect Effects

Recreation

The direct and indirect effects of the proposed action on recreation resources are varied. The upgraded road and trail system would provide clear definitions for visitor travel on a system that would be reconstructed and maintained to Forest Service standards. The 14 way-finding stations at public access points would make an important contribution to minimize confusion on how to access the project area, especially for unfamiliar visitors. Visitors to the LTBMU who are unfamiliar with this area would eventually learn about these opportunities and begin to experience them. At the same time, established unclassified routes would be eliminated and new controls would discourage their future use. A once unconfined recreation experience would be replaced with a system that includes additional management (through route signs) with increased clarity for access and route finding.

The 2006 National Visitor Use Monitoring Project (Project Record Document E53), a Forest Service-wide program aimed at understanding visitor use patterns, demographics, and satisfaction levels, indicates that LTBMU users participated in the following primary activities at the following rates:

- 54% - Viewing natural features and scenery
- 45% - Relaxing or “hanging out”
- 45% - Hiking or walking

- 29% - Driving for pleasure

While these statistics reflect total LTBMU recreation use, the range of activities can be inferred to apply within the project area. It is important to note that one activity is not exclusive of others. For example, virtually all recreation experiences include viewing of natural scenery.

Fuel removal and vegetative treatments would occur generally from May 15 through October 15, which generally coincides with the heavy recreation use season, and the above recreation activities would be impacted for approximately two working seasons (described above). This would result in temporary inconveniences, restrictions, and short-term closures on public use in portions of the project area. The quietness and solitude normally experienced by the forest user would be changed with the sights and sounds of chainsaws, mechanized equipment, and work crews. These changes would extend outside the project area; especially in the immediate area and on travel routes. The above effects would remain during the dead tree removal and live tree thinning phases of the project and would end when this portion of the project work has been completed. Risks to public safety would be reduced with the removal of dead trees. However, the public would travel (e.g. walking and biking,) on established roads and trails that are adjacent to areas where heavy equipment is operating. The removal of concentrations of dead trees in close proximity to private land and/or access roads and trails is likely to increase the use of snowmobiles in these areas, as the areas will be much more open, and impediments to snowmobile travel is reduced. This increased use, although allowed for and consistent with current Forest Service policy, is likely to inconvenience and bother the local residents in close proximity to these open areas. This use is expected to decline over the next 5-10 years after the project implementation, as planted trees and brush re-growth to a height that will begin to impede access by snowmobilers to the extent that they will seek other areas to recreate in that are more amenable to open and safe riding.

Replacing Seneca Pond with a functional wetland environment would change public recreational uses and experiences within this portion of the project. The physical, recreational, and emotional values associated with the pond in its current state would be changed to values associated with a functional wetland environment. A key stopping spot and cooling off place for hikers, equestrians, mountain bikers, and snowmobilers would continue but change because the water level of the pond would decrease. The amount of riparian vegetation is expected to increase in the form of willows, alder, and aspen trees. An increase in these plants communities would increase wildlife habitat health which would lead to a long term (around 10 or more years) improvement on the viewing of natural features and scenery (as described above). The social benefits, such as providing a gathering spot for families, and informal community gatherings; a destination for nearby residents, including their pets; a place for kids to play in the water; are among those values which would also be changed. The indirect effects are likely to result in different patterns of public use including but not limited to exercise, walking pets, the amount of time spent there, and other changes associated with the values stated above.

Other phases of this alternative such as aspen enhancement, aquatic habitat and stream channel restoration, Gardner Meadow restoration, and noxious weed treatments would have no immediate effect on recreation use. These restoration activities would enhance the recreational user's experience over the short and long term. In the short term, the Gardner Meadow restoration and the aspen enhancement and reforestation aspects of this project would be most noticeable. Gardner Meadow improvements would be noticeable within 2 to 3 years and continue to be valued as a special ecosystem component. Effects of aspen enhancement, noxious weed treatments, and aquatic habitat and stream channel restoration would result in gradual environmental changes only noticeable to those users who are actively and specifically monitoring the changes over time. Once established, the aspen planting areas would add summer and fall colors to the viewing public. These scenic attributes are expected to substantially exceed the aspen colors present prior to the Angora Fire.

Scenic

This alternative implements the visual requirements of the Forest Plan and thus is consistent with the plan. It accelerates restoration and the natural recovery processes significantly through management intervention using acceptable land management practices and BMPs. Individual projects would have varying effects on the scenic resources and are described as follows.

In the immediate term (1 to 3 years), dead tree removal would have a short term visual impact (up to 951 acres of ground based mechanical tree removal and 447 acres of helicopter tree removal with hand thinning removal occurring for both) on disturbed areas and would give the appearance of a more open area with scattered stumps from the removed dead trees. If aerial removal of snags does not occur, the scenic effect would be different, as there would be fewer visible stumps due to hand treatment of snags and growth of brush and conifers. However, these areas would have a greater amount of dead standing trees remaining for a short time. These trees would fall, rather than being removed during project implementation. This extended visual effect is minimal, as these areas of proposed aerial removal are typically not in the foreground view of most forest users. There would also be diverse pockets of standing dead trees and large downed wood because of project specific design features for leaving larger trees, snag management zones, and the other untreated areas beyond the tree removal zone. This would improve the heterogeneity of the area by creating an openness and visual diversity not present in the existing burned landscape. Comments that were received from the public during scoping expressed the public's desire to see dead trees removed. Reasons for this were that the dead trees were visually detracting to several people who lived in the area or adjacent to it.. The areas proposed for dead tree removal would temporarily cause the viewer to focus on the open area as a result of equipment operations disturbing portions of the landscape. This condition would change following the spring season with grass and shrub regeneration as well as reforestation of conifers and aspen trees.

Proposed fuel treatment includes changes to the current density and composition of forest vegetation, evidence of cut tree stumps, creation of cleared landing areas to facilitate mechanical treatment, and creation of burn piles associated with hand treatment. Proposed vegetation treatments that alter the forest vegetation would result in stands that are visually more open than existing conditions. Historically, the landscape within the project area experienced more frequent surface fires, which resulted in a more open forest character. The effects of implementing the proposed vegetation treatments would mimic these historic conditions and would be consistent with the Forest Plan VQOs of retention and partial retention.

During vegetative treatment implementation, management activity in the form of mechanical equipment or hand crew activities would cause a visual impact that exceeds VQO standards, but these activities would occur within short durations. Landings used to facilitate mechanical treatments would be treated following their use to reduce their visual contrast with the surrounding landscape. Implementation of these landing areas is considered a short-term impact that would temporarily exceed VQOs. These areas would comply with the VQO standards of retention or partial retention following implementation of proposed restoration efforts and 1 to 3 years of vegetative growth. Similarly, burn piles associated with hand treatments would remain in the landscape for 1 to 3 years following their creation until they were adequately cured and burned during available burn days. Smoke from prescribed fire would be visually evident; however, it would be minimized as part of the approved burn plan and these effects would be temporary.

Management activities within foreground viewing areas are the most sensitive to the visual resource. Prescribed burning, burn piles, cut stumps, vegetative treatments, and landings within the foreground view all create variances to the approved VQOs of retention or partial retention. These variances would be temporary and the visual attributes would recover to the approved VQOs within 1 to 3 years following implementation. The above fuel management activities commonly occur within the LTBMU and other land management agencies.

Indirect effects of the proposed fuel treatments include enhanced views in foreground areas and increased distance views in some middleground areas. These could also include more frequent views of Lake Tahoe and the surrounding mountain peaks. The reduced vegetation and biomass also significantly reduces the risk of future high intensity wildfire and its subsequent effects on the visual character and attributes of this area.

The direct visual effects of the Gardner Mountain Meadow conifer removal project would create a temporary variance from the approved VQOs during the implementation phase. Once the conifers were removed and the channel work, structures, and plantings completed, the visual attributes of this mountain meadow would be substantially improved. These attributes would include a larger, healthy, and more open meadow complex with a variety of low-growing perennial plants. The approved VQOs are expected to be met within 1 to 3 years following full project implementation. This expanded meadow would have the indirect effect of contributing to increased variety in the overall landscape character of the surrounding area.

The channel reconstruction above Lake Tahoe Boulevard and the large wood placement in 2 miles of Angora Creek would create a temporary variance from the approved VQOs during the implementation phases. Implementation would require the use of equipment, work crews, and channel excavation leading to subsequent visual disturbances. These disturbances would be primarily created by a temporary access road and exposed raw soils. Following implementation, these wet channels would quickly restore the temporary loss of visual qualities and the approved VQOs would be met within 1 to 3 years. The improved stream channels would provide the indirect positive effect of providing recreationists and passers-by a view of a healthier ecosystem that is recovering from a wildfire.

The direct visual effect of replacing Seneca Pond with a functional wetland would be seen as a change to the character of the area. The presence of ponded water provides a visual experience that attracts viewers to stop and stay awhile or to use it as their destination; the re-establishment of a wetland environment is viewed differently.. While a large wetland area can have visual attributes that make it a special place and provide a sense of arrival to visitors, the conversion to a wetland of this small size would not provide this sort of visual experience. This project would be located in the sensitive foreground area that is immediately adjacent to an established NFS trail. Replacing Seneca Pond with a functional wetland would require heavy, earth-moving equipment in the immediate area and the removal of several small Jeffrey pines to facilitate the necessary earthwork. This part of restoration would be phased over the course of three years (as described in the proposed action) and this would provide the public to view the transformation of the pond into a wetland complex. The transformation into a more natural wetland setting would take about 5 years. During the construction and implementation phase, this area would not meet the established VQO of retention.

Restoration activities of this area to a functioning wetland are expected to occur within 3 years and the area would meet the established VQOs after this time.

Adjacent Property Owners

The direct and indirect effects on local residents would be substantially different from those of a casual visitor. The most noticeable would be the continuous sights and sounds of operating equipment. Typically, equipment and cutting operations begin early in the morning and continue with elevated noise and dust levels along with distractions of the equipment working throughout the day. Noise around landings and staging areas would be noticeable. Design Feature 3 (Section 2.3.2) is included to partially address neighborhood concerns and impacts of noise and traffic during project implementation. Dust would be limited to a few hours a day along skidding and forwarding trails. Landings and roads include dust abatement measures such as BMPs (e.g., watering). The landing and staging areas would tend to attract curious neighbors and visitors. In addition, these same areas could attract unsupervised neighborhood children who were curious or looking for excitement. Removal of the biomass and other materials offsite would directly affect the convenience and personal safety of those who live or travel along the transportation routes. This would be most critical in highly developed residential neighborhoods and near South Tahoe High School where the roads are designed for small vehicle traffic. All of these effects would continue during the tree removal operation and would be discontinued when complete with no long-term effect on public safety.

Cumulative Effect

The proposed action, when taken in account with other fuel treatments and the ongoing reforestation activities occurring under the Angora Reforestation CE, would contribute positively towards the accelerated return of the approved VQOs of retention and partial retention. Initially impacts on recreation and scenic quality would be short term lasting a few years while treatments are taking place in and adjacent to the project area. Recreation opportunities and access would remain open to the area and scenic conditions would improve as fuel treatments would remove smaller ground and ladder fuels, thus emphasizing a more open forest with retention of larger trees and snags. Once dead tree removal and tree planting under the Angora Reforestation CE are completed, the recovery would slowly begin with some noticeable positive, visual effects on the landscape character, primarily through the natural establishment of early succession plants and as tree plantings begin to grow in height. In the long term, approximately 10 years after tree planting, the trees combined with the natural recovery of grasses, forbs, seedlings, and sprouting shrubs would show noticeable and positive effects on the scenic attributes of the area. These attributes would continue to improve through time with slow but continuous recovery towards the eventual return of a healthy forest with a visual character similar to what existed prior to the Angora Fire. It is expected that the areas of high-intensity burn (where coniferous forest mortality was very high) would be approaching pre-fire conditions in 50 to 75 years, as planted trees become well-established and begin to dominate the visual landscape.

The proposed action would discourage establishment of user-created trails through such measures as placement of physical barriers, increased signage, and increased enforcement where feasible. There would be increased coordination between the road and trail access and larger scale travel management planning and implementation within and adjacent to the project area. On-going trail and road access and travel management planning (Fallen Leaf Trail and Angora/Twin Peaks Trail ATMs) include efforts to inventory and eliminate user-created trails that pose a threat to ecological resources and public safety. Access and travel management activities are anticipated to reduce the overall number of user-created trails, and develop a sustainable trail system that meets user needs and protect resources, particularly hydrologic and aquatic conditions.

3.4.4 Analytical Conclusions

This section provides a brief summary of the conclusions for the analysis of effects to recreation and scenic quality resources comparing both the no action and proposed action alternatives.

For Alternative 1 (no action), the current recreation opportunities and access would remain unchanged throughout the majority of the project area. People may alter their activities in the area as the forest changes. Additional unclassified trails are expected to increase in the short term as the forest is more open following the fire. As dead trees fall, safety and recreation access will change. The presence of numerous snags pose a safety hazard and safer more enjoyable recreation access would be limited to classified road and trail corridors. This is due to the difficulty in navigating through pockets of shrubs and large amounts of downed wood that exist beyond these managed routes. The scenic character of the area would change as dead trees fall and shrub and conifer regeneration occurs. The scenic character of the area may be less resilient to change as a result of wildfire from the presence of higher future fuel loads and more flashy fuels. Visual quality objectives will be inconsistent with Forest Plan objectives for several decades.

For Alternative 2 (proposed action), recreation opportunities would remain unchanged and recreation access would improve over the long term by providing wayfinding signs and a more sustainable road and trail network that accesses the project and surrounding areas. Seneca Pond will change in appearance through wetland restoration that will occur in phases while trail access to the pond would continue to exist. There are short term negligible impacts to recreationists and adjacent property owners along neighborhoods corridors during dead tree removal and other restoration activities. The scenic character of the area would change as dead trees are removed and conifers are planted along with meadow, aspen, and stream channel restoration. The scenic character would be more resilient in the long term due to management activities that reduce fuels and re-establish forest and riparian systems. Forest Plan VQO's are expected to be met within 3 years of completing restoration activities.

Section 3.5
Botanical Resources

3.5 Botanical Resources

3.5.1 Introduction

The most recent list of threatened, endangered, proposed, and candidate wildlife species that may be present in the Forest Service's LTBMU was obtained from the USFWS, Sacramento Fish and Wildlife Office website on April 17, 2009. The list was updated on January 29, 2009. This list fulfills the requirements of the USFWS to provide a current species list pursuant to section 7 of the ESA. The LTBMU does not currently support any plant species listed as threatened or endangered under the ESA; however, *Rorippa subumbellata* (Tahoe yellow cress), a candidate species for listing does occur on lands administered by the LTBMU, and is not in the vicinity of the proposed action.

A pre-field review of existing information from the LTBMU flora atlases and available GIS coverages was performed to evaluate the extent of potential habitat and known populations of sensitive plants within the project area. The Jepson Manual (Project Record Document E54) supplied taxonomy and nomenclature as well as information regarding the distribution and habitats for many of the species identified on site. Additional references included A California Flora and Supplement (Project Record Document E55), A Flora of Marshes of California (Project Record Document E56), and Manual of Grasses of the United States (Project Record Document E57). Other literature reviewed include: Lake Tahoe Watershed Assessment (Project Record Document E58), Meadows in the Sierra Nevada of California (Project Record Document E59), and Status of the Sierra Nevada (Project Record Document E60).

Botanical surveys conducted in the project area focus on species with potential habitat; however, surveys are floristic in nature and attempts are made to identify all plants encountered in the field. Many species have specific habitat preferences (such as wet meadows, fens, granite scree), and botanists search for these as well as their constituent species. In addition, surveys were conducted to identify populations of noxious weeds.

3.5.2 Existing Conditions

Candidate, Sensitive, and Special-Interest Species

Table 3.5-1 lists all candidate and sensitive plant and fungi species that are known to occur or have potential to occur on the LTBMU as of April 2009. No other TEPS plant species have known occurrences or potential habitat on the LTBMU. Species that do not have potential habitat in the project area, based on the reasons given in Table 3.5-1, are not further analyzed in this document.

Table 3.5-1. Candidate and Sensitive Plant and Fungi Species with Potential Habitat on the LTBMU and Are Known or Suspected to Occur on the LTBMU.

Species	Status	Known to Occur in Project Area	Potential Habitat in Project Area	Habitat Unsuitable Based on the Following:
Arabis rigidissima var. *demota* Galena Creek rock cress	S	No	Yes	Species is found in open, rocky areas along forest edges of conifer and/or aspen stands. Usually found on northerly aspects above 7,500 feet (ft).
Arabis tiehmii Tiehm's rock cress	S	No	No	Species is known from open rocky soils in the Mt. Rose Wilderness.
Botrychium ascendens Upswept moonwort	S	No	Yes	*Botrychium* species share similar preferences in habitat, *i.e.* wet or moist soils such as marshes, meadows, and along the edges of lakes and streams at elevations between 4,700 and 9,000 ft. They generally occur with mosses, grasses, sedges, rushes, and other riparian vegetation.
Botrychium crenulatum Scalloped moonwort	S	No	Yes	See above
Botrychium lineare Slender moonwort	S	No	Yes	See above
Botrychium lunaria Slender moonwort	S	No	Yes	See above
Botrychium minganense Mingan moonwort	S	No	Yes	See above
Botrychium montanum Western goblin	S	No	Yes	See above
Bruchia bolanderi Bolander's candle moss	S	No	Yes	Montane meadows and stream banks are favored habitat. This moss tends to grow on bare, slightly eroding soil where there is little competition from other vegetation.
Dendrocollybia racemosa Branched collybia	S	No	Yes	This species is a mycoparasite growing on old decayed or blackened mushrooms or occasionally in coniferous duff, usually within old growth stands.
Draba asterophora var. *asterophora* Tahoe draba	S, SI	No	No	Species is found in rock crevices and open granite talus slopes at high elevations between 8,000 to 10,200 ft on north-east facing slopes.
Draba asterophora var. *macrocarpa* Cup Lake draba	S, SI	No	No	This species is found on steep, gravelly or rocky slopes at elevations of 8,400 to 9,235 ft.
Epilobium howellii Subalpine fireweed	S	No	Yes	Plants are known from wet meadows and mossy seeps at 6,500 to 9,000 ft in subalpine coniferous forest.

Species	Status	Known to Occur in Project Area	Potential Habitat in Project Area	Habitat Unsuitable Based on the Following:
Erigeron miser Starved daisy	S	No	Yes	Plants are known from high elevation granitic rock outcrops above 6,000 ft.
Eriogonum umbellatum var. *torreyanum* Torrey's or Donner Pass buckwheat	S	No	Yes	This species grows in dry gravelly or stony sites, often on harsh exposures such as ridge tops or steep slopes.
Helodium blandowii Blandow's bog-moss	S	No	Yes	Habitat for this moss is in bogs and fens, wet meadows, and along streams under willows.
Hulsea brevifolia Short-leaved hulsea	S	No	Yes	This species is known primarily from red fir forests, but has also been found in mixed conifer forests. The elevational range of the plant is between 4,920 to 8,860 ft.
Lewisia kelloggii ssp. *hutchisonii* Kellogg's lewisia	S	No	Yes	Habitat for this plant occurs on ridge tops or flat open spaces with widely spaced trees and sandy granitic to erosive volcanic soil from about 5,000 to 7,000 ft.
Lewisia kelloggii ssp. *kelloggii* Kellogg's lewisia	S	No	Yes	See above
Lewisia longipetala Long-petaled lewisia	S, SI	No	No	This species occurs on the northerly exposures on slopes and ridge tops at elevations between 8,000 and 12,500 ft where snow banks persist throughout the summer. The plants are often found near the margins of the snow banks in wet soils.
Meesia triquetra Three-ranked hump-moss	S	Yes	Yes	This moss prefers bogs and fen habitats, but is also found in very wet meadows.
Meesia uliginosa Broad-nerved hump-moss	S	Yes	Yes	This moss prefers bogs and fen habitats, but is also found in very wet meadows.
Peltigera hydrothyria Veined water lichen	S	No	Yes	This species is found in cold unpolluted streams in mixed conifer forests.
Rorippa subumbellata Tahoe yellow cress	C, S, SI	No	No	This species is endemic to the shore zone around Lake Tahoe in California and Nevada. Typically found in back beach areas between elevations of 6,223 and 6,230 ft.

[a] Status explanations

- No species in LTBMU are currently listed as "Endangered" by USFWS under ESA

C = USFWS Candidate species for listing as threatened or endangered under ESA

SC = USFWS Species of Concern

S = USFS LTBMU Sensitive Species, Regional Forester's Sensitive Species List, Amended 2006

SI = TRPA Special-Interest Species, Regional Plan for the LTB: Goals and Policies (1986) and Code of Ordinances (1987).

The project area was surveyed in August 2006, October 2006, June, July, and August 2007, and July, August, and September 2008, and at the appropriate intensity of surveys commensurate with the potential site disturbance and risk to sensitive plants or their habitats. Two sensitive plant occurrences were found within the project area. The following sensitive plant species from Table 3.5-1 have known locations and/or have potential habitat in the footprint of the project area:

1. Meesia triquetra, three-ranked hump moss; and
2. Meesia uliginosa, broad-nerved hump moss.

Meesia triquetra, Three-Ranked Hump-Moss

Meesia triquetra: The California Diversity Database has record of 19 occurrences in Siskiyou, Shasta, Plumas, Tehama, El Dorado, Humboldt, Nevada, Fresno, and Tulare counties. In California, 74 occurrences have been documented with the majority in the Sierra Nevada Mountains. A large proportion of the occurrences are in the southern Sierra Nevada Mountains, there are 24 occurrences on the Sierra National Forest (NF). The species is well distributed to the north in the Sierra Nevada Mountains as well with 25 occurrences on the Lassen NF. This species is also known from Sequoia/Kings Canyon NP, Sierra NF, Eldorado NF, Tahoe NF, Plumas NF, as well as from the LTBMU. On the LTBMU there are nine known element occurrences (EOs) made up of 14 sub-element occurrences located in El Dorado and Washoe counties.

This moss prefers bogs and fen habitats, but is also found in very wet meadows. It is often associated with Sphagnum, Drosera, and Drepanocladus. This species was detected during the botanical surveys. One occurrence is located within treatment stand 12, which will have ground removal of live and dead trees. The second occurrence is located within the Angora burn area, but will be treated as part of the South Shore Project. However, suitable habitat is present in the wet meadow portions of the project area.

Meesia uliginosa, Broad-Nerved Hump-Moss

Meesia uliginosa: The California Natural Diversity Database has record of 22 occurrences in Plumas, Nevada, Sierra, El Dorado, Riverside, Tulare, Siskiyou, and Fresno counties. The species is sporadically distributed throughout the Sierra Nevada Mountains: there are two occurrences on the Sierra NF, two occurrences in Sequoia NF and one in Kings Canyon NP in Tulare County, one on the Plumas NF, 12 on the Tahoe NF, and two on the LTBMU. Both occurrences on the LTBMU are located in the South Lake Tahoe area in El Dorado County.

This moss grows in bogs, fens, and wet meadows. It is often associated with Sphagnum and Drosera. It tends to grow on raised hummocks and old stumps/logs within the bog/fen and can sometimes be found in rock crevices. This species was detected during the botanical surveys. The one occurrence is located within the Angora burn area, but is located in an area to be treated as part of the South Shore Project. Within the project area, suitable habitat is present in the spring-fed portions of the meadow habitat.

The following special interest plant species, from Table 3.5-2, have known locations and/or have potential habitat in the footprint of the project area:

- *Sphagnum species.*

Table 3.5-2. TRPA Special-Interest Species with Potential Habitat on the LTBMU and Are Known or Suspected to Occur on the LTBMU.

Scientific Name	Common Name	Potential Habitat in Project
Arabis rectissima var. *simulans*	Washoe Trail rock cress	No
Meesia longiseta	Meesia moss	No
Myurella julacea	Myurella moss	No
Orthotrichum praemorsum	Orthotrichum moss	No
Orthotrichum shevockii	Shevrock's moss	No
Orthotrichum spjutii	Spjut's bristle-moss	No
Pohlia tundrae	Tundrae pohlia moss	No
Sphagnum species	Sphagnum species	Yes

Sphagnum Species, Sphagnum/Peat Moss

Sphagnum is known from the project area and from several locations within the basin. Other known locations on the LTBMU include Grass Lakes RNA, Osgood Swamp, Hell Hole, Big Meadow Creek watershed, and Velma Lakes. Design criteria were developed to prevent impacts on all sphagnum moss, including flagging, buffering, and avoiding Sphagnum spp. locations. No project activities would occur within fens or sphagnum moss locations.

Invasive Weeds

The following noxious weed species were identified during field surveys:

Bull thistle	*Cirsium vulgare*
Field bindweed	*Convolvulus arvensis*
Teasel	*Dipsacus fullonum*
St. John's wort/Klamath weed	*Hypericum perforatum*
Tall whitetop/Perennial pepperweed	*Lepidium latifolium*
Ox eye daisy	*Leucanthemum vulgare*

All noxious or nonnative plants are further discussed in the project's Noxious Weed Risk Assessment (Project Record Document E61).

3.5.3 Direct, Indirect, and Cumulative Effects

Alternative 1—No Action

Direct and Indirect Effects

There would be no direct environmental effects if no action were taken; however, it is likely that indirect effects would include a continued potential for unintended trampling of individual plants due to the uncontrolled public access. There would be a continued degradation of the habitat for species that are dependent upon riparian or wet meadow conditions, particularly in the area of

Gardner Mountain Meadow and Seneca Pond. As the coniferous forest and associated vegetation becomes re-established over several decades, the incisement of Angora Creek would continue leading to drying of the adjacent riparian and wet meadow environment. In addition, taking no action increases the risk of future wildfires burning under extreme conditions, which have the most damaging effects on soil conditions and the species that depend on that habitat.

Cumulative Effects

There would be no cumulative effects on native species of interest, as no action would be taken. The potential for spread of existing noxious weeds would be reduced due to the ongoing eradication program by the Forest Service.

Alternative 2—Proposed Action

Direct Effects

The following is a description of individual direct effects that could occur. Design criteria state that all sensitive plant species and sensitive plant communities identified during surveys or project implementation will be avoided. These design criteria protect sensitive plant species from the following direct effects; while potential direct effects are summarized below, no direct effects are expected as a result of this project based on project design criteria.

Direct effects from trampling: Direct effects from trampling, may occur to species identified in Table 3.5-1 with suitable habitat due to the potential presence of these species within the project area. The Meesia triquetra and Meesia uliginosa sites would be flagged and avoided so that no direct effects on these species because of trampling would occur. No other species are known to occur in the project area; therefore, no other species with suitable habitat are expected to be affected. Moreover, all sensitive plant species discovered within the project area would be flagged and avoided with a buffer up to 100 feet, depending on the species and project area.

Direct effects from driving over them: Direct effects from driving may occur to species identified in Table 3.5-1 with suitable habitat due to the potential presence of these species within the project area. Direct effects include physically breaking, crushing, or uprooting sensitive plants. Direct effects may also occur to sensitive plants when branches or flowering stems are crushed or broken by off-road vehicles. This damage reduces the reproductive and photosynthetic capacities of plants. Repeated damage of this type weakens the compensatory capabilities of sensitive species, which can lead to the degradation of habitat and eventually to the replacement of the species with non-native plants more adapted to frequent disturbance, such as invasive weeds. The Meesia triquetra and Meesia uliginosa sites would be flagged and avoided so that no direct effects on these species because of driving would occur. No other species are known to occur in the project area; therefore, no other species with suitable habitat are expected to be affected. Moreover, all sensitive plant species discovered within the project area would be flagged and avoided with a buffer up to 100 feet, depending on the species and project area.

Direct effects of the construction of new and temporary roads, decommissioning of roads, construction of new landing and staging areas, and construction of new trails within suitable sensitive plant habitat include ground disturbance, the removal of trees, shrubs, and herbaceous plants, soil compaction, and the creation of open disturbed areas. Following project activities, temporary roads for all components of the project (e.g., channel reconstruction) would be completely restored. Staging and landings would create or enlarge disturbed openings within the forested stands. Twenty-three existing landings and staging areas would be used and 27 new landings and staging areas would be constructed. The size of new landings and staging areas may range from 1 to 1.5 acres in size in order to safely facilitate the processing and removal of sawlogs and biomass. After completion of removal and pile burning, landings and staging areas would be restored. Restoration may include subsoiling to a minimum of 18 inches depth, re-seeding of native grass and shrub species, and spreading slash, chip, or masticated material. The Meesia triquetra and Meesia uliginosa sites would be flagged and avoided so that no direct effects on these species because of construction of new and temporary roads, decommissioning of roads, construction of new landing and staging areas, and construction of new trails would occur. No other species are known to occur in the project area; therefore, no other species with suitable habitat are expected to be affected. Moreover, all sensitive plant species discovered within the project area would be flagged and avoided with a buffer up to 100 feet, depending on the species and project area.

Direct effects from ground and aerial removal of live and dead trees, including hand-thinning within suitable sensitive plant habitat include: crushing, killing, or injuring herbaceous and non vascular plants (which can reduce growth or seed production), felling and removing overstory trees reducing the canopy cover, removing or killing understory shrubs reducing the shrub cover, removal of coarse woody debris, accumulation of slash and wood chips dispersed on the ground, the creation of wood piles, reduction of the ground litter layer, ground disturbance, soil disturbance, soil compaction, and the creation of open disturbed areas. Stand tree density and shading of the understory would be reduced.

Additional mechanical fuel reduction and thinning direct effects include: creation of skid trails and driving over plants killing or uprooting them and disturbance of mycorrhizal soils caused from mechanized and motorized equipment moving throughout the project area.

Direct effects from fuels treatments within suitable sensitive plant habitat include crushing, killing, or injuring herbaceous and non vascular plants (which can reduce growth or seed production), felling and removing overstory trees reducing the canopy cover, removing or killing understory shrubs reducing the shrub cover, removal of coarse woody debris, accumulation of slash and wood chips dispersed on the ground, the creation of wood piles, reduction of the ground litter layer, ground disturbance, soil disturbance, soil compaction, and the creation of open disturbed areas. Stand tree density and shading of the understory would be reduced. Additional direct effects specific to mechanical fuel treatment include: creation of skid trails and driving over plants killing or uprooting them and disturbance of mycorrhizal soils caused from mechanized and motorized equipment moving throughout the project area.

Direct effects from pile burning within suitable sensitive plant habitat include killing trees, shrubs, and herbaceous plants, creating open disturbed areas, if slash piles block their light, and if piles are burned over them and the heat is too intense for them to survive. Mycorrhizal soils may be impacted depending on the intensity of the prescribed fire and sensitive plants could be burned.

Direct effects from construction of new channels, fill and decommission of former stream channels, and removal of hydraulic diversion structures, channels, and ditches within suitable sensitive plant habitat include ground disturbance and soil compaction, crushing, killing, or injuring herbaceous and non vascular plants (which can reduce growth or seed production), and the removal of tree, shrubs, and herbaceous plants.

Indirect Effects

Indirect effects on sensitive species or their potential habitat are effects that are separated from an action in either time or space. Indirect effects resulting from project implementation may affect the quantity, quality, and distribution of habitats and may have positive or negative effects on sensitive plant, lichen, bryophyte, and fungi populations. These effects, which can be beneficial or detrimental to sensitive species, may include: changes in vegetation composition; changes in local hydrologic patterns in sensitive species habitats; changes in soil characteristics in sensitive species habitats; weed invasions; fire treatment response; and impacts on mycorrhizae associated with sensitive plant species. Design criteria state that all sensitive plant species and sensitive plant communities (i.e., fens) discovered within the project area would be avoided. These criteria would protect sensitive plant species and sensitive plant communities from the indirect effects summarized below. With the exception of Meesia triquetra and Meesia uliginosa, no indirect effects are expected to individual species. However, both beneficial and non-beneficial indirect effects are expected to occur to sensitive plant habitat.

The project is designed to improve geomorphic conditions along Angora Creek, which is likely to improve habitat for the sensitive plant species detected in the project area as well as those that have potential habitat. Improved geomorphic condition would improve the capacity of meadows to recharge groundwater and trap sediment and retain moisture in meadow habitat for longer periods of time through the summer. Indirect effects are not expected as a result of implementation of the proposed action because project design features have been implemented into the project (see Chapter 2, Project Design Features).

Indirect effects due to vegetation composition: There could be indirect effects on sensitive species due to the change in vegetation composition from competitive and/or facilitative interactions. The restoration component of the project is anticipated to create additional wet meadow habitat (e.g., Seneca Pond), deciduous riparian habitat, restored aspen stands, and new aspen stands. These changes in vegetation composition could benefit sensitive plant species by improving and expanding habitat for: Botrychium spp., Bruchia bolanderi, Epilobium howellii, Helodium blandowii, Meesia triquetra, M. uliginosa.

The removal of conifers could have negative indirect effects on Hulsea brevifolia due to the removal of conifers that this species associates with; however, because this species is not currently known from the LTBMU, and the surrounding area would maintain conifer overstory outside of the project area, these indirect effects are not expected to be significant. Moreover, the Angora fire already altered the existing conifer habitat, possibly reducing habitat suitability for this species.

Indirect effects due to changes in local hydrologic patterns: The restoration component of the project is designed to restore the natural hydrology of Angora Creek and could create a shallower channel with less streamflow capacity. As a result, meadow surfaces would be restored to active floodplain areas and flood more often. Over time, the increased presence of saturated soils and more sunlight would stimulate healthier wet meadow and riparian communities. Seneca Pond would be restored to a functional wetland. The increase in available water and increased wet meadow and riparian communities could have beneficial indirect effects on several sensitive plant species due to changes in hydrology: Arabis rigidissima var. demota, Botrychium spp., Bruchia bolanderi, Epilobium howellii, Meesia triquetra, Meesia uliginosa, and Peltigera hydrothyria. Since Meesia triquetra and Meesia uliginosa occur along Angora Creek, changes in hydrology could have an unknown impact on these populations.

The loss of conifer habitat due to the Angora fire has reduced stand evapotranspiration rates, which has likely increased available ground and runoff water to the ecosystems. The removal of live trees would provide additional water for aspen and thus improve aspen ecosystem function. The increase in available water and increased aspen community could have beneficial indirect effects on several sensitive plant species due to changes in hydrology: Arabis rigidissima var. demota, Botrychium spp., Bruchia bolanderi, Epilobium howellii, Helodium blandowii, Meesia triquetra, and M. uliginosa.

Indirect effects due to changes in soil characteristics: Lopped and scattered activity fuels could be spread within the project area. The depth of the material will depend on soils, hydrology, slope, amount of material, and available research. In the short term the spread of lopped and scattered activity fuels could affect plants due to the difficulty in growing through material; this will be considered when individual site prescriptions are written. In the long term, the spread of the lopped and scattered activity fuels could provide beneficial indirect effects by improving the organic layer as they break down and decompose. Compaction due to implementation activities could change soil characteristics, and cause an indirect effect on sensitive plant habitat. Temporary roads where compaction occurs would be restored following project activities. Landings and staging areas would be restored following the completion of removal and pile burning. Soil displacement could indirectly affect sensitive plants and their habitats through mounding and rutting. Over time this could come to equilibrium, but it would indirectly affect habitat

Indirect effects due to invasive weed invasions: There is a potential that sensitive plant species and their habitats would be affected by invasive weed invasions and changes in vegetation structure as a result of project implementation. Currently there are eight invasive weeds in the project area. Invasive weed invasion can result in negative impacts on all ecosystems, although different habitats may be invaded by different invasive weed species. Invasive weed infestations can lead to changes in habitat characteristics that are detrimental to sensitive plant species. Once weeds have become established they can indirectly impact sensitive species through allelopathy (the production and release of chemical compounds that inhibit the growth of other plants), alter fire regimes, and compete for nutrients, light, and water. Because invasive weeds can be difficult to control or eradicate, weed control efforts must be conducted on a regular basis, such as hand-pulling or digging, which could also negatively impact sensitive plants. If standard management requirements such as inventory, avoiding invasive weed areas, using weed free material, and avoiding spread are utilized, the threat from invasive weed establishment and infestation would be greatly minimized.

Indirect effects from fire treatment response: Prescribed fire within suitable sensitive plant habitat could alter plant communities, change vegetation composition and successional pathways, impact soils and mycorrhizae associated with sensitive plants, and increase the potential for weed invasion or spread. In addition, plant species and communities could respond differently depending on the time of year prescribed fire is implemented (i.e., spring versus fall). While suitable habitat may be altered initially there may be long term beneficial indirect effects from the proposed action. The proposed action is designed to enhance and increase available sensitive plant suitable habitat by changing the present condition to a more desirable condition. This may include an increase of available water in the soils and riparian area and the reduction of canopy ground cover of trees and shrubs.

Indirect effects due to impacts on mycorrhiza: Prescribed burning can decrease the amount of soil surface organic matter. This potentially could reduce the mycorrhiza development altering both the growth of trees and plants depending on this organic soil component. Roughly 80% to 90% of vascular plant species, including moonwort complex species, are associated with mycorrhiza for nutrient uptake (Project Record Document E62). Reduction in mycorrhiza in moonwort associated soils can cause indirect effects on these sensitive plant species. This can include compromised vegetative and reproductive growth, loss of individuals, and loss of suitable habitat.

Prescribed burning has been shown to increase mycorrhizal species evenness, due to the decrease in dominant species in the litter and organic layers (Project Record Document E63). The change in the mycorrhizal community could indirectly influence the plant community, by potentially increasing the plant community evenness. The evenness of the mychorrhizal community could change the evenness of the above ground vegetation community, potentially allowing rare species to become more common and common species to become less dominant. This shift could be beneficial to sensitive species as long as mychorrhizal species are not lost from the community.

Invasive Weeds: Motorized vehicles (e.g. equipment for live and dead tree removal) disturb the habitats they pass through, creating conditions favorable for weed introduction and spread. They are recognized as vectors for introducing and spreading weeds into new areas. Ground disturbance would occur during numerous facets of the project, including construction of new roads, landings, and staging areas; removal of live and dead trees; restoration components such as new channel construction and fill of the old channel; and alteration of Seneca Pond into a functioning wetland. People use the motorized roads, non-motorized roads, and trails for a variety of activities including mountain bike riding, dog walking, and hiking. These activities add to the likelihood of weed introduction. Wind is also a non-project vector. Due to the loss of vegetation as a result of the Angora Fire, changes in drainage and surface water flow could also be a non-project vector.

Some loss of canopy cover would occur as a result of live tree removal. Where the trees are dying due to the fire, loss of canopy cover would occur without the project. This could increase the potential for weed invasion by species that require high light conditions. Areas of mineral soil with full to partial sun are vulnerable to weed introduction and spread. The loss of conifer habitat due to the Angora Fire has reduced stand evapotransporation rates, which has likely increased available ground and runoff water to the ecosystems. The removal of live trees would provide additional water for remaining vegetation. This could increase the potential for weed invasion by species that require wetter conditions.

The proposed action includes an extensive list of design features that are intended and expected to reduce the risk of effects from invasive weeds (see Chapter 2, Design Criteria). The overall risk of introducing or spreading invasive weeds as a result of the project is considered to be medium. This determination is based on the following:

- Surveys identified eight invasive weed species in the project area).
- Areas not previously surveyed or with surveys that are older than 5 years would be re-surveyed prior to implementation reducing this risk to medium.

- Vectors in the project area include roads, recreationists, and animals. Construction would result in a short-term increase in traffic in the area.
- The soil disturbance would provide weed seeds an opportunity to establish, and increased moisture would provide good habitat for some weeds.
- A series of effective design criteria has been included as a part of the proposed action. These criteria would decrease the risk of project-related weed spread to a level that is at pre-project conditions.

Cumulative Effects

The extent of cumulative effects on sensitive plants depends on the management of potential direct and indirect effects, as well as the attributes of the sensitive plant species located within the project area, their distribution within the project area, and the ability to design future projects with sensitive plant attributes in mind.

Two sensitive plant occurrences were found within the project area. It is likely that additional Meesia triquetra and Meesia uliginosa individuals have been impacted in the project area from past projects. Cumulative effects to the status or management of any sensitive plant species on the LTBMU from future projects (South Shore) are not expected from this project because these species would be protected through implementation of project design features.

There would not be any cumulative effects from the potential spread of noxious weeds. The design features of the proposed action would reduce the risk of spread from high to medium, and the on-going Forest Service program to eradicate noxious weeds in the project area and in adjacent areas would further reduce potential for spreading of weeds. The Terrestrial Non-native Invasive Plant Species Treatment Project would authorize treatment of noxious weeds by manual, mechanical, chemical, and thermal methods. This project would cumulatively reduce the potential for spread of weeds within the project area.

3.5.4 Determinations

Based on the description of the proposed action and the evaluation contained in the Biological Evaluation (Project Record Document E64), these are the determinations made for TEPS plant species:

Will not affect the following species:

- *Arabis tiehmii* (Tiehm's rock cress)
- *Draba asterophora* var. *asterophora* (Tahoe draba)
- *Draba asterophora* var. *macrocarpa* (Cup Lake draba)
- *Lewisia longipetala* (Long-petaled lewisia)
- *Rorippa subumbellata* (Tahoe yellow cress)

This determination is based on the absence of suitable habitat within the project area and the absence of individuals known or expected to occur.

May affect individuals, but is not likely to result in a trend toward federal listing or loss of viability for:

- *Dendrocollybia racemosa* (Branched collybia)
- *Lewisia kelloggii* ssp. *hutchisonii* (Kellogg's lewisia)
- *Lewisia kelloggii* ssp. *kelloggii* (Kellogg's lewisia)
- *Arabis rigidissima* var. *demota* (Galena Creek rock cress)
- *Botrychium ascendens* (Upswept moonwort)
- *Botrychium crenulatum* (Scalloped moonwort)
- *Botrychium lineare* (Slender moonwort)
- *Botrychium lunaria* (Slender moonwort)
- *Botrychium minganense* (Mingan moonwort)
- *Botrychium montanum* (Western goblin)
- *Bruchia bolanderi* (Bolander's candle moss)
- *Epilobium howellii* (Subalpine fireweed)
- *Erigeron miser* (Starved daisy)
- *Eriogonum umbellatum* var. *torreyanum* (Torrey's or Donner Pass buckwheat)
- *Helodium blandowii* (Blandow's bog-moss)
- *Hulsea brevifolia* (Short-leaved Hulsea)
- *Peltigera hydrothyria* (Veined water lichen)

Indirect effects of the proposed action may improve and expand habitat for these species due to changes in vegetation composition, increased water availability, and increased wet meadow and riparian communities. These species may be affected during project implementation if undetected individuals or populations are present. If any of these species are detected before or during project implementation they would be flagged and avoided.

These species may be affected during project implementation if undetected individuals or populations are present. If any of these species are detected during project surveys pre-project implementation then they would be flagged and avoided.

May affect individuals, but is not likely to result in a trend toward federal listing or loss of viability for:

- *Meesia triquetra* (Three-ranked hump-moss)
- *Meesia uliginosa* (Broad-nerved hump-moss)

The known populations of Meesia triquetra and Meesia uliginosa would be protected by project design criteria, which require that the population be flagged and avoided with a buffer up to 100 feet where project activities would not occur. These species may be affected during project implementation if undetected individuals or populations are present. If additional locations of these species are detected before or during project implementation then they would also be flagged and avoided.

3.5.5 Analytical Conclusions

This section provides a brief summary of the conclusions of the effects analysis for botanical resources. It provides a summary of the environmental effects and their significance to botanical resources from project activities. Two sensitive plant occurrences (*Meesia triquetra* and *Meesia uliginosa)* were found within the project area.

Alternative 1 would result in a continued degradation of the habitat for species that are dependent upon functioning riparian and wet meadow conditions. Any realized or potential effects to sensitive plants from ground disturbing activities will not occur. The potential for spread of existing noxious weeds would be reduced due to the ongoing eradication program by the Forest Service.

Alternative 2 is designed to improve geomorphic and hydrologic conditions along Angora Creek and other riparian and meadow systems. Such activities are likely to improve habitat for sensitive plant species detected in the project area as well as those that have potential habitat. Design features to conserve sensitive plants and prevent the spread of invasive weeds are identified for fuels management and stream and watershed restoration activities. Alternative 2 will not cause adverse impacts to botanical resources.

Section 3.6
Wildlife and Aquatic Species

3.6 Wildlife and Aquatic Species

3.6.1 Introduction

The purpose of this section is to disclose the potential effects of the Angora Fire Restoration Project on species (and/or their habitats) listed as endangered, threatened, candidate or proposed (Biological Assessment) under the federal Endangered Species Act of 1973 as amended (ESA); species designated as sensitive by the Regional Forester in Region 5 (Biological Evaluation); habitats designated for management indicator species (MIS) for the Lake Tahoe Basin Management Unit (MIS report); and wildlife and fisheries threshold standards as designated by the TRPA report. This section is based upon the "Biological Assessment/Biological Evaluation Aquatic and Terrestrial Species for the Angora Fire Restoration Project" (Project Record Document E64).

Species lists are based on the January 29, 2009 (verified on April 17, 2009), list of federally threatened, endangered, proposed, and candidate species for the LTBMU from the USFWS (http://sacramento.fws.gov/es/spp_list.htm). The Forest Service's wildlife sensitive species list is based on the Pacific Southwest Region's list of 1998, as amended. These lists are the most current versions for the LTMBU.

Wildlife surveys have been performed in and near the Angora Project area by LTBMU biologists. Survey methods include protocol surveys for California spotted owls and northern goshawks). None of the terrestrial species considered in the BA/BE requires consultation with the USFWS. For aquatic species, it was determined that the project would have no effect on Lahontan cutthroat trout since the species is not present in the project area; therefore, no formal consultation with the USFWS was necessary.

3.6.2 Existing Conditions

The project area is approximately 3,100 acres. Of that total, 58 acres are comprised of roads and 276 acres are private, state, or city owned. Thus, the total acres of Forest Service land are 2,700. A total of 1,398 acres would be treated under the Angora Project (Stands 1–13), while a total of 1,168 acres would not have any treatment. See Figure 3.6-1 for locations of these non-treated areas. Within the Forest Service acreage, 325 acres located in the non-treatment stands would be treated under the South Shore Project.

Vegetation Composition and Structure

Prior to the Angora fire, the existing vegetation within the project area (EVEG GIS layers for the Lake Tahoe basin [12/08]) was dominated by mid-seral stage Jeffrey pine and Sierran mixed conifer forest (see Table 3.6.1). Vegetation structure in conifer forests within and adjacent to the project area was dominated by CWHR (California Wildlife Habitat Relationship) system (CWHR v. 8.1) tree size class 4 (11- to 24-inch dbh), and by open (25%–39%) to moderate (40%–59%) overstory canopy cover (Tables 3.6-1 and 3.6-2).

Table 3.6-1. Pre-Fire CWHR Habitat Types within the Angora Project Area (Project Record Document E65)

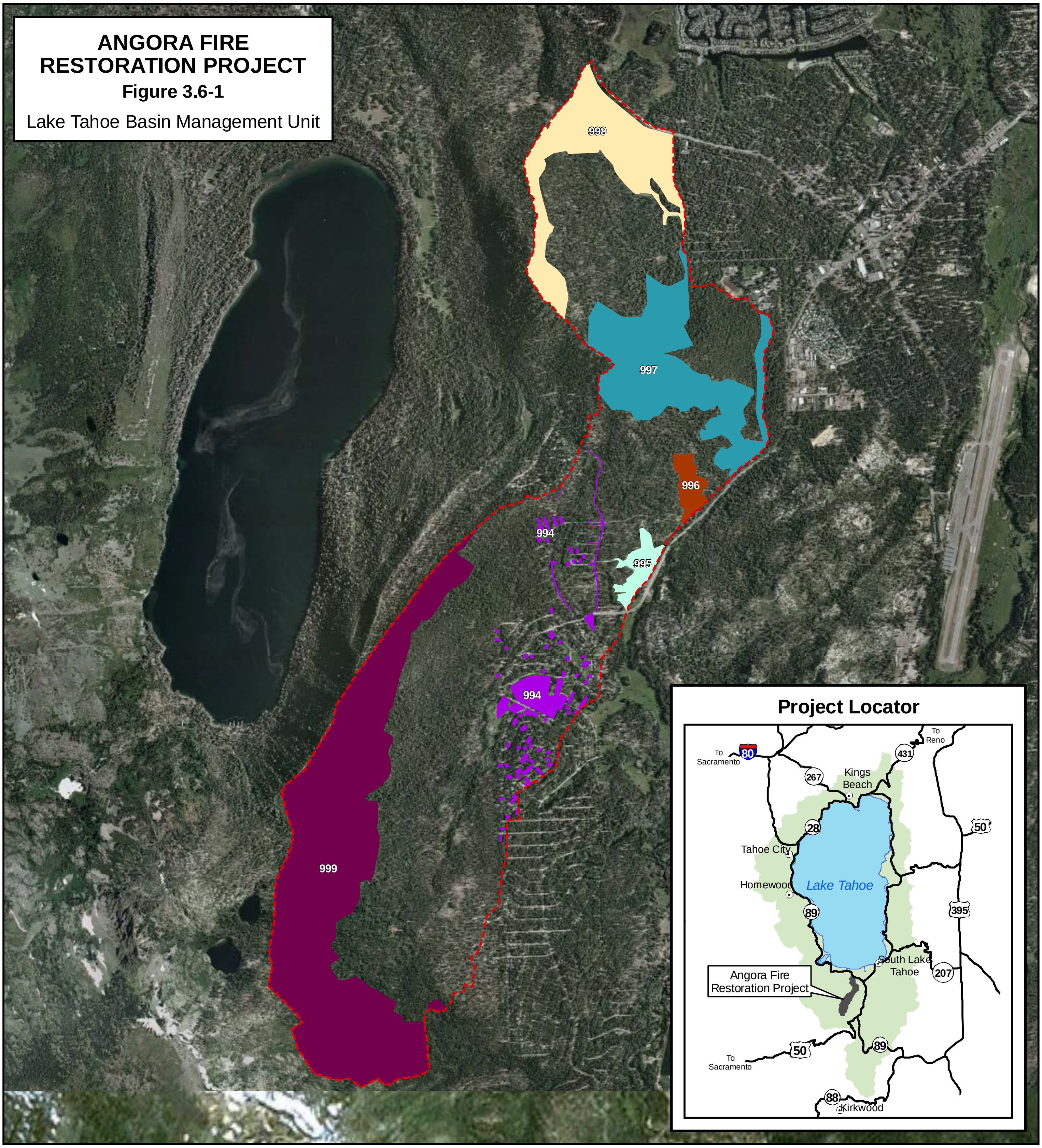
CWHR Habitat Type	CWHR Size (diameter at breast height, inches)[1]	CWHR Density (canopy closure)[2]	CWHR Acres in the Project Area
Conifer Forest[1]			
Jeffrey Pine	6–11	40–59	9.3
Jeffrey Pine	6–11	25–39	0.9
Jeffrey Pine	11–24	60–100	0.6
Jeffrey Pine	11–24	40–59	785.8
Jeffrey Pine	11–24	25–39	183.8
Jeffrey Pine	11–24	10–24	1.3
Jeffrey Pine	> 24	40–59	8.9
Lodgepole Pine	6–11	40–59	5.0
Lodgepole Pine	11–24	60–100	7.2
Lodgepole Pine	11–24	40–59	250.6
Lodgepole Pine	11–24	25–39	11.1
Lodgepole Pine	> 24	60–100	0.6
Lodgepole Pine	> 24	40–59	3.6
Red Fir	11–24	60–100	15.1
Red Fir	11–24	40–59	64.4
Red Fir	11–24	25–39	2.7
Red Fir	11–24	10–24	0.7
Subalpine Conifer	11–24	40–59	0.2
Sierran Mixed Conifer	6–11	40–59	3.2
Sierran Mixed Conifer	6–11	25–39	0.7
Sierran Mixed Conifer	11–24	60–100	4.0
Sierran Mixed Conifer	11–24	40–59	1095.0
Sierran Mixed Conifer	11–24	25–39	232.2
Sierran Mixed Conifer	> 24	40–59	22.3
Other Vegetation Types			
Aspen	11–24	60–100	1.2
Barren			0.8
Lacustrine			2.1
Montane chaparral			220.3
Montane riparian			1.3
Montane hardwoods			9.1
Perennial grass			59.5
Sagebrush			0.1
Urban			61.3
Wet Meadow			4.6

[1] Tree size class: 1 = < 1-inch dbh; 2 = 1- to 6-inch dbh; 3 = 6- to 11-inch dbh; 4 = 11- to 24-inch dbh; 5 = > 24-inch dbh;
6 = size 5 over size 4 or 3, with total tree crown closure greater than 60%.
[2] Canopy closure class: S (sparse) = 10%–24%; P (open) = 25%–39%; M (moderate) = 40%–59%; and D (dense) = 60%–100%.

ANGORA FIRE RESTORATION PROJECT

Figure 3.6-1

Lake Tahoe Basin Management Unit



Legend

Angora Fire Restoration Project

Non-treated Stands

- 994
- 995
- 996
- 997
- 998
- 999

N

0 0.25 0.5 1 Miles

Source: USFS & ESRI USA Imagery (07-15-05; 0.5m)

Table 3.6-2. Pre-Fire CWHR Habitat Types in and within 0.5 Mile of the Angora Project Area (Project Record Document E65)

CWHR Habitat Type	CWHR Size (diameter at breast height, inches)[1]	CWHR Density (% canopy closure)[2]	CWHR Acres in and within 0.5 mile of the Project Area
Conifer Forest			
Jeffrey Pine	6–11	60–100	4.3
Jeffrey Pine	6–11	40–59	21.4
Jeffrey Pine	6–11	25–39	0.9
Jeffrey Pine	11–24	60–100	12.2
Jeffrey Pine	11–24	40–59	2080.4
Jeffrey Pine	11–24	25–39	354.2
Jeffrey Pine	11–24	10–24	12.3
Jeffrey Pine	> 24	60–100	19.4
Jeffrey Pine	> 24	40–59	259.3
Jeffrey Pine	> 24	25–39	0.6
Lodgepole Pine	6–11	40–59	19.4
Lodgepole Pine	6–11	25–39	0.9
Lodgepole Pine	11–24	60–100	7.3
Lodgepole Pine	11–24	40–59	393.2
Lodgepole Pine	11–24	25–39	28.2
Lodgepole Pine	> 24	60–100	32.5
Lodgepole Pine	> 24	40–59	27.2
Red Fir	6–11	10–24	2.2
Red Fir	11–24	60–100	24.4
Red Fir	11–24	40–59	69.5
Red Fir	11–24	25–39	62.1
Red Fir	11–24	10–24	16.7
Red Fir	> 24	25–39	1.8
Subalpine Conifer	11–24	40–59	7.3
Subalpine Conifer	11–24	25–39	2.4
Sierran Mixed Conifer	6–11	40–59	17.0
Sierran Mixed Conifer	6–11	25–39	11.0
Sierran Mixed Conifer	6–11	10–24	13.3
Sierran Mixed Conifer	11–24	60–100	15.7
Sierran Mixed Conifer	11–24	40–59	1666.0
Sierran Mixed Conifer	11–24	25–39	427.0
Sierran Mixed Conifer	11–24	10–24	7.6
Sierran Mixed Conifer	> 24	60–100	2.9
Sierran Mixed Conifer	> 24	40–59	359.0
Sierran Mixed Conifer	> 24	25–39	13.3

CWHR Habitat Type	CWHR Size (diameter at breast height, inches)[1]	CWHR Density (% canopy closure)[2]	CWHR Acres in and within 0.5 mile of the Project Area
Other Vegetation Types			
Aspen	6–11	60–100	0.6
Aspen	6–11	40–59	0.1
Aspen	11–24	60–100	1.5
Barren			100.2
Lacustrine			115.2
Montane chaparral			838.4
Montane riparian			3.8
Montane hardwoods			9.1
Perennial grass			262.6
Riverine			5.1
Sagebrush			0.09
Urban			319.3
Wet Meadow			77.2

[1] Tree size class: 1 = < 1-inch dbh; 2 = 1- to 6-inch dbh; 3 = 6- to 11-inch dbh; 4 = 11- to 24-inch dbh; 5 = > 24-inch dbh;
6 = size 5 over size 4 or 3, with total tree crown closure greater than 60%.
[2] Canopy closure class: S (sparse) = 10%–24%; P (open) = 25%–39%; M (moderate) = 40%–59%; and D (dense) = 60%–100%.

The Angora Fire killed thousands of trees and created a mosaic of dead and live trees. Approximately 60% of the Angora Fire area burned at high vegetation severity (see Table 3.6-3). Areas of moderate and high fire intensity and severity have significant tree mortality caused by the fire burning through heavy surface fuels and the crowns of trees. The CWHR types affected by the different fire regime severities are depicted in Table 3.6-4.

In the areas of high vegetation burn severity and much of the areas that burned at moderate severity, the overall fuel loading is now very low (average of less than 7 tons per acre). However, as dead trees fall, over time surface fuels would increase. This, in combination with surface grass, forb, and shrub growth, would contribute to the potential for future high fire severity and would affect future fire behavior and suppression capabilities. Because of ongoing drought, many trees within moderately burned stands are expected to succumb to insect-related mortality over the next three to five years.

Table 3.6-3. Vegetation Burn Severity Categories Used in the Angora Project Area

Category	Definition	Description of Tree Mortality	Approximate Number of Acres in Project Area
1	Low vegetation burn severity	Less than 25% of the forest stand, as measured by basal area, killed by the fire	600
2	Moderate vegetation burn severity	Between 25% and 75% of the forest stand, as measured by basal area, killed by the fire	600
3	High vegetation burn severity	More than 75% of the forest stand, as measured by basal area, killed by the fire	1,800

Table 3.6-4. CWHR Seral Stages of the Angora Project Affected by the Angora Fire

CWHR Type	CWHR Size	CWHR Density	Area (acres)	High Burn Severity (acres)	Moderate Burn Severity (acres)	Low Burn Severity (acres)
ASP	4	D	1.3	1.3	0	0
BAR			0.8	0	0.80	0
JPN	3	M	9.3	0.5	2.8	6
JPN	3	P	0.9	0	0.91	0
JPN	4	D	0.6	0	0	0.6
JPN	4	M	785.8	197.6	373.1	215.1
JPN	4	P	183.8	27.1	72.2	84.6
JPN	4	S	1.3	0	1.31	0
JPN	5	M	8.9	0	3.1	5.8
LAC			2.1	0	0	2.1
LPN	3	M	5.0	2.4	2.6	0
LPN	4	D	7.3	4.4	0.8	2.0
LPN	4	M	250.7	71.7	126.7	52.2
LPN	4	P	11.1	0.1	8.2	2.9
LPN	5	D	0.6	0	0.6	0
LPN	5	M	3.7	0	3.7	0
MCP			220.3	13.8	98.7	107.7
MHC	4	P	9.1	0	0.4	8.7
MRI			1.3	0	0	1.3
PGS			59.5	5.5	24.0	29.9
RFR	4	D	15.2	12.2	0.7	2.2
RFR	4	M	64.4	41.7	21.2	1.6
RFR	4	P	2.7	2.7	0.1	0
RFR	4	S	0.7	0	0	0.7
SCN	4	M	0.2	0	0	0.2
SGB			0.1	0	0.1	0

CWHR Type	CWHR Size	CWHR Density	Area (acres)	High Burn Severity (acres)	Moderate Burn Severity (acres)	Low Burn Severity (acres)
SMC	3	M	3.2	0	1.0	2.3
SMC	3	P	0.7	0	0	0.7
SMC	4	D	4.1	0	0	4.1
SMC	4	M	1094.9	596.4	388.2	110.4
SMC	4	P	232.2	76.4	106.3	49.5
SMC	5	M	22.3	2.9	13.0	6.5
URB			61.3	0.5	38.9	21.8
WTM			4.6	0.5	2.8	1.3

The fire removed approximately 1,921 acres of habitat that was previously suitable for foraging (CWHR types 4-5, M and D) for the California spotted owl, northern goshawk, and American marten (Table 3.6-5).

Table 3.6-5. CWHR Seral Stages of the Angora Project Prior to and Following the Fire

CWHR Type	Pre-fire (acres)	Post-fire (acres)
4M	2196	176.5
4D	28.7	10
5S	0	22.2
5P	0	102.3
5M	34.8	27.7
5D	0.6	0
Total	2260.1	338.7

Current conditions in the 2,738 Forest Service acres were determined based on several criteria. Stand exam data are available for the 12 stands that would be treated via aerial or ground treatment. Table 3.6-6 shows the predicted effects of Alternatives 1 and 2 post-project and 20 years in the future.

Table 3.6-6. CWHR Seral Stages of the Angora Project in the 12 Treatment Stands

Treatment Stand Number	Total acres	Current (post-fire) CWHR Type	Post-Treatment (Alternative 1, No-Action Alternative)	Post-Treatment (Alternative 2)	No Treatment, (Alternative 1, No-Action Alternative) 20 years in the future	Post-Treatment (Alternative 2) 20 years in the future
1	132	SMC4S	SMC4S	SMC4S	4P	SMC5S
2	147	Barren	Barren	Barren	Barren	2S
3	72	Barren	Barren	Barren	Barren	Still barren, less than 10% cover

Treatment Stand Number	Total acres	Current (post-fire) CWHR Type	Post-Treatment (Alternative 1, No-Action Alternative)	Post-Treatment (Alternative 2)	No Treatment, (Alternative 1, No-Action Alternative) 20 years in the future	Post-Treatment (Alternative 2) 20 years in the future
4	15	JPN4M	JPN4M	JPN5P	4M	JPN5P
5	269	JPN4P	JPN4P	JPN4P	4P	JPN5P
6	72	SMC4S	SMC4S	SMC4S	5S	SMC5S
7	67	SMC4S	SMC4S	SMC4S	4P	SMC5P
8	60	Barren	Barren	Barren	Barren	SMC5S
9	38	JPN5P	JPN5P	JPN5P	5P	JPN5P
11	170	Barren	Barren	Barren	Barren	JPN2S – no trees over 10-inch dbh (all planted trees)
12	356	SMC4S	SMC4S	SMC4S	4P	SMC4S
13	143	Barren	Barren	Barren	Barren	JPN2S – no trees over 10-inch dbh (all planted trees)
Total	1,541					

To quantify the habitat conditions of the entire burned area, stand numbers were assigned to areas not proposed for any fuel reduction treatment. The following assumptions were made for untreated areas:

1. Areas of high severity burn have no remaining canopy cover and are classified CWHR barren. In 20 years, these areas would remain barren with only brush and small conifers regenerating (i.e., shrub).
2. Areas of moderate burn severity drop down one canopy class, thus pre-fire class D is now class M, pre-fire class M is now class P, and pre-fire class P is now class S. The one exception is pre-fire class S, which remains the same. Because there is no information on growth rates, mortality rates, etc., it is assumed that in 20 years, stands would not grow enough to move into the next size or density classes. Therefore, there would be no change in CWHR classifications in 20 years.
3. Areas of low burn severity are classified the same as they were for pre-fire conditions. Because there is no information on growth rates, mortality rates, etc., it is assumed that in 20 years, stands would not grow enough to move into the next size or density classes. Therefore, there would be no change in CWHR classifications in 20 years.

Estimated conditions for the untreated areas are depicted in Table 3.6-7.

Table 3.6-7. Current (post-fire) Estimated CWHR Seral Stages of the Angora Project in the Non-Treatment Stands

Stand Number	Current (post-fire) CWHR Type	Burn Severity	Acres	Projected CWHR 20 years in the Future
994	JPN4P	Moderate	4.00	JPN4P
994	JPN4P	Low	17.15	JPN4P
994	JPN4S	Moderate	17.81	JPN4S
994	MCP	Moderate	4.52	MCP
994	SGB	Low	3.95	SGB
994	SMC4P	Moderate	1.22	SMC4P
994	WTM	Low	12.51	WTM
994	WTM	Moderate	1.23	WTM
995	JPN4P	Low	6.55	JPN4P
995	MCP	Low	2.51	MCP
995	SGB	Low	3.08	SGB
995	SGB	Moderate	8.73	SGB
995	WTM	Low	2.85	WTM
995	WTM	Moderate	2.26	WTM
996	JPN4M	Low	1.97	JPN4M
996	JPN4P	Low	1.69	JPN4P
996	JPN4S	Low	6.51	JPN4S
996	MCP	Low	11.66	MCP
996	MCP	Moderate	1.37	MCP
997	JPN4P	Low	16.00	JPN4P
997	JPN4S	Moderate	2.62	JPN4S
997	Barren	High	16.19	MCP
997	JPN4P	Low	11.90	JPN4P
997	JPN4S	Moderate	19.01	JPN4S
997	Barren	High	1.85	MCP
997	Barren	High	1.87	MCP
997	JPN4S	Low	1.17	JPN4S
997	JPN4S	Moderate	3.04	JPN4S
997	JPN4S	Moderate	17.72	JPN4S
997	Barren	High	3.21	MCP
997	MCP	Low	7.10	MCP
997	MCP	Moderate	22.68	MCP
997	Barren	High	12.55	MCP
997	SMC4M	Low	3.77	SMC4M
997	SMC4P	Moderate	20.55	SMC4P
997	SMC4S	Moderate	17.43	SMC4S
997	Barren	High	1.20	MCP
997	SMC5M	Low	22.49	SMC5M
997	SMC5P	Moderate	44.91	SMC5P

Stand Number	Current (post-fire) CWHR Type	Burn Severity	Acres	Projected CWHR 20 years in the Future
997	SMC5P	Low	4.96	SMC5P
997	SMC5S	Moderate	1.56	SMC5S
998	SMC4P	Low	4.73	SMC4P
998	SMC4P	Moderate	29.73	SMC4P
998	WTM	Low	4.89	WTM
998	WTM	Moderate	2.18	WTM
998	JPN4M	Low	24.88	JPN4M
998	JPN4P	Low	25.86	JPN4P
998	JPN4P	Moderate	4.39	JPN4P
998	SMC4M	Low	4.70	SMC4M
998	SMC4M	Moderate	4.08	SMC4M
998	MCP	Low	25.72	MCP
998	MCP	Moderate	13.87	MCP
998	LPN4M	Low	2.46	LPN4M
998	JPN4S	Low	1.90	JPN4S
998	JPN4S	Moderate	5.17	JPN4S
998	LPN4P	Low	16.11	LPN4P
998	LPN4P	Moderate	6.94	LPN4P
998	SMC5S	Moderate	15.51	SMC5S
999	LPN4M	Low	14.62	LPN4M
999	LPN4P	Moderate	8.37	LPN4M
999	Barren	High	19.36	MCP
999	MCP	Low	63.60	MCP
999	MCP	Moderate	39.35	MCP
999	Barren	High	38.20	MCP
999	SMC4D	Low	10.01	SMC4D
999	SMC4M	Moderate	23.34	SMC4M
999	Barren	High	167.43	MCP
999	SMC4M	Low	47.82	SMC4M
999	SMC4P	Moderate	98.92	SMC4P
999	Barren	High	7.78	MCP
999	SMC4P	Low	19.14	SMC4P
999	SMC4S	Moderate	1.02	SMC4S
999	Barren	High	5.61	MCP
999	SMC4S	Low	33.94	SMC4S
999	SMC4S	Moderate	13.61	SMC4S
999	SMC5M	Low	5.46	SMC5M
999	SMC5P	Moderate	12.44	SMC5P
999	SMC5P	Low	2.05	SMC5P
999	SMC5S	Moderate	5.10	SMC5S
TOTAL			1195.63	

Table 3.6-8 shows a breakdown of the current CWHR mid- to late-successional forest stands within the treatment areas compared to the non-treatment areas.

Table 3.6-8. Current CWHR Seral Stages of the Angora Project in the Treated and Untreated Stands

CWHR Type	Total Acres for 12 Treatment Stands	Total Acres outside of Treatment Stands	Total Acres
4S	627	200	827
4P	269	296	565
4M	15	168	183
4D	0	10	10
5P	38	0	38
Total	949	674	1623

* Total is less than 1,196 acres of non-treatment stands as only forested habitat is included.

3.6.3 Threatened, Endangered and Sensitive Species

Species Addressed

Potentially affected species were determined through an evaluation of whether each threatened, endangered, or sensitive (TES) species was either 1) known to occur in the project area or 2) the project area contained suitable habitat within the current range of the species. Resources used to determine whether each species was known to occur in the project area included:

- LTBMU wildlife program survey records, and
- Wildlife program corporate GIS layers/Atlas (for LTBMU TES species).

Resources used to determine whether the project area contained suitable habitat within the current range of the species, and to assist in effects analysis (e.g., determining important life history characteristics and important habitat elements for various life history stages, etc) included:

- CHWR (v8.1),
  - Habitat suitability models,
  - Species life history accounts,
  - Important habitat elements;
- Life history species accounts (Project Record Document E66);
- Region 5 TES species protocols; and
- CALVEG habitat GIS data layers (e.g., Eveg).

The following table (Table 3.6-9) summarizes species considered in the effects analysis for the Angora Project as part of the biological assessment and biological evaluation. There is no proposed or designated Critical Habitat for any species on the LTBMU.

Table 3.6-9. Threatened, Endangered, and Sensitive Species (considered for effects analysis as part of the biological assessment and biological evaluation portion of this document. Potentially affected species are defined as species either known to occur or that have suitable habitat in the project area.)

Species	Special Status	Known to Occur in the Project Area	Suitable Habitat in the Project Area
Birds			
Bald Eagle (*Haliaeetus leucocephalus*)	Forest Sensitive Species	N	Y
California Spotted Owl (*Strix occidentalis occidentalis*)	Forest Sensitive Species	N	Y
Northern Goshawk (*Accipiter gentiles*)	Forest Sensitive Species	Y	Y
Willow Flycatcher (*Empidonax traillii adastus*)	Forest Sensitive Species	N	Y
Great Gray Owl (*Strix nebulosa*)	Forest Sensitive Species	N	N
Mammals			
Sierra Nevada red fox (*Vulpes vulpes necator*)	Forest Sensitive Species	N	N
American marten (*Martes americana*)	Forest Sensitive Species	N	Y
Pacific fisher (*Martes pennanti*)	Federal Candidate Species	N	N
California wolverine (*Gulo gulo luteus*)	Forest Sensitive Species	N	N
Townsend's big-eared bat (*Corynorhinus townsendii*)	Forest Sensitive Species	N	Y
Amphibians			
Sierra Nevada (mountain) yellow-legged frog (*Rana sierrae*)	Forest Sensitive Species	N	N
Northern leopard frog (*Rana pipiens*)	Forest Sensitive Species	N	N
Yosemite toad (*Bufo canorus*)	Candidate	N	N
Fish			
Lahontan cutthroat trout (*Oncorhynchus clarkii henshawi*)	Federally Threatened	N	N
Lahontan Lake tui chub (*Gila bicolor pectinifer)*	Forest Sensitive Species	N	N
Delta Smelt (*Hypomesus transpacificus*)	Federally Threatened	N	N
Central Valley Steelhead (*Oncorhynchus mykiss)*	Federally Threatened	N	N

Species	Special Status	Known to Occur in the Project Area	Suitable Habitat in the Project Area
Invertebrates			
Great Basin rams-horn *(Helisoma newberryi newberryi*)	Forest Sensitive Species	N	N

Instead of an alternative-by-alternative discussion, both the proposed action and the no-action alternative are included in each separate species account.

Analysis Method

The project area is defined as the area where the proposed action alternative (Alternative 2) would occur and encompasses the Angora fire burn perimeter for the purposes of this EA. The analysis area for the Angora Project includes the project area and a 0.5-mile radius around the project area boundary. The 0.5-mile radius was used because (1) TRPA enforces a Limited Operating Period (LOP) of a 0.5-mile radius around active goshawk nests (TRPA 2002 as cited in Project Record Document E64); (2) relevant cumulative effects, particularly other projects that would treat burned habitat from the Angora fire are more effectively addressed; and (3) impacts on habitat as a result of the Angora fire and the effects from cumulative actions within this burned landscape are not diluted by expanding the analysis area boundary to include larger parcels of unburned habitat outside the wildfire boundary. The analysis area includes locations that would be indirectly affected by the proposed action, such as tree removal, access roads, and staging areas, as well as areas where indirect impacts from these actions could occur on affected species. The cumulative effects analysis was bounded in time to 20 years in the future for foreseeable future actions. This approximates the time frame over which conditions due to the proposed action could be reasonably estimated.

Direct and Indirect Effects Analysis: Direct effects are defined as physical injury or death, and the effects of activity-related disturbance upon reproduction, behavior, and movement. Direct effects are impacts that occur at the same time and place as the proposed action. Indirect effects result from vegetation management affecting the quantity, quality, and distribution of habitats. These indirect effects include changes in habitat, how the habitat is used (for breeding, foraging, or shelter), when it is used, and the extent of the changes in proportion to the amount of unaltered habitat. Indirect effects are impacts that occur at a later time or at a distance from the proposed action.

For analysis of direct and indirect effects on individuals, the species' life history information, necessary habitat elements (e.g., snags), the spatial and temporal scale of potential impacts, and vegetation structure and composition important for various life history stages (e.g., suitable habitat), were considered.

Suitable habitat affected by the proposed actions within the analysis area were derived from remotely sensed vegetation data and California Wildlife Habitat Relationship system (CWHR v. 8.1) models for moderate to highly suitable reproductive and foraging habitat. However, because habitat models do not include impacts from human disturbance to habitat quality, the estimates of suitable habitat could be overestimated.

The pre-fire and post-fire vegetation conditions and the changes that would likely occur as a result of the proposed action alternative are quantified using the CWHR. The CWHR describes vegetation conditions through metrics such as tree size classes and canopy closure and functions as a predictive model of habitat suitability for wildlife species.

The CWHR does not provide a useful estimate of habitat suitability for all wildlife species (e.g., Townsend's big-eared bat). In such cases, the method of estimating existing habitat and changes to the habitat that could occur as a result of the proposed alternatives follows the approach used in the South Shore Project.

The direct and indirect effects of the Angora Project to terrestrial and aquatic wildlife species are bounded in space by a 0.5-mile radius around the project area. This radius complies with TRPAs 0.5-mile radius no disturbance zone for northern goshawk nests. It is also based on anticipated noise disturbance to potentially affected species from project activities, such as dead and live tree removal and trucks hauling material.

Cumulative Effects Analysis: Cumulative effects are environmental impacts that result from this project and other past, present, and reasonably foreseeable future projects in the same geographic area. For the Angora Project, the cumulative effects analysis was bounded in space by a 0.5-mile radius around the project area. This area is large enough to encompass the territory size of the wildlife species of concern that could occur in the project area (e.g., northern goshawk). The cumulative effects analysis was bounded in time to 20 years in the future for foreseeable future actions. This approximates the time frame over which conditions due to the proposed action could be reasonably estimated. The following project is considered in the species specific cumulative effects analyses.

The Lake Tahoe Basin Management Unit proposes to implement the South Shore Project (Project Record Document E67) using funds from the Sierra Nevada Public Lands Management Act (SNPLMA). This project is adjacent to and encompasses a portion of the Angora Project Area. The South Shore Project proposes vegetation and fuel treatments that would reduce stand densities to improve forest health, reduce fire hazard from existing fuels, and modify fire behavior to provide defensible space for adjoining private lands. Treatment options would include ground based mechanical treatments wherever slope and road access allow and hand treatments where slope would not permit mechanical equipment or no road exists. Phases of this project could occur concurrently with the Angora Project.

Species Accounts and Effects

This section summarizes life history information, necessary habitat elements (e.g., snags), vegetation structure and composition important for various life history stages (e.g., habitat suitability), and occurrence records for each potentially affected species. Extensive detail on life history can be found in the Sierra Nevada Forest Plan Amendment Final Environmental Impact Statement (January 12, 2001) and Sierra Nevada Forest Plan Amendment Record of Decision and Final Supplemental Environmental Impact Statement (Project Record Document E8). This section then documents the direct, indirect, and cumulative effects from the proposed action on each potentially affected species.

Birds

Bald Eagle

Habitat consists of mature coniferous forests with the presence of dominant and co-dominant trees (defined as trees taller and with a greater circumference of the upper canopy relative to the surrounding stand) in close proximity to large bodies of water (Project Record Document E68). Bald eagle nests are usually located in uneven-aged (multi-storied) stands with old growth components. Trees selected for nesting are characteristically one of the largest in the stand or at least co-dominant with the overstory (Project Record Document E69). Nests are typically constructed in large, dominant live trees with open branch work. The massive stick platform nests are added to annually. Nests are usually situated at or just below the tree canopy in forested areas. Breeding is initiated in January via courtship, pair bonding, and territory establishment. Incubation may begin in late February to mid-March, with the nestling period extending to the end of June. Fledglings typically leave the immediate nest site in late August.

Tree perches selected by eagles typically provide a good view of the surrounding area (Project Record Document E70). Bald eagles typically perch in large, robustly limbed trees, on snags, on broken topped trees, or on rocks near water (Project Record Documents E71 and E80). Nesting territories often contain trees with exposed lateral limbs, trees with dead tops, or snags, which are used for perching or as access points to the nest.

The Pacific Bald Eagle Recovery Plan identifies four nesting territories in the Lake Tahoe Basin, three of which are targeted for the California side of Lake Tahoe (Project Record Document E70). Bald eagles historically nested in the Lake Tahoe Basin (Project Record Document E73). However, between 1971 and 1995, no confirmed nesting pairs were sighted. Since 1996, bald eagles have nested with varying degrees of success in the Lake Tahoe Basin. At least two nest sites currently exist. The nests are situated in dominant live coniferous trees in close proximity to open water (< 200m) and at a considerable distance from developed shoreline (> 4.5 km).

The Tahoe Basin contains wintering habitat for bald eagles, consisting of mid to late successional stages of montane riparian and mixed conifer forest (Project Record Document E74). Sighting records indicate that the Lake Tahoe Basin is used year-round by bald eagles. However, use occurs primarily during fall and winter months when kokanee salmon (*Oncorhynchus nerka*) spawn. Bald eagle activity in the Lake Tahoe Basin typically declines during summer as individual winter resident eagles disperse or migrate to more productive summer breeding and foraging grounds (Project Record Document E75).

CWHR Types

High capability nesting habitat includes Eastside Pine (5S, 5P, and 5D), Sierran Mixed Conifer (5S, 5P, 5D, and 6), and White Fir (5S, 5P, 5D, and 6). Moderate capability nesting habitat includes Sierran Mixed Conifer (all strata in size classes 1 through 3) and White Fir (all strata in size classes 1 through 3). Bald eagles use the Jeffrey Pine vegetation type for nesting in the Lake Tahoe basin even though the CWHR model predicts that this vegetation type provides low nesting capability. Therefore, the Jeffrey Pine vegetation type is considered high capability (5S, 5P, and 6) and moderate capability (4S, 4P, and 4D) nesting habitat for this analysis. Moderate to high capability nesting habitat types are located within one mile of open water.

High capability perching habitat includes Eastside Pine (5S, 5P, 5M, and 5D), Sierran Mixed Conifer (5S, 5P, and 5M), and White Fir (5S, 5P, and 5M). Moderate capability perching habitats include Eastside Pine (4S, 4P, and 4M), Montane Hardwood-Conifer (5S, 5P, and 5M), Sierran Mixed Conifer (all strata in size classes 1 through 3; and 5D and 6), and White Fir (all strata in size classes 1 through 3; and 5D and 6). Bald eagles use the Jeffrey Pine vegetation type for perching in the Lake Tahoe basin even though the CWHR model predicts that this vegetation type provides low perching capability. Therefore, the Jeffrey Pine vegetation type would be considered high capability (5S, 5P, 5M, and 6) and moderate capability (4S, 4P, and 4M) perching habitat for this analysis. Moderate to high capability perching habitat types are located within 0.25 mile of open water.

High capability foraging habitat includes Lacustrine (all strata except size class 3), Riverine (all strata except size class 3), Sierran Mixed Conifer (5S, 5P, and 5M), and White Fir (5S, 5P, and 5M). Moderate capability foraging habitats include Eastside Pine (all strata except 2D, 3D, 4D, and 5D), Fresh Emergent Wetland (all strata), Montane Hardwood-Conifer (all except 5D and 6), Montane Riparian (all strata except 2D, 3D, 4D, 5D, and 6), Sierran Mixed Conifer (all strata except 5S, 5P, and 5M), Wet Meadow (all strata), and White Fir (all strata except 5S, 5P, and 5M).

Bald eagles use the Jeffrey Pine vegetation type for foraging in the Lake Tahoe basin even though the CWHR model predicts that this vegetation type provides low foraging capability. Therefore, the Jeffrey Pine vegetation type would be considered high capability (5S, 5P, 5M, and 6) and moderate capability (4S, 4P, and 4M) foraging habitat for this analysis. Moderate to high capability foraging habitats are located within 0.25 mile of open water.

Pre-fire, less than 7% of the project area provided moderate nesting habitat (no high capability nesting habitat is present in the project area). Overall, the fire reduced suitable bald eagle nesting habitat by approximately 11% (Table 3.6-10). No perching or foraging habitat was present as the project area is located more than 0.25 mile from any open water (i.e., Lake Tahoe, Fallen Leaf Lake).

Table 3.6-10. Effect of the Angora Fire on Suitable Bald Eagle Habitat within the Project Area

Habitat Capability	Pre-fire Acres	Post-fire Acres	Reduction in Suitable Habitat (%)
High and Moderate Nesting Habitat	188	167	11%
High and Moderate Perching Habitat	0	0	0
High and Moderate Foraging Habitat	0	0	0

Occurrence in Project Area

Bald eagles are known to fly over the Lake Tahoe shore, which is approximately 0.5 miles north of the project area during the fall, winter, and spring months. No bald eagle nests are documented in or near the project area. The closest bald eagle nesting areas are approximately 2.5 miles northwest at Emerald Bay and 17 miles northeast at Marlette Lake. During summer, bald eagles are typically observed near these two locations. There are no known communal or winter roost sites in or near the project area. Due to the Angora fire, the potential for bald eagles to occur in or near the project area is very low. Dispersing individuals or latitudinal migrants could pass through the project area. However, bald eagles have not been recorded in the project area (Project Record Document E76).

Alternative 1 (No-Action Alternative)

Direct and Indirect Effects

There would be no change in the amount of existing suitable bald eagle habitat. Potential project-related disturbance to breeding bald eagles would not occur. With the exception of the hazard tree removal and mitigation along 256 acres of roads and trails, which began in December 2008 and is scheduled for completion in December 2009, the project area would retain all live and dead trees that currently exist within the fire perimeter.

The removal of dead trees to reduce long-term fuel loading and to reduce future fire severity would not occur. Reducing tree density by thinning live trees to increase the resiliency of the remaining live trees to insects and disease would not occur. The opportunity to increase the survival, growth, and vigor of the remaining live trees through less competition for water and nutrients would not occur. The area would not be reforested to expedite stand conditions to those that are fairly open and dominated by larger, fire-tolerant trees such as Jeffrey pine and sugar pine, which are resistant and resilient to fire, drought, and insect outbreak, Removal of some of the standing dead trees would not occur. These trees would fall and contribute to high fuel loads in about five to 10 years.

The conditions that could cause another stand-replacing fire would not be reduced. Over time, the excessive large woody debris and overall high fuel loads would increase the probability of future wildland fires that burn at high severity and provide conditions that make suppression of wildfires more difficult and ultimately increase the fire size. A high severity fire would impact developing bald eagle habitat and increase the risk of fire adversely affecting adjacent bald eagle habitat. While there are consequences of inaction, Alternative 1 would not affect bald eagles or their habitat. No direct or indirect effects would occur as a result of Alternative 1.

Cumulative Effects

Alternative 1 (No-Action Alternative): No direct or indirect effects would occur; therefore, no cumulative effects would occur.

Alternative 2 (Proposed Action)

Direct and Indirect Effects

Disturbance to bald eagles is most critical during nest building, courtship, egg laying and incubation (Project Record Document E77). If bald eagles nest in or near the project area during implementation, project activities could disturb them and cause nest failure. No direct effects on potential nesting bald eagles or their habitat are expected as there are no historic or recent records of bald eagles nesting in or within 0.5 mile of the project area. In addition, the already small amount of suitable nesting habitat within the project area was further reduced by 11% due to the Angora fire. Agencies within the Lake Tahoe basin (e.g., LTBMU, and TRPA) conduct annual bald eagle nesting surveys and would be expected to detect any nesting eagles within the project area. No disturbance to bald eagle breeding activities and habitat would occur because a LOP from March 1 to August 31 would be applied within 0.5 mile of any active nest.

Approximately 95 acres of moderate capability nesting habitat is located in the 12 treatment stands. While live and dead tree removal would occur in this suitable habitat, the post treatment conditions would still be classified as suitable habitat (e.g., JPN 4M to JPN 4S). Seventy-two acres of moderate capability nesting habitat is located outside of the treatment stands and would not be affected by Alternative 2. Thus the quantity and distribution of suitable bald eagle habitat would not be altered by any of the project activities.

Numerous studies have documented that bald eagles avoid or are adversely affected by human disturbance (Project Record Documents E78–82). Grubb et al. (Project Record Document E80) found that eagles are disturbed by most activities that occur within 1500 feet. Activities that occur within 600 feet cause eagles to take flight. Bald eagles are disturbed differently depending on the kind of disturbance, the noise that it creates, the length of time that it lasts, and its location. Eagles are more disturbed as noise levels increase, the source of the disturbance gets closer, and by unusual disturbances not normally occurring in a particular area. Among aircraft, helicopters elicited the highest disturbance response from eagles, frequently causing them to fly. Grubb and King (Project Record Document E82) recommend permitting only short duration flights within 3600 feet of a nest, and they found that a greater frequency of disturbances appeared to have a greater effect on breeding eagles. Position is also important, with activities located above an eagle being more disturbing than below.

Table 3.6-11. Estimated Amount of Acres of High- and Moderate-Capability Bald Eagle Nesting, Perching, and Foraging Habitat within the Angora Project Area before and after Implementation of Alternative 1 and Alternative 2

	Nesting Habitat		Perching Habitat		Foraging Habitat	
	Before After	Change	Before After	Change	Before After	Change
Alternative 1 (No-Action)	167 167	0	0 0	0	0 0	0
Alternative 2 (Proposed Action)	167 167	0	0 0	0	0 0	0

Due to the lack of documented nesting, breeding bald eagles are unlikely to experience these disturbance effects. However, individual bald eagles could experience temporary auditory and/or visual disturbance if they perch in or near the project area or fly over or near the project area during project activities. These impacts would persist as long as project actions are taking place at a given location. Because project activities are scheduled to occur over numerous years, this seasonal disturbance could extend the period of time that bald eagles might avoid a given location within the project area. Once project actions are completed, any bald eagles could return.

Cumulative Effects

Alternative 2 (Proposed Action): The proposed action, when combined with past, present, and reasonably foreseeable future actions is not expected to have a cumulative effect on bald eagles because effects on survival are unlikely and no effects on reproduction are expected to occur. Although there are no records of consistent use of the analysis area by bald eagles, the concurrent implementation of the South Shore Project and Angora Project could contribute to short-term cumulative impacts on bald eagles. In the long-term, habitat suitability would be expected to increase as a result of both projects.

California Spotted Owl

California spotted owl occurs in several forest vegetation types, including mixed conifer, ponderosa pine, red fir and montane hardwood (Project Record Document E105). Suitable habitat for spotted owl nesting and roosting is generally characterized by 1) two or more canopy layers; 2) dominant and codominant trees in the canopy averaging at least 24 inches dbh; 3) at least 70% total canopy cover (including the hardwood component); 4) higher than average levels of very large, old trees; and 5) higher than average levels of snags and downed woody material. High canopy cover and dense forest structure is important for thermal cover during roosting.

In general, stands suitable for spotted owl foraging have 1) at least two canopy layers; 2) dominant and codominant trees in the canopy averaging at least 11 inches dbh; 3) at least 40% canopy cover in overstory trees; and 4) higher than average numbers of snags and downed woody material. Spotted owls forage most frequently in intermediate to late-successional forest with greater than 40% canopy cover and a mixture of tree sizes, including some larger than 24 inches dbh. Although habitat characterized by canopy cover as low as 40% can be suitable for foraging, owls spend disproportionately less time in areas with canopy cover less than 40%. California spotted owl are year-round residents of the Tahoe basin. They are nocturnal, foraging at night, and roosting during the day.

Forest Service management direction for spotted owls directs that a PAC be delineated around 300 acres of the highest quality nesting habitat available. The PAC includes the most recent nest site or activity center within a spotted owl breeding territory (Project Record Document E83). In addition to the PAC, a Home Range Core Area (HRCA) is delineated. The HRCA consists of 1,000 acres, which includes the 300 acre PAC. The HRCA is composed of the best available contiguous habitat. The core area corresponds with 20% of a breeding pair home range plus one standard error. Home ranges vary substantially across the range of this subspecies (though an HRCA is specified as 1,000 acres for the LTBMU).

Home range sizes of California spotted owls tend to be largest in true fir forests in the northern Sierra Nevada (Project Record Document E84). Neal et al. (Project Record Document E85) reported that California spotted owl home ranges in Sierra Nevada mixed conifer forests averaged 3,400 acres, including about 460 acres in stands with 70% or greater canopy cover, and about 1,990 acres in stands with 40 to 69% canopy cover. Verner et al. (Project Record Document E84) generally concur with these data, indicating that Sierra National Forest owls were found to have a median home range for pairs of approximately 3,000 to 5,000 acres. However, Verner et al. (Project Record Document E84) cite an overall mean home range size of owl pairs during the breeding period in Sierran conifer forests of about 4,200 acres. Radio telemetry studies have not been undertaken for California spotted owls in the LTBMU, so more accurate home range information is currently unavailable.

CWHR Types

High-capability nesting habitat includes Montane Hardwood (5D), Red Fir (5D), Montane Hardwood-Conifer (5D and 6), Montane Riparian (5D and 6), Sierran Mixed Conifer (5D and 6), and White Fir (5D and 6). Moderate capability nesting habitat includes Eastside Pine (5D) and Lodgepole Pine (5D).

Within the Lake Tahoe Basin, approximately 80.4% of the forested acres within known spotted owl nest stands are Sierran Mixed Conifer (4M, 4D, and 5M). These vegetation strata are not described as high or moderate capability nesting habitat by CWHR. Within the Lake Tahoe Basin, these stands probably provide the most suitable nesting habitat relative to other available habitats. Because spotted owls successfully reproduce in these stands within the basin, Sierran Mixed Conifer (4M, 4D, and 5M) must provide at least moderate capability nesting habitat. Therefore, in this analysis, Sierran Mixed Conifer (4M, 4D, and 5M) stands are considered moderate capability spotted owl nesting habitat.

High capability roosting habitat includes Red Fir (5M and 5D); Montane Hardwood-Conifer, Sierran Mixed Conifer, and White Fir (5M, 5D, and 6); and Montane Riparian (5D and 6). Moderate capability roosting habitat includes Lodgepole Pine (5M and 5D); Montane Riparian and Red Fir (4M, 4D, 5S, and 5P); and Sierran Mixed Conifer and White Fir (4M and 4D).

High capability foraging habitat includes Red Fir (5M and 5D); Montane Hardwood-Conifer, Sierran Mixed Conifer, and White Fir (5M, 5D, and 6); and Montane Riparian (5D and 6). Moderate capability foraging habitat includes Lodgepole Pine (5M and 5D); Montane Hardwood (4M and 4D); Montane Hardwood-Conifer, Red Fir, Sierran Mixed Conifer, and White Fir (4M, 4D, 5S, and 5P); and Montane Riparian (3M, 3D, 4M, 4D, 5S, 5P, and 5M).

Overall, the fire reduced suitable spotted owl nesting, roosting, and foraging habitat by more than 81% (see Table 3.6-12).

Table 3.6-12. Estimated Amount of Acres Affected by the Angora Fire on Suitable Spotted Owl Habitat within the Project Area

Habitat Capability	Pre-fire Acres	Post-fire Acres	Reduction in Suitable Habitat (%)
High and Moderate Nesting Habitat	1121.3	121.4	89.2%
High and Moderate Roosting Habitat	1182.2	121.4	89.2%
High and Moderate Foraging Habitat	1099	207.9	81.1%

Vegetation severity maps indicate that 89% of the Tahoe Mountain PAC burned at moderate (50–75% basal area killed) to high (>75% basal area killed) severity (see Table 3.6-13).

Table 3.6-13. Burn Severity Effects of the Angora Fire on the Tahoe Mountain Spotted Owl PAC

	Severity		
	High	Low	Moderate
Area (acres)	98	32	170

Occurrence in Project Area

Pre-fire, one spotted owl PAC (Tahoe Mountain) was mapped within the project area. Spotted owls were detected in 1993, 2000, and 2007. The fire made the Tahoe Mountain PAC unsuitable. Direction for evaluating a PAC for retention or removal after a stand replacing event is found on page 37 of the SNFPA 2004 Record of Decision (ROD). The process is as follows:

1. Evaluate habitat conditions within a 1.5-mile radius around existing 300 acre PACs.
    a. If opportunities exist (i.e., suitable habitat remains within a 1.5 mile radius) for re-mapping the PAC, re-map the PAC at a minimum of 300 acres. Based on SNFPA 2004, as well as GTR-133 (Project Record Document E84), the PAC is 300 acres of the best possible owl habitat available, blocked up into as compact a unit as possible around an owl activity center (nest site or best roost or repeated daytime detections). The existing PAC number could be retained or a new PAC number could be established.
    b. If opportunities do not exist (i.e., no suitable habitat remains within a 1.5 mile radius, or 300 acres of contiguous suitable not present, or suitable habitat scattered across the area and not arranged to logically create a compact unit, or an adjacent existing PAC already exists) for re-mapping, the PAC may be removed from the network. A PAC may be removed after rationale has been documented for removal without the need to conduct owl surveys.

This process was conducted for the PAC within the Angora Project. Vegetation burn severity maps were used to evaluate post-fire habitat conditions and a new PAC, called Tahoe Mountain, was delineated. The owl pair was detected immediately after the Angora fire, adjacent to the remapped PAC (Figures 3.6-2 and 3.6-3).

The PAC was surveyed during the 2007–2008 nesting season and will be surveyed during the 2009 nesting season. California spotted owl(s) were not detected during the 2009 survey. The PAC delineation will be re-evaluated based on survey results. If spotted owls are detected the PAC boundary may be adjusted according to management direction for the LTBMU. If spotted owls are not detected and the PAC habitat is determined to be of insufficient quality or quantity, the decision to re-map the land allocation may then be re-evaluated.

The spotted owl PAC and HRCA were remapped with input from:

1. LTBMU Ecosystem Conservation Department biologists, and
2. LTBMU Forest Leadership Team and staff

A detailed description of the methods used to revise and delineate the spotted owl PAC and HRCA is available in the Ecosystem Conservation department files. A geo-database delineating the boundaries of these land allocations will be delivered to our GIS department for inclusion in the LTBMU GIS libraries.

Protocol spotted owl surveys were conducted in 2006–2009 within the project area, as well as 0.5 mile west of the project area. Within the project area, two call points were located in high burn severity, five call points were located within moderate burn severity, and eight call points were located in low burn severity. No owls were detected.

Alternative 1 (No-Action Alternative)

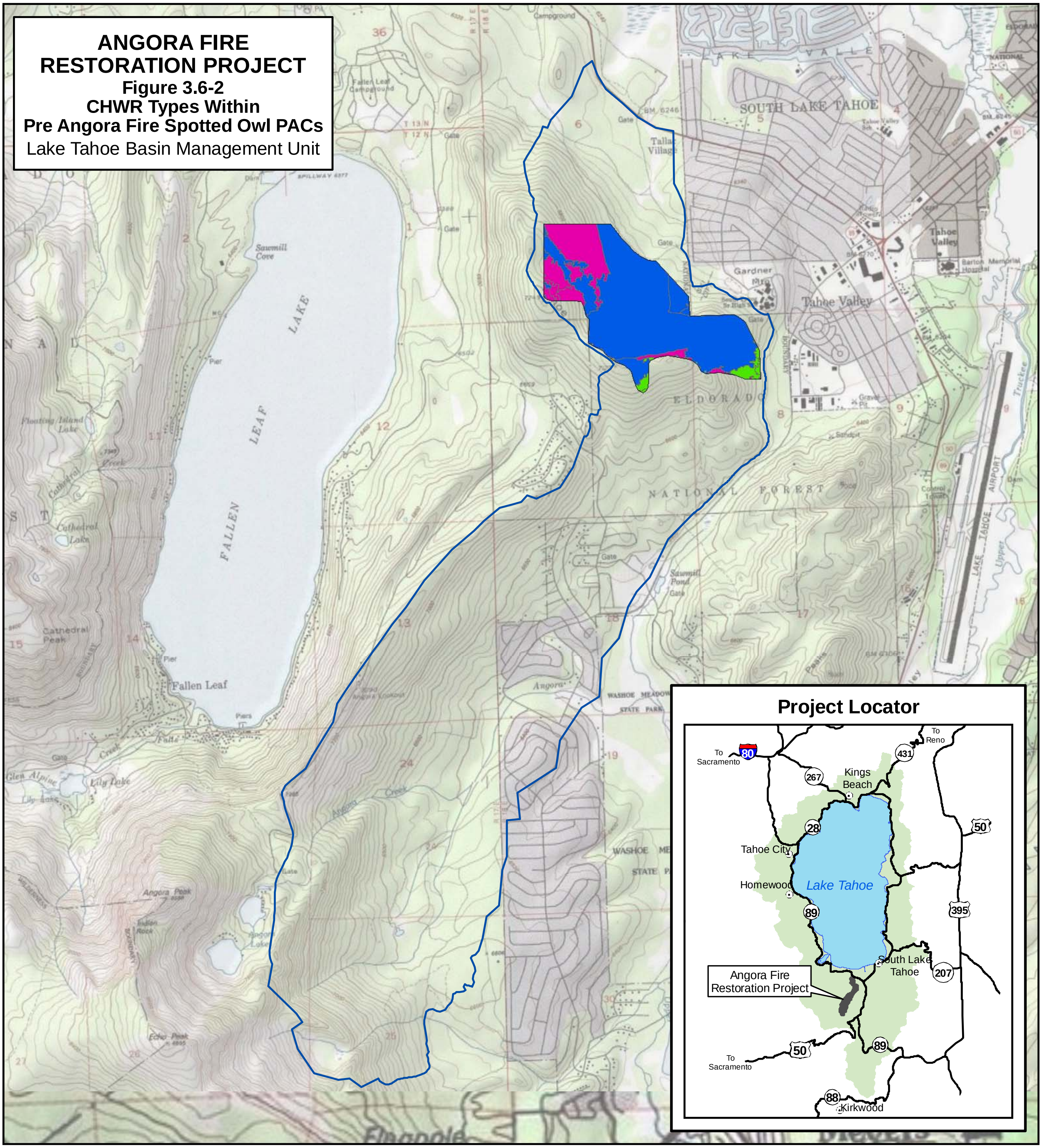
Direct and Indirect Effects

There would be no change in the amount of existing suitable spotted owl habitat. Potential project-related disturbance to breeding, roosting, and foraging spotted owls would not occur. No potential effects on prey species would occur. In the long-term, less suitable habitat for flying squirrel and woodrat prey species compared to action alternative as 592 acres would still be classified as shrub 20 years later.

ANGORA FIRE RESTORATION PROJECT

Figure 3.6-2
CHWR Types Within
Pre Angora Fire Spotted Owl PACs

Lake Tahoe Basin Management Unit



Legend

- Angora Fire Restoration Project Boundary
- Pre Angora Fire Spotted Owl PACs

CWHR Types

- JPN, 4, M
- JPN, 4, P
- MCP
- SMC, 4, M
- SMC, 4, P

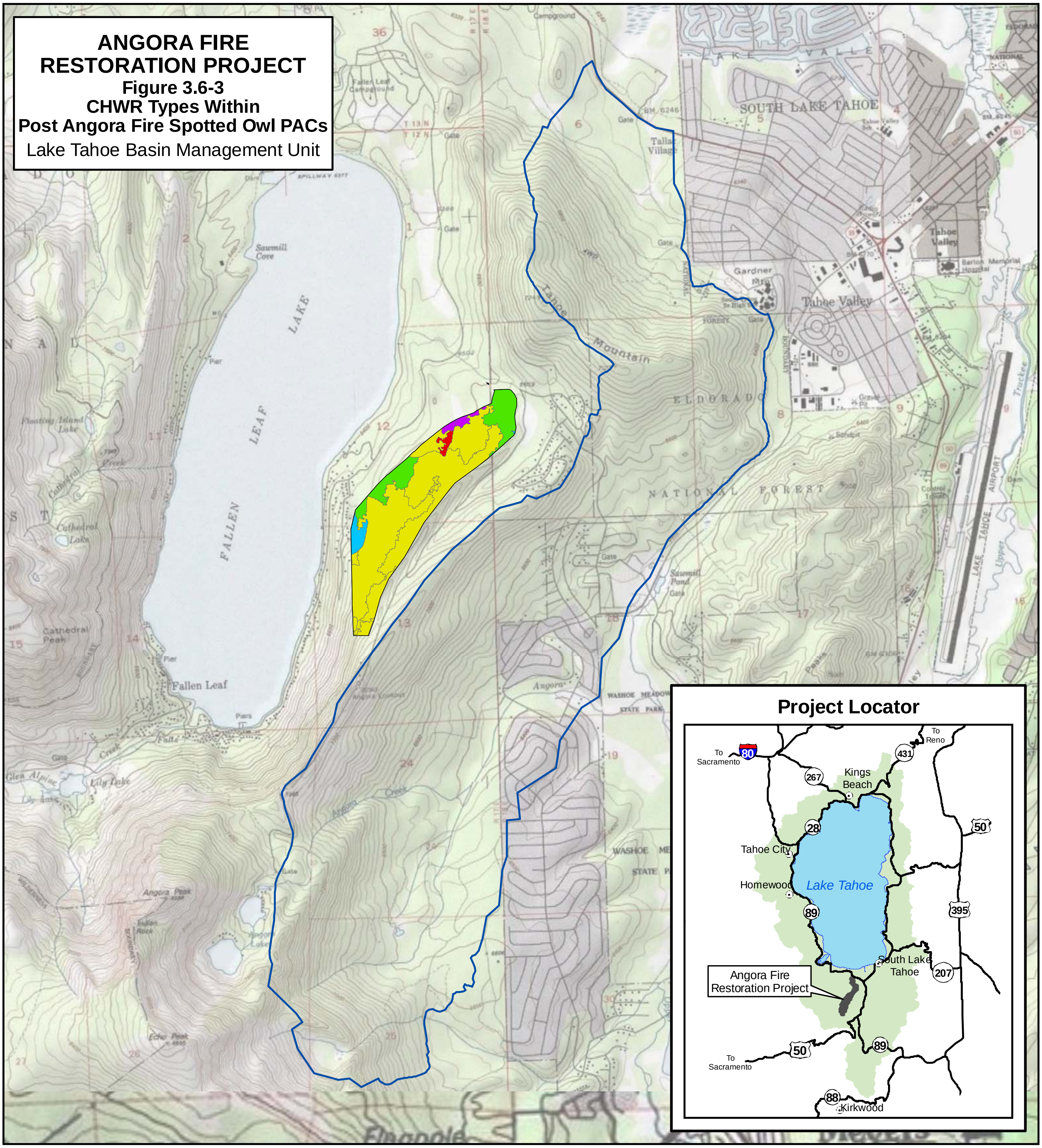
0 0.25 0.5 1 Miles

Source: USFS & USGS 7.5' Quad., CA: Emerald Bay, Echo Lake, South Lake Tahoe & Freel Peak

ANGORA FIRE RESTORATION PROJECT

Figure 3.6-3
CHWR Types Within
Post Angora Fire Spotted Owl PACs

Lake Tahoe Basin Management Unit



Legend

Angora Fire Restoration Project Boundary	CWHR Types	SMC, 4, M
Post Angora Fire Spotted Owl PACs	JPN, 5, D	SMC, 5, D
	JPN, 5, M	SMC, 5, M
	PGS	

0 0.25 0.5 1 Miles

Source: USFS & USGS 7.5' Quad., CA: Emerald Bay, Echo Lake, South Lake Tahoe & Freel Peak

The project area would retain all live and dead trees that currently exist within the fire perimeter. Snags and cavities would be abundant, especially in the 600 acres of high burn severity. However, canopy closure would be low and no nesting by spotted owls would be expected. Over time, mortality of some live trees would be expected due to stress caused by insects and drought. While this would provide snag and downed log recruitment, in the long-term, it would also contribute to fuel accumulation.

The removal of dead trees to reduce long-term fuel loading and to reduce future fire severity would not occur. Reducing tree density by thinning live trees to increase the resiliency of the remaining live trees to insects and disease would not occur. The opportunity to increase the survival, growth, and vigor of the remaining live trees through less competition for water and nutrients would not occur. Removal of some of the standing dead trees would not occur. These trees would fall and contribute to high fuel loads in about five to 10 years.

The conditions that could cause another stand-replacing fire would not be reduced. Over time, the excessive large woody debris and overall high fuel loads would increase the probability of future wildland fires that burn at high severity and provide conditions that make suppression of wildfires more difficult and ultimately increase the fire size. A high severity fire would impact developing spotted owl habitat and increase the risk of fire adversely affecting adjacent spotted owl habitat. While there are consequences of inaction, Alternative 1 would not affect spotted owls or their habitat. No direct or indirect effects would occur as a result of Alternative 1.

Cumulative Effects

Alternative 1 (No-Action Alternative): No direct or indirect effects would occur; therefore, no cumulative effects would occur.

Alternative 2 (Proposed Action)

Direct and Indirect Effects

Disturbance Effects

Spotted owls may be directly affected by project activities in two areas of primary behavior: nesting and roosting, and foraging. Project-related activities within 0.25 mile of nests or roosts during the breeding season (March 1 through August 15) could cause reproductive failure or increase mortality of young. Numerous project activities would occur in portions of the pre-fire Tahoe Mountain PAC, including both aerial and ground treatment. According to CWHR, the PAC no longer provides adequate nesting habitat and sufficient suitable nesting habitat is no longer present in the project area (the 121 acres of suitable habitat remaining within the project area are disjunct).

However, within the first year of a fire, owls have been recorded returning to PACs located in burned landscapes (Project Record Document E86). Some studies show that long-term reproductive use does not occur in severely burned habitat (Project Record Document E19). Because the Angora fire occurred in 2007, no effect on reproductive activities within the pre-fire PAC would be expected because project activities would not begin until 2010. However, Bond et al. (Project Record Document E86) found that four years post-fire, two pairs of spotted owls nested in moderate burn severity mixed conifer forest and one pair nested in low burn severity mixed conifer forest. During the breeding season, they also found that roosting spotted owls selected low severity burned forest and avoided moderate and high burn severity burned areas. Thus, the possibility exists that spotted owls could nest within the Angora project area rather than in the post-fire, remapped PAC, although the owl pair was detected outside and adjacent to the burned area in 2006.

No disturbance to nesting owls is anticipated because it is assumed that any nesting owls would be detected during protocol surveys, which would be conducted in and near the project area prior to project activities. If nesting owls are found, a 0.25-mile no-disturbance radius would be delineated around any active nest from March 1 through August 15.

Owls could potentially forage in the pre-fire PAC or in other locations within the project area classified as suitable habitat using CWHR. According to CWHR, a total of 207 acres of suitable foraging habitat remains within the project area. Studies examining how spotted owls use burned landscapes for foraging are equivocal. Spotted owls continued to use areas burned by understory (low severity) fire but avoided stand-replacement burns, probably because of reduced prey (Project Record Document E87). Thus, prey species preferred by spotted owls (i.e., flying squirrels) are likely to have already been reduced in number due to changes in project area habitat caused by the Angora fire. However, wood rats are known to use earlier successional habitats and may recolonize the edges of shrub fields (Project Record Document E65). Flying squirrels are associated with mature conifers and are likely to be absent from portions of the project area until such conditions develop in the future.

In contrast, Bond et al. (Project Record Document E86) found that four years post-fire, foraging owls selected burned areas for foraging over unburned forest, with the greatest selection for high-severity burned areas. The most likely explanation for their results was increased presence of prey (e.g., woodrats, deer mice) caused by enhanced habitat conditions, including increased shrub and herbaceous cover, and number of snags (Project Record Document E86). Thus, the entire Angora project area could be considered suitable foraging habitat for spotted owls.

Protocol spotted owl surveys are designed to determine territorial occupancy by spotted owls (i.e., roosting and nesting) and are not the best approach to detect foraging owls (e.g., compared to techniques such as telemetry on tagged owls). While some foraging owls might be detected during the annual protocol surveys, other occurrences might be missed. Therefore, this assessment assumes that spotted owls could forage throughout the project area, including all classifications of burn severity.

Project activities might temporarily disturb any spotted owls that are present as a result of the noise, mechanical activity, and human presence. Although an owl might not flush from a site, continued disturbance could stress the owl, potentially increasing foraging time, decreasing foraging efficiency, or otherwise altering typical behavior patterns. Spotted owls are nocturnal. Since project activities would primarily occur during the day, the potential for disturbance to nocturnal, foraging individuals is unlikely. However, any owls roosting in low burn severity habitat or unburned habitat in the project area could be flushed. These impacts would persist as long as project actions are taking place at a given location. Because project activities are scheduled to occur over numerous years, this seasonal disturbance could extend the period of time that spotted owls might not forage or roost within a given location within the project area. Once project actions are completed, any spotted owls could return to forage or roost.

Numerous project components in forested habitat could temporarily reduce prey availability in the area of direct impact (e.g., road construction, logging) through loss of habitat, mortality of small mammals, or behavioral changes. Because prey species (e.g., woodrats, deer mice, flying squirrels) have relatively rapid reproduction rates, this effect would be expected to be short-term in duration.

Habitat Effects

Removal of standing and downed wood, and thinning of live trees, would occur on approximately 1,542 acres using a ground-based logging system (up to 1,036 acres) and an aerial logging system, which may include a combination of helicopter, yarder, and hand treatment methods (up to 506 acres). Under this alternative, approximately 183.4 acres of removal would occur in the former PAC (approximately 61%).

Using CWHR criteria, implementation of Alternative 2 would not result in any additional, unsuitable spotted owl habitat beyond the changes due to the Angora fire as all CWHR suitable habitat is located in the non-treatment stands (Table 3.6-14). Although project actions would further reduce canopy closure and vegetation structure, these project mediated changes would not be considered significant. This is due to the fire, which has already reduced the suitability of these stands for spotted owls.

However, based on Bond et al.'s (Project Record Document E86) study, all project activities could affect potential foraging habitat (all burn severities), roosting habitat (low burn severity), and nesting habitat (low and moderate burn severity). The proposed removal would reduce perch sites for roosting and foraging, and potential nest trees, as well as further reduce canopy closure and vegetation structure. Bond et al. (Project Record Document E86) recommended that burned forests within 1.5 km of nests or roosts of California spotted owls not be salvaged-logged until long-term effects of fire on spotted owls and their prey are understood more fully. At this time, no known spotted owl nests or roosts are known in the project area. If a roost or nest is found in or within 1.5 km of the project area, Alternative 2 of the Angora project might not comply with their recommendation. However, it should also be noted that no studies are available that assess whether salvage logging reduces post-fire use by spotted owls.

Table 3.6-14. Estimated Acres of CWHR High- and Moderate-Capability Spotted Owl Nesting, Roosting, and Foraging Habitat within the Angora Project Area before and after Implementation of Alternative 1 (No-Action Alternative) and Alternative 2 (Proposed Action)

	Nesting Habitat		Roosting Habitat		Foraging Habitat	
	Before After	Change	Before After	Change	Before After	Change
Alternative 1 (No-Action Alternative)	121.4 121.4	0	121.4 121.4	0	207.9 207.9	0
Alternative 2 (Proposed Alternative)	121.4 121.4	0	121.4 121.4	0	207.9 207.9	0

In the long-term, Alternative 2 is likely to be beneficial for spotted owl foraging. Without implementation of Alternative 2, it is estimated that approximately 592 acres (treatment stands 2, 3, 8, 11, and 13) would become unsuitable shrub habitat. As snags fall, suitable hunting perches would no longer be present, and dense shrub cover would inhibit the growth of replacement trees.

Approximately 1,196 acres (43%) would not be treated for fire-killed trees or live tree thinning. This untreated land base would support various densities of fire-killed trees. Overall snag density within the ten "wildlife leave islands," which would be located in the treatment stands, would depend on management zone. Minimal snag size of 9-inch dbh or greater would be retained and would include an estimated 40-50 snags per acre. These islands would be expected to provide only marginal spotted owl foraging habitat because they would be surrounded by large expanses of unsuitable habitat. Nonetheless, the natural processes that would occur, such as snags falling and contributing to downed wood, could develop into more suitable habitat in the future and could provide habitat for some prey species.

Long-term effects of the proposed action on spotted owl habitat include a reduced risk of stand-replacing fire, which would decrease the potential loss of other suitable spotted owl habitat adjacent to the project area. Other effects include the eventual return of structural complexity and canopy cover in treated stands, increased forest health and vigor in treated stands, and a potential increase in habitat quality and quantity due to the eventual development of reforested acres into suitable habitat. Without implementation of Alternative 2, it is estimated that approximately 592 acres (treatment stands 2, 3, 8, 11, and 13) would develop into unsuitable shrub habitat.

Approximately 6.2 miles of new system road construction would occur. Approximately 3.6 miles would be sited on top of existing road and trail prisms. To facilitate fuel removal, 23 new landing and staging areas ranging in size from 0.25 to 1.5 acres would be developed. Approximately 7.7 miles of temporary road would be constructed to accommodate logging and other project activities. Approximately 3.99 miles would be decommissioned and 16.43 miles restored upon completion of the project.

The specific reductions in stand area from new road and landing and staging area construction are unknown. Based on the upper limits of the total number of acres required for the latter two components, at least 34.5 acres would be affected. Reductions of stand interior area, edge, or insularity would occur as a result. The scale of the reductions would depend on the location of the roads and landings in relation to potentially suitable habitat. A road or landing constructed along the edge of a stand of suitable habitat would have a smaller effect compared to one constructed in the center of an unfragmented stand of habitat. Due to the paucity of suitable spotted owl habitat, construction of roads, landings, and staging areas is not expected to adversely affect spotted owls.

Cumulative Effects

Alternative 2 (Proposed Action): Cumulative effects of past, present and reasonably foreseeable future projects on spotted owls include collective temporary displacement from project areas during project implementation. There is a high risk of direct effects on individuals in the Tahoe Mountain PAC, especially if the South Shore Project is implemented in and near the PAC while the Angora Project is also implemented near the PAC. Although the Angora Project area provides little suitable habitat compared to pre-fire conditions, owls that are displaced from the Tahoe Mountain PAC could still find refuge in the remaining suitable habitat. Likewise, any owls in the Angora Project area could find refuge downslope in the Tahoe Mountain PAC and HRCA. However, if both projects occur simultaneously there would be additive disturbance and less suitable habitat available for owls to seek refuge. Scheduling these projects to avoid overlap would reduce this risk.

No substantial impacts are expected to spotted owl breeding activities as LOPs have been and would be implemented when necessary to avoid project impacts on nesting pairs. In addition, all projects would comply with the SNFPA framework, which would protect habitat conditions within spotted owl PACs. Based on known information and as-needed implementation of a LOP, the projects should not disturb known nesting pairs and would not alter their current distribution across the LTBMU.

In the short-term, the cumulative effect of Alternative 2 is to adversely affect individual spotted owls associated with the Tahoe Mountain PAC and their habitat. In the long-term, cumulative effects of this alternative should be beneficial to spotted owls and their habitat as (1) the risk of a stand-replacing fire is reduced; (2) a potential increase in habitat quality and quantity due to the eventual development of reforested acres into suitable habitat; and (3) habitat in the analysis area matures during the 20-year period following implementation of the Angora Project.

Northern Goshawk

Goshawk foraging habitat includes forests with dense to moderately open overstories, and open understories interspersed with meadows, brush patches, riparian areas, or other natural or artificial openings. For nesting, northern goshawks require mature conifer and deciduous forests with large trees, snags, downed logs, dense canopy cover, and open understories. Although structural characteristics of nesting habitat differs between vegetation types and geographic regions, relative habitat use patterns are consistent: northern goshawk nest sites have greater canopy cover, greater basal area, greater numbers of large diameter trees, lower shrub/sapling/understory cover and numbers of small diameter trees, and gentle to moderate slopes relative to non-used random sites (Project Record Documents E88–E90). This habitat provides large trees for nest sites, a closed canopy for protection from predators and thermal cover, and open understories that provide for maneuverability and detection of prey below the canopy.

In the Lake Tahoe region, Keane (Project Record Document E90) reported that northern goshawk nest sites (n = 35) were characterized by significantly greater numbers of live trees >40 inches dbh (mean = 15.8 trees/acre) and 24-40 inches dbh (mean = 22.1 trees/acre); greater canopy cover (mean = 70.4%); and significantly lower shrub/sapling cover (mean = 9.9%) and number of live trees >2-12 inches dbh (mean = 121.4/acre) compared to random locations. Nest trees are usually among the largest trees in the nest stand. Conifer nest trees in the Lake Tahoe region averaged 32 inches dbh (range = 15-61 inches, n = 39) (Project Record Document E90). Northern goshawk are known to utilize aspen stands for both nesting and foraging, 9% of known goshawk nest sites in the Tahoe basin, 2004-2005, occurred in aspen stands (Project Record Document E91). Northern goshawks are year-round residents of the Tahoe basin and are diurnal.

Nesting behavior, including courtship and nest initiation, begins mid-February to early March. The average incubation period is approximately 33 days and the nestling period typically extends from early June through early July, with most young fledged by mid-July. The post-fledging dependency period extends until mid/late August (Project Record Document E92).

CWHR Types

High capability nesting habitat for this species: Jeffrey Pine, Lodgepole Pine, Montane Hardwood, and Subalpine Conifer (4M, 4D, and 5D); Montane Hardwood-Conifer, Montane Riparian, Sierran Mixed Conifer, and White Fir (4M, 4D, 5D, and 6); and Red Fir (5D). Within CWHR, size class 6 is only recognized for a subset of the forest vegetation types (Sierran Mixed Conifer, White Fir, Montane Hardwood-Conifer, Montane Riparian, and Aspen).

Moderate capability nesting habitat for goshawks: Aspen (4M, 4D, 5D, and 6), Eastside Pine (3M, 3D, 4M, 4D, and 5D), Lodgepole Pine (3M and 3D), Red Fir (4M and 4D), and Subalpine Conifer (3M and 3D).

High capability perching habitat for this species: Jeffrey Pine, Lodgepole Pine, Montane Hardwood, Montane Hardwood-Conifer, Montane Riparian, Sierran Mixed Conifer, Subalpine Conifer, and White Fir (4M and greater size and density classes); and Red Fir (5M and 5D).

Moderate capability perching habitat for this species: Aspen and Eastside Pine (3M and greater size and density classes); Jeffrey Pine, Lodgepole Pine, Sierran Mixed Conifer, Subalpine Conifer, and White Fir (3M, 3D, 4S, and 4P); Montane Hardwood, Montane Hardwood-Conifer, and Montane Riparian (4S and 4P); and Red Fir (4M, 4D, 5S, and 5P).

High capability foraging habitat for goshawk: Alpine Dwarf-Shrub (all strata); Eastside Pine (4D, 5S, 5P, 5M, and 5D); Jeffrey Pine, Lodgepole Pine, Montane Hardwood, Montane Hardwood-Conifer, Montane Riparian, Sierran Mixed Conifer, Subalpine Conifer, and White Fir (4M and greater size and density classes); and Red Fir (5M and 5D).

Moderate capability foraging habitat for goshawks: Aspen (3M and greater size and density classes); Jeffrey Pine, Montane Hardwood, Montane Hardwood-Conifer, Montane Riparian, Sierran Mixed Conifer and White Fir (4P and below); Lodgepole Pine and Subalpine Conifer (1, 2S, 3S, 3P, 3M, 3D, 4S, and 4P); and Red Fir (3M, 3D, 4S, 4P, 4M, 4D, 5S, and 5P).

Overall, the fire reduced suitable goshawk nesting, roosting, and foraging habitat by an average of 61%. However, the effects varied widely by habitat capability (Table 3.6-15).

Table 3.6-15. Effect of the Angora Fire Created on Suitable Northern Goshawk Habitat within the Project Area

Habitat Capability	Pre-fire Acres	Post-fire Acres	Reduction in Suitable Habitat (%)
High and Moderate Nesting Habitat	2752.6	186.5	93.2%
High and Moderate Perching Habitat	2626.6	1416.5	46.1%
High and Moderate Foraging Habitat	2659.3	1510.2	43.2.7%

Vegetation burn severity maps indicate that 100% of the Angora PAC burned at moderate to high severity while 99% of the Seneca Pond PAC burned at moderate to high severity (see Table 3.6-16).

Table 3.6-16. Burn Severity Effects of the Angora Fire on the Angora and Seneca Pond Northern Goshawk PACs

	Severity		
	High	Low	Moderate
Angora PAC Area (acres)	158.4	0	41.6
Seneca Pond PAC Area (acres)	130.8	2.3	67.4

Occurrence in Project Area

Post-fire, goshawks were recorded in the project area five times, twice in 2007 and three times in 2008. No nesting activity was detected.

The Angora fire burned the two goshawk Protected Activity Centers (R0519AT01 and R0519AT31) delineated within the project area. The North Angora Creek PAC R0519AT01 was eliminated due to severe fire effects. Immediately after the fire, a northern goshawk auditory detection was recorded in the moderate vegetation burn severity area in one small patch of trees and shrubs along the headwaters of Angora creek on July 1, 2007. Goshawks were known to forage near this area prior to the fire. The pre-fire Seneca Pond PAC R0519AT31 was remapped to include suitable habitat outside the fire perimeter. This PAC was first detected in 1993 and was infrequently occupied. No known nests or fledglings were detected.

The pre-fire Tahoe Mountain PAC (R0519AT23) was infrequently occupied. The original unconfirmed nest was found in 1992. A different unconfirmed nest was found in 1993. A nest was confirmed in 2003, but no fledglings were observed. Goshawk detections associated with this PAC were recorded in 1997 and 2002-2005. The post fire Tahoe Mountain PAC is located outside the project area. It was moved due to habitat alteration from the fire. There were no detections in 2008 and 2009. If goshawks are not detected in 2009 and/or the habitats are determined to be of insufficient quality or quantity, the LTBMU might decide to re-map this land allocation. Direction for evaluating a PAC for retention or removal after a stand replacing event is found on page 37 of the SNFPA 2004 ROD and is more fully discussed under the section on spotted owls. All PAC revisions complied with the SNFPA and LTBMU Forest Plan (Project Record Document E93) direction.

Approximately 79% and 65% of the North Angora and Seneca Pond pre-fire goshawk PACs burned at high severity and were completely lost (see Figures 3.6-4 and 3.6-5). The burned area will not provide desirable nesting habitat for this species in the foreseeable future.

The northern goshawk PAC's were remapped with input from:

1. LTBMU Ecosystem Conservation Department biologists, and
2. LTBMU Forest Leadership Team and staff

Alternative 1 (No-Action Alternative)

Direct and Indirect Effects

There would be no change in the amount of existing suitable goshawk habitat. Potential project-related disturbance to breeding, perching, and foraging goshawks would not occur. No potential effects on prey species would occur. With the exception of the completed hazard tree removal and mitigation along 256 acres of roads and trails, the project area would retain all live and dead trees that currently exist within the fire perimeter. Snags and cavities would be abundant, especially in the 600 acres of high burn severity. However, canopy closure would be low and no nesting by goshawks would be expected. Over time, mortality of some live trees would be expected due to stress caused by insects and drought. While this would provide snag and downed log recruitment, in the long-term, it would also contribute to fuel accumulation.

The removal of dead trees to reduce long-term fuel loading and to reduce future fire severity would not occur. Reducing tree density by thinning live trees to increase the resiliency of the remaining live trees to insects and disease would not occur. The opportunity to increase the survival, growth, and vigor of the remaining live trees through less competition for water and nutrients would not occur. The opportunity to maintain and increase the vigor and health of aspen stands by removing live, dead, and dying conifers and by planting 2.75 acres of new aspen habitat along riparian corridors and meadow edges would not occur. Thus, there would be no improvement in goshawk foraging and nesting opportunities within aspen habitat. Removal of some of the standing dead trees would not occur. These trees would fall and contribute to high fuel loads in about five to 10 years.

The conditions that could cause another stand-replacing fire would not be reduced. Over time, the excessive large woody debris and overall high fuel loads would increase the probability of future wildland fires that burn at high severity and provide conditions that make suppression of wildfires more difficult and ultimately increase the fire size. A high severity fire would impact developing goshawk habitat and increase the risk of fire adversely affecting adjacent goshawk habitat. While there are consequences of inaction, Alternative 1 would not affect goshawks or their habitat. No direct or indirect effects would occur as a result of Alternative 1.

Cumulative Effects

Alternative 1 (No-Action Alternative): No direct or indirect effects would occur; therefore, no cumulative effects would occur.

Alternative 2 (Proposed Action)

Direct and Indirect Effects

Goshawks may be directly affected by project activities in two areas of primary behavior: nesting and foraging. Project-related activities within 0.5 mile of nests during the breeding season (February 15 through September 15) could cause reproductive failure or increase mortality of young. While there are no longer any PACs delineated within the project area, two PACs (i.e., the new Seneca Pond PAC and Tahoe Mountain) are mapped within 0.5 mile of the project area. The Seneca Pond PAC is located within 0.5 mile of treatment stands 11 and 12. The Tahoe Mountain PAC is located within 0.5 mile of treatment stands 5, 6, 7, and 8. These stands are scheduled for aerial and ground removal. If goshawks are nesting in the PACs or within 0.5 miles of the project area during project implementation, project activities could disturb them and cause nest failure. However, no disturbance to goshawk breeding activities would occur because a 0.5-mile no-disturbance radius would be delineated around any active nest from February 15 through September 15.

Goshawks have home ranges that exceed the size of PACs and the potential for disturbance to undetected nests in suitable habitat within and adjacent to the project area exists. Prior to project activities, annual protocol surveys would be conducted in and near the project area in order to identify and protect any nests that could be affected by project activities. Therefore, adverse effects from the proposed action to goshawk breeding would be largely avoided. Numerous project activities would occur in portions of the pre-fire PACs, including both aerial and ground treatment, however, this would not be expected to cause any adverse effects on reproducing goshawks as the PACs no longer provide adequate nesting habitat.

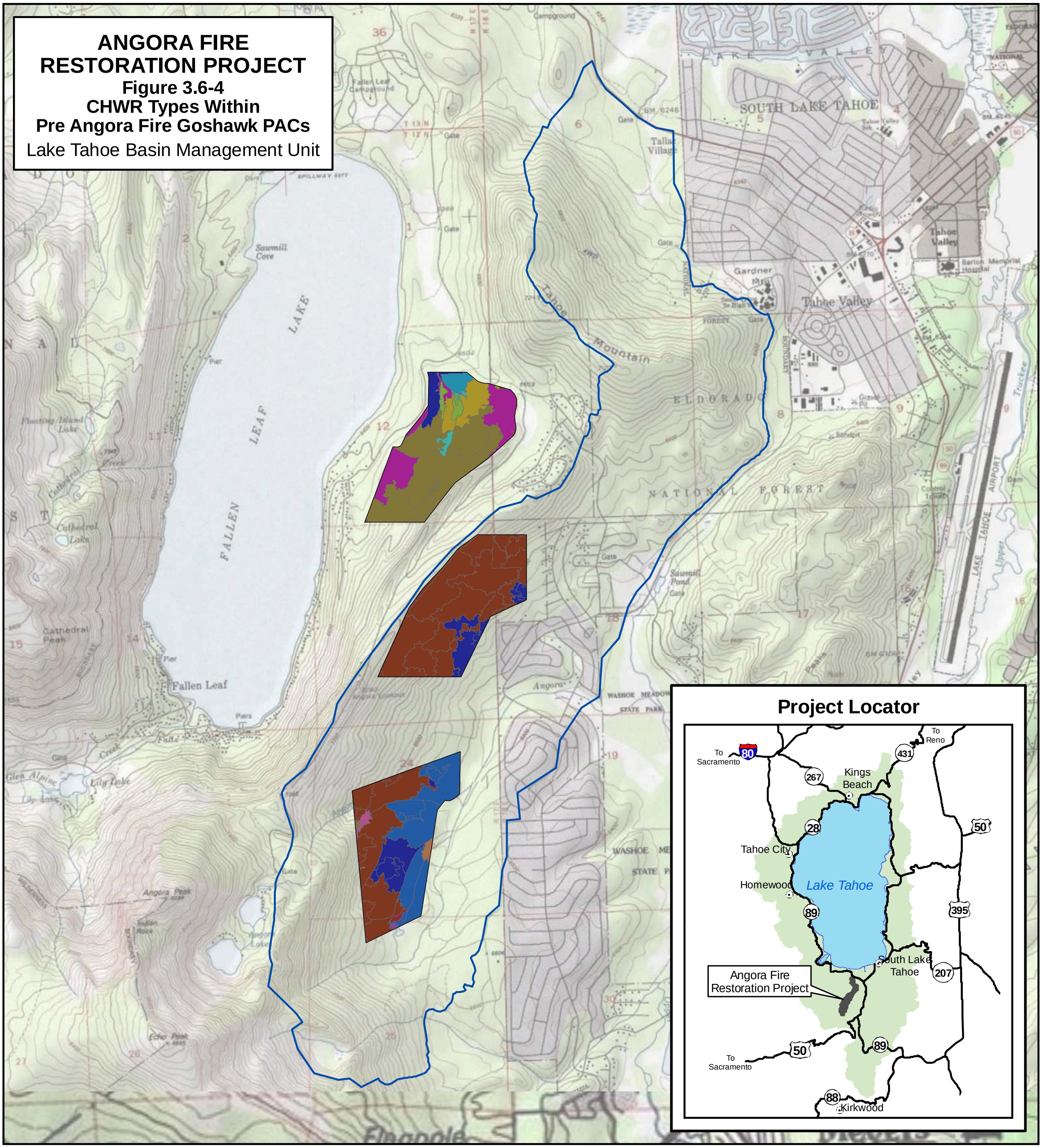
Project activities could potentially disturb any foraging, non-nesting goshawks as a result of the human presence, mechanical activity, and noise. No LOP applies to non-nesting goshawks. Prolonged disturbance from project activities could decrease goshawk foraging efficiency and disrupt typical behavior patterns. If present, individuals might alter their behavior by avoiding portions of the project area during project activities. The displacement would be short-term until project actions at a given location are completed. Once the activity ceases, the goshawks could return. Due to the availability of suitable goshawk habitat within 0.5 mile of the project area, any temporary displacement of foraging goshawks to adjacent suitable habitat should not be a substantial impact.

However, project activities are scheduled to occur over several years and this seasonal disturbance (generally from May 15 through October 15) could extend the period of time that goshawks might

ANGORA FIRE RESTORATION PROJECT

Figure 3.6-4
CHWR Types Within
Pre Angora Fire Goshawk PACs

Lake Tahoe Basin Management Unit



Legend

Angora Fire Restoration Project Boundary

Pre Angora Fire Goshawk PACs

CWHR Types

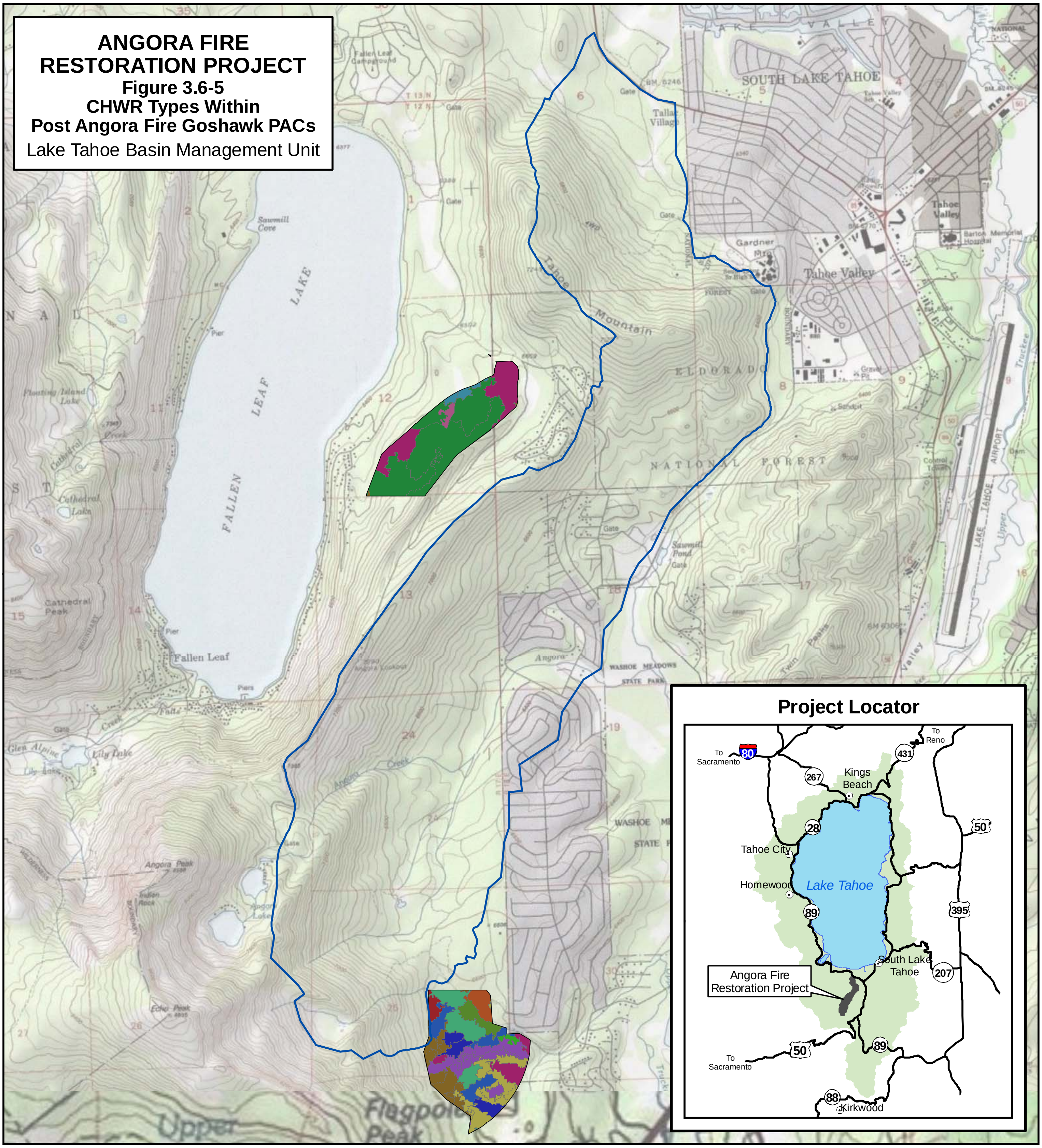
- ASP, 4, D
- BAR
- JPN, 4, D
- JPN, 4, M
- JPN, 5, D
- JPN, 5, M
- JPN, 5, P
- LPN, 4, M
- LPN, 4, P
- MCP
- PGS
- SMC, 4, M
- SMC, 4, P
- SMC, 5, D
- SMC, 5, M

N

0 0.25 0.5 1 Miles

Source: USFS & USGS 7.5' Quad., CA: Emerald Bay, Echo Lake, South Lake Tahoe & Freel Peak

ANGORA FIRE RESTORATION PROJECT
Figure 3.6-5
CHWR Types Within Post Angora Fire Goshawk PACs
Lake Tahoe Basin Management Unit



Legend

- Angora Fire Restoration Project Boundary
- Post Angora Fire Goshawk PACs

CWHR Types

JPN, 4, D	JPN, 5, M	PGS
JPN, 4, M	LPN, 4, M	RFR, 4, D
JPN, 4, P	LPN, 5, D	RFR, 4, M
JPN, 5, D	LPN, 5, M	SMC, 4, M
	MCP	SMC, 5, D
		SMC, 5, M

0 0.25 0.5 1 Miles

Source: USFS & USGS 7.5' Quad., CA: Emerald Bay, Echo Lake, South Lake Tahoe & Freel Peak

not occupy potentially suitable foraging and perching habitat in the project area. There is some evidence that goshawks are not that sensitive to noise. A brooding adult female and lone juvenile goshawk did not exhibit any discernable behavioral response to logging truck noise within 500 meters of their positions (Project Record Document E58). Thus, it is possible any goshawks could become habituated to some project area activities.

Habitat Effects

Under Alternative 2, approximately 300.6 acres of dead and live trees would be removed from the two pre-fire goshawk PACs. However, the 300.6 acres are no longer suitable goshawk nesting habitat due to the Angora fire. Before the Angora fire, 2,752.6 acres of suitable nesting habitat was present in the project area. Post-fire, approximately 186.5 acres of potentially suitable nesting habitat exists in the project area (Table 3.6-17). Fifteen of these acres are located in treatment stand 4 and are scheduled for ground treatment. Following treatment, seral conditions in stand 4 would be CWHR 5P. Twenty years post-treatment, seral conditions are expected to still be CWHR 5P. This seral type is not considered suitable goshawk nesting habitat. The loss of this patch of nesting habitat is not considered significant due to its small size, isolation from other suitable nesting habitat, and proximity to existing urban development. Thus, Alternative 2 would not substantially alter the project area nesting habitat for goshawks. The remaining 171.5 acres of suitable nesting habitat are located in the non-treatment stands and no dead or live tree removal would occur in this habitat. Because this habitat would not be treated, and is mostly low burn severity, it is likely it would retain its existing habitat characteristics.

Prior to implementation of the action alternative, 1495.2 acres of suitable goshawk foraging habitat and 1416.5 acres of perching habitat is present in the project area (Table 3.6-17). Within these habitat types, 15 acres would become unsuitable after dead and live tree removal. This alteration is not considered significant because it affects less than 1% of the suitable habitat and because of the proximity of the 15 acres to existing urban development.

Table 3.6-17. Estimated Acres of High- and Moderate-Capability Goshawk Nesting, Perching, and Foraging Habitat Created within the Angora Project Area before and after Implementation of Alternative 1 (No-Action Alternative) and Alternative 2 (Proposed Action)

	Nesting Habitat		Perching Habitat		Foraging Habitat	
	Before After	Change	Before After	Change	Before After	Change
Alternative 1 (No-Action Alternative)	186.5 186.5	0	1416.5 1416.5	0	1510.2 1510.2	0
Alternative 2 (Proposed Action)	186.5 171.5	-15	1416.5 1401.5	-15	1495.2	-15

Potential nesting and foraging snags for prey species could be lost as a result of dead tree removal. However, the action alternative's design criteria and snag retention guidelines would minimize this loss. Approximately 1,196 project area acres (43%) would not be treated for fire-killed trees or live tree thinning. Approximately 10-15% of the treatment stands would be designated as wildlife leave islands (snags and live tree retention areas). These 10 islands would be irregular in shape and be up to 40 acres in size. These areas would retain high levels of snags from existing fire-killed trees.

Additional snags would be recruited over the next five years because some trees that might have survived the immediate effects of the fire would eventually die from the combined stresses of the fire, disease, and subsequent insect attacks. Overall, the project area would retain a mosaic of areas with moderate to high densities of snags, which would provide important habitat for goshawk prey species.

An indirect effect could occur with the removal of concentrated areas of snags that serve as activity centers for important prey species for goshawks. Goshawks are frequently found foraging on woodpeckers in these patches. The complete removal of such patches could adversely affect goshawk foraging habitat. This effect is unlikely to occur because the project design features include leaving snags in clumps, as well as retention of live trees that are currently in decline.

In the long-term, effects of the proposed action on goshawk habitat include a reduced risk of stand-replacing fire, a potential increase in habitat quality and quantity due to the eventual development of suitable forest habitat rather than shrubs, and the development of at least 2.75 acres of aspen stands into suitable foraging and nesting habitat. Aspen habitat is important for goshawk foraging and nesting. High quality nesting habitat might be created in some locations where conifer removal allows more growing space for the remaining trees and allows reestablishment of aspen stands. The project is likely to increase habitat quality in approximately six acres of aspen stands due to their release from conifer encroachment. It would also establish 2.75 acres of new aspen stands along riparian corridors and meadows.

Habitat disturbance from project activities could potentially affect the goshawk's avian and small mammal prey base in the area of direct impact through displacement of birds, mortality of small mammals, and loss of habitat. Depending on the type of project activity, prey displacement could be temporary (e.g., vehicle traffic) or result in long-term changes (e.g., loss of habitat in locations with construction and maintenance of new roads).

Improvements in wet meadow and riparian habitat are expected to increase habitat for small mammals and songbirds, two categories of potential prey. It is possible the restored conditions could translate into improved habitat conditions for forest-edge species, which would also improve the prey base for goshawks. Goshawks forage over large areas and the area of disturbance due to project activities is small compared to the available surrounding forest.

Consumptive use of natural resources that cause direct habitat alteration, such as removal of dead and live trees, were thought to be more detrimental to wildlife than non-consumptive recreational use (Project Record Document E59). Over the past decades, more attention has focused on how non-consumptive recreation contributes to the cumulative effects of human activities on wildlife. Research has shown that wildlife is more readily disturbed by hikers than motor vehicles. Hikers are more unpredictable, more likely to approach animals, and may be considered more of a threat by animals (Project Record Document E60). Hikers may be somewhat more disturbing to wildlife than recreationists on horseback, although this has not been studied (Project Record Document E61).

Nesting goshawks are sensitive to human presence and disturbance from recreationists. No project activities are scheduled to occur in 92% of the remaining suitable goshawk nesting habitat as it is all located in the non-treatment areas. None of the road and trail system components are designed to increase recreational use. However, the construction, decommission, and restoration would re-distribute where the use occurs. No portion of the new roads and/or trails would occur in a goshawk PAC. The 0.8 mile of road decommissioning would cause a reduction in vehicle traffic in those specific locations. Benefits to goshawks from the roads and trails project component include relocating 0.3 mile of road and 1.4 miles of trail out of an SEZ. Because SEZs have a greater diversity and abundance of wildlife species (Project Record Document E38), this portion of the project could improve foraging conditions for goshawks. In the long-term, it could also reduce potential disturbance to nesting goshawks should any of the adjacent vegetation develop into suitable nesting habitat.

Vehicle traffic during project implementation would be greater than during pre-project conditions. However, post-project, no change in the number of vehicle trips and the potential effect of those trips on habitat use and occurrence by goshawks are anticipated. Pre-project use, which consists of Forest Service administrative vehicles, would not differ after project completion.

Cumulative Effects

Alternative 2 (Proposed Action): Cumulative effects of past, present and reasonably foreseeable future projects on goshawks include collective temporary displacement from project areas during project implementation. Cumulative effects on goshawks have already occurred due to the Angora fire. The Seneca Pond PAC was remapped and the North Angora PAC was removed. Thus, one PAC was lost from the LTBMU goshawk PAC network. There is a high risk of direct effects on individuals in the Tahoe Mountain PAC, especially if the South Shore Project is implemented in and near the PAC while the Angora Project is also implemented near the PAC. There is a low risk of disturbance to individuals in the Seneca Pond PAC as this PAC is infrequently occupied.

Although the Angora Project area provides less suitable habitat than existed compared to the pre-fire conditions, any goshawks that are displaced from the Tahoe Mountain and Seneca Pond PACs as a consequence of the South Shore Project could still find refuge in the remaining suitable habitat. Likewise, any goshawks in the Angora Project area could find refuge downslope in these PACs. However, if both projects occur simultaneously there would be additive disturbance and less suitable habitat available for goshawks to seek refuge. Scheduling these projects to avoid overlap would reduce this risk.

No substantial impacts are expected to goshawk breeding activities as LOPs have been and would be implemented when necessary to avoid project impacts on nesting pairs. In addition, all projects would comply with the SNFPA framework, which would protect habitat conditions within goshawk PACs. Based on known information and as-needed implementation of a LOP, the projects should not disturb known nesting pairs and would not alter their current distribution across the LTBMU.

In the short-term, the cumulative effect of Alternative 2 is to adversely affect individual goshawks associated with the Tahoe Mountain and Seneca Pond PACs and their habitat. In the long-term, cumulative effects of this alternative should be beneficial to goshawks and their habitat as (1) the risk of a stand-replacing fire is reduced; (2) a potential increase in habitat quality and quantity due to the eventual development of reforested acres into suitable habitat; and (3) habitat in the analysis area matures during the 20-year period following implementation of the Angora Project.

Willow Flycatcher

Nesting habitat typically includes moist meadows with perennial streams and smaller spring-fed or boggy areas with willow (*Salix* spp.) or alder (*Alnus* spp.) (Project Record Documents E94 and E95). Willow flycatchers have been found in riparian environments of various shapes and sizes ranging from small willow-surrounded lakes or ponds with a fringe of meadow or grassland to various willow-lined streams, grasslands, or boggy areas. Willow flycatcher nest territories generally contain open water (i.e., running water or standing water), boggy seeps, or saturated soil (Project Record Document E96).

Nests constructed of grass and sedges are usually located in willows between 3.3 to 10 feet in height (Project Record Document E94). In mountain meadows, duff from the previous growth season must be available when the flycatchers construct their nest.

In the Sierra Nevada, willow flycatchers have nested in meadows less than one acre to meadows several hundred acres (Project Record Documents E94 and E96–E98). The minimum size meadow useable for willow flycatchers is assumed to be 0.62 acre (Project Record Document E99). However, most willow flycatchers occur in meadows larger than 20 acres. Riparian meadow sites used by willow flycatchers vary in size and shape and may contain relatively dense, linear stands of shrubs, or irregularly shaped mosaics of dense vegetation with open areas in between. Various researchers describe openings within thickets of riparian deciduous shrubs or tall clumps of shrubs separated by open areas as important components of willow flycatcher nesting habitat (Project Record Documents E94, E95, and E100). Large contiguous willow thickets are avoided (Project Record Documents E95 and E100). According to Sanders and Flett (Project Record Document E100), openings within willow patches appear to increase habitat suitability. However, Harris et al. (Project Record Document E95) found it was not possible to predict presence or absence of willow flycatchers by willow clump sizes. Nonetheless, some openness in the shrub stratum seems important. Meadows occupied by willow flycatchers generally contain > 60% willow cover with willows that are structurally diverse (> 2 meters tall) (Project Record Document E101). The presence of water during the breeding season appears to be an important habitat component (Project Record Document E99).

The willow flycatcher was once a common summer resident throughout California, but is now limited to scattered meadows of the Sierra Nevada and along the Kern, Santa Margarita, and San Luis Rey Rivers. Alteration and loss of riparian habitats are the primary reasons for its historic and recent decline (Project Record Documents E94, E97, E98, and E102–E105). Other factors that may have contributed to its decline are nest parasitism by brown-headed cowbirds (*Molothrus ater*), disturbance and habitat degradation from grazing, and events on the wintering grounds (Project Record Documents E94 andE104).

CWHR Types

The CWHR model describes high to moderate capability nesting habitats in the montane riparian vegetation type (high = 2D, 3D, 4M, and 4D; moderate = 2M, 3M); high to moderate capability perching habitats in the montane riparian vegetation type (high = greater than 2P; moderate = 2P); and high capability foraging habitat (no moderate capability habitats described) in the montane riparian (all strata except 1 and 2S) and wet meadow (all strata) vegetation types for this species.

The CWHR model is not subspecies-specific and the local subspecies, *E. t. adastus*, is known to nest only in wet meadows in the Lake Tahoe Basin. Therefore, high and moderate capability nesting habitat would only include the wet meadow vegetation type (all strata) for this analysis. Similarly, as *E. t. adastus* nests locally in wet meadows, high and moderate capability perching habitat would include wet meadow (high = all strata) and montane riparian (high = greater than 2P; moderate = 2P) vegetation types. High capability foraging habitat, as described in CWHR (no moderate capability habitats described), would include montane riparian (all strata except 1 and 2S) and wet meadow (all strata).

Although the fire reduced the extent and vigor of the associated riparian habitat, the vegetation is beginning to recover. Nonetheless, it is assumed that the riparian vegetation lacks sufficient height and quantity to provide suitable willow flycatcher habitat (Table 3.6-18).

Table 3.6-18. Effect of the Angora Fire on Suitable Willow Flycatcher Habitat within the Project Area

Habitat Capability	Pre-fire Acres	Post-fire Acres	Reduction in Suitable Habitat (%)
High and Moderate Nesting Habitat	4.6	0	100%
High and Moderate Perching Habitat	5.9	0	100%
High Foraging Habitat	5.9	0	100%

Occurrence in Project Area

There are no records of willow flycatchers in the project area. The LTBMU has not mapped any occupied, suitable, or emphasis habitat for willow flycatchers in or near the project area. The current habitat conditions are considered unsuitable for willow flycatchers due to the Angora fire. The willows are undersized, and abundant edge and isolated conifers/snags within the willow habitat increase the potential for predation and nest parasitism.

Alternative 1 (No-Action Alternative)

Direct and Indirect Effects

The No-Action Alternative would avoid short-term impacts on willow flycatcher habitat, but would forgo the potential to enhance and increase meadow and riparian habitat quality and quantity. Opportunities to reduce risk of predation and nest parasitism through removal of live and dead conifers in meadow habitat would not occur. The conditions that could cause another stand-replacing fire would not be reduced. Over time, the excessive large woody debris and overall high fuel loads would increase the probability of future wildland fires that burn at high severity and provide conditions that make suppression of wildfires more difficult and ultimately increase the fire size. A high severity fire would impact developing willow flycatcher habitat and increase the risk of fire adversely affecting other willow flycatcher habitat outside the project area. While there are consequences of inaction, Alternative 1 would not affect willow flycatchers or their habitat. No direct or indirect effects would occur as a result of Alternative 1.

Cumulative Effects

Alternative 1 (No-Action Alternative): No direct or indirect effects would occur; therefore, no cumulative effects would occur.

Alternative 2 (Proposed Action)

Direct and Indirect Effects

No direct effects on nesting willow flycatchers are expected. Willow flycatchers have not been detected foraging or nesting in the project area. The current habitat conditions are considered unsuitable. However, it is possible that willow cover could increase over the five year project period and provide potential habitat. Habitat suitability will be evaluated in the future by LTMBU wildlife biologist(s) to determine whether protocol surveys become necessary. If protocol surveys are performed, and nesting willow flycatchers are detected, a protected activity center would be delineated by the LTBMU wildlife biologist and a LOP would be implemented from June 1 through August 31.

It is possible that non-nesting, undetected willow flycatchers could use the project area (i.e., birds arrive after protocol surveys are concluded). Any willow flycatchers occupying the project area during project activities might be displaced from the immediate work area due to mechanical activity, noise, and visual disturbance. The displacement could result in a temporary spatial redistribution of individuals, changes in habitat use patterns, or changes in occupancy of habitat. Because willow flycatchers spend most of their time during the breeding season within the boundaries of wet meadow habitat, they are unlikely to be affected by actions beyond approximately 50 feet of the edge of wet meadow willow habitat. Therefore, this potential effect is confined to a relatively narrow area along riparian and wet meadow habitat.

Although the project would be implemented over several years, not all portions of the project area would be entered and disturbed at a given time. Nonetheless, the overall effect could be such that the disturbance level prevents occupancy by willow flycatchers throughout the four years of project activity. This potential long-term disturbance is not likely to cause any adverse effects on willow flycatchers because they have never been documented in the project area.

During the restoration component of the project, localized reductions in suitable willow flycatcher riparian and wet meadow habitat could occur, but in the long-term it will result in increased vigor and extent of riparian habitat (i.e., willows and alders would be planted in strategic locations in both the new and old channel). Such actions would improve nesting and foraging habitat for willow flycatchers. Although it is expected that willows would be salvaged for re-planting along the new channel, it is likely to take several years for them to grow to sufficient size (e.g., > 2 m) before they are suitable nesting and foraging habitat. In the long-term, the project could increase the quantity, quality, and distribution of suitable willow flycatcher habitat. Encroaching conifers would be removed from meadow habitat, which would reduce the risk of predation and parasitism.

Under Alternative 2, Seneca Pond would be completely drained and replaced with a functional wetland. Doing so would increase riparian vegetation and provide suitable willow flycatcher foraging and nesting habitat where only marginal habitat currently exists. This would result in an increase of approximately 4.6 acres of new willow flycatcher habitat. Although no design plan is yet available for restoration of Angora Creek, if geomorphic processes are restored, new nursery sites for riparian vegetation through sediment deposition and change in flood inundation, timing, duration, and magnitude could be created. If moisture was retained in meadow habitat for longer periods of time through the summer, invertebrate prey levels could increase for the willow flycatcher.

These expected changes in willow flycatcher habitat (e.g., increases in extent and vigor) as a result of Alternative 2 would not occur until several years post-project, when the riparian plants grow large enough to be functional (e.g., > 2 m) (Table 3.6-19).

Table 3.6-19. Estimated Acres of High- and Moderate-Capability Willow Flycatcher Nesting and Foraging Habitat within the Angora Project Area before and after Implementation of Alternative 1 (No-Action Alternative) and Alternative 2 (Proposed Action)

	Nesting Habitat		Foraging Habitat	
	Before After*	Change	Before After*	Change
Alternative 1 (No-Action Alternative)	0 0	0	0 0	0
Alternative 2 (Proposed Action)	0 0	0	0 0	0

* No immediate effects on willow flycatcher habitat are expected post-project, but suitable habitat is expected to develop within 5 to 10 years.

Cumulative Effects

Alternative 2 (Proposed Action): The proposed action, when combined with past, present, and reasonably foreseeable future actions is not expected to have a cumulative effect on willow flycatchers because the risk of potential effects due to disturbance is low and because the quality and quantity of suitable habitats would not change immediately after implementation. No cumulative impacts on individuals would occur because no direct impacts on individuals are expected due to implementation of LOPs if needed. Any indirect effects are expected to be relatively minor due to the sparse amount of potentially suitable habitat currently in the project area.

Mammals

American Marten

Preferred habitat is characterized by dense (60%–100% canopy closure), multi-story, multi-species mature coniferous forests with a high number of large (> 2-inch dbh) snags and downed logs (Project Record Documents E106 and E107). Marten do use a variety of other habitat types, but depend on a well-connected expanse of late-successional forest. High numbers of large snags and downed logs are an important component of marten habitat, especially in winter when snow covers much of the ground. Snags and downed logs provide denning and resting sites for marten, access to subnivian areas, and habitat for marten prey (Project Record Document E108). Subnivian habitat is also important for resting and thermoregulation during winter (Project Record Document E107). In winter, martens usually require forest with a canopy closure at least 50% (Project Record Document E109). Other elements that contribute to habitat suitability include low branches of live trees, tree boles in various stages of decay, large coarse woody debris, presence of squirrel middens, and a shrub layer to the canopy (Project Record Document E110).

High quality habitat includes close proximity to forested riparian corridors that are used as travelways and an interspersion of small (< 1 acre) openings with good ground cover used for foraging (Project Record Documents E106, E111, and E112). Travelways between 300 to 600 feet in width are recognized by one expert as the minimum for marten dispersal (Project Record Document E113). Riparian corridors or other means for dispersal are necessary to martens to provide safe and frequent movements through poor habitat areas and between habitats. These travelways should be multistoried stands and should have a minimum canopy closure of 50%–60% (Project Record Document E114). Martens forage at the edge of openings, especially natural meadows, but they avoid traveling across large openings. Prey species abundance is an important component of habitat. Their prey is primarily squirrels, but their diet varies seasonally and may include snowshoe hare, blue grouse, northern flying squirrels and other small rodents. Variable sizes for home ranges within the Sierra Nevada are reported in the literature; male home ranges vary from 673 to 3,000 acres and females range from 427 to 1,075 acres (Project Record Document E115).

Marten natal dens are typically found in cavities in large trees, snags, stumps, logs, burrows, caves, rocks, or crevices in rocky areas. Dens occur in structurally complex, late successional forests (Project Record Document E107). Canopy cover, and the number of large old trees in these patches, are higher than those found in the surrounding area (Project Record Document E66). Rest sites are associated with closed canopy, multi-layered conditions (Project Record Document E116). Martens selected stands with 40% to 60% canopy closure for both resting and foraging and avoided stands with less than 30% canopy closure (Project Record Document E111).

CWHR Types

Important CWHR habitat types include red fir, lodgepole pine, subalpine conifer, mixed conifer-fir, Jeffrey pine, and eastside pine (Project Record Document E66). Moderate to highly important CWHR strata for marten are 4M, 4D, 5M, 5D, and 6 (Project Record Document E66; Project Record Document E117).

High capability denning habitat includes Lodgepole Pine (4M, 4D, and 5D), Montane Hardwood Conifer (4M, 4D, 5D, and 6), Montane Riparian (5D and 6), Red Fir (4M, 4D, and 5D), Sierran Mixed Conifer (6), and Subalpine Conifer (4M, 4D, and 5D).

Moderate capability denning habitat includes Aspen (4M, 4D, 5D, and 6), Jeffrey Pine (4M, 4D, and 5D), Lodgepole Pine (4P and 5P), Montane Hardwood Conifer (4P and 5P), Montane Riparian (4M and 4D), Red Fir (4P and 5P), Sierran Mixed Conifer (4M, 4P, and 5D), Subalpine Conifer (4P and 5P), and White Fir (4M, 4D, 5D, and 6).

High capability resting habitat includes Lodgepole Pine (4M, 4D, 5M, and 5D), Montane Hardwood Conifer (4M, 4D, 5M, 5D, and 6), Montane Riparian (5D, 5M, and 6), Red Fir (4M, 4D, 5M, and 5D), Sierran Mixed Conifer (6), and Subalpine Conifer (4M, 4D, 5M, and 5D).

Moderate capability resting habitat includes Aspen (4M, 4D, 5M, 5D, and 6), Barren (all strata), Eastside Pine (5M, 5P, and 5D), Jeffrey Pine (4M, 4D, 5M, and 5D), Lodgepole Pine (4P and 5P), Montane Hardwood Conifer (4P and 5P), Montane Riparian (4M and 4D), Red Fir (4P and 5P), Sierran Mixed Conifer (4M, 4P, 5M, and 5D), Subalpine Conifer (4P and 5P), and White Fir (4M, 4D, 5M, 5D, and 6).

High capability foraging habitat includes Lodgepole Pine (4M, 4D, 5M, and 5D), Montane Hardwood Conifer (4M, 4D, 5M, 5D, and 6), Montane Riparian (5D, 5M, and 6), Red Fir (4M, 4D, 5M, and 5D), Subalpine Conifer (4M, 4D, 5M, and 5D), and Wet Meadow (all strata).

Moderate capability foraging habitat includes Aspen (4M, 4D, 5M, 5D, and 6), Barren (all strata), Eastside Pine (5M and 5D), Jeffrey Pine (4M, 4D, 5M, and 5D), Lodgepole Pine (3S, 3P, 4S, 4P, and 5P), Montane Hardwood Conifer (4P and 5P), Montane Riparian (4M and 4D), Pasture (all strata), Perennial Grassland (all strata), Red Fir (3S, 3P, 4S, 4P, and 5P), Sierran Mixed Conifer (4M, 4P, 5M, 5D, and 6), Subalpine Conifer (3S, 3P, 4S, 4P, and 5P), and White Fir (4M, 4D, 5M, 5D, and 6).

Overall, the fire reduced marten denning, resting, and foraging habitat by at least 80% (see Table 3.6-20).

Table 3.6-20. Effect of the Angora Fire on Suitable Marten Habitat Within the Project Area

Habitat Capability	Pre-fire Acres	Post-fire Acres	Reduction in Suitable Habitat (%)
High and Moderate denning Habitat	3342	382.1	88.5%
High and Moderate Resting Habitat	2372	409.8	82.7%
High and Moderate Foraging Habitat	2269	437.5	80.7%

Occurrence in Project Area

Martens have not been documented in the project area; however, no protocol surveys for martens using sooted track plates or remote cameras were conducted in the project area. Martens have been documented approximately four miles east of the project area at Heavenly Ski Resort.

Alternative 1 (No-Action Alternative)

Direct and Indirect Effects

There would be no change in the amount of existing suitable marten habitat. Potential project-related disturbance to martens would not occur. No potential effects on prey species would occur. With the exception of the hazard tree removal and mitigation along 256 acres of roads and trails, which began in December 2008 and is scheduled for completion in December 2009, the project area would retain all live and dead trees that currently exist within the fire perimeter. Snags and cavities would be abundant, especially in the 600 acres of high burn severity. However, canopy closure would be low and martens would not be expected to den within this area. Over time, mortality of some live trees would be expected due to stress caused by insects and drought. While this would provide snag and downed log recruitment, in the long-term, it would also contribute to fuel accumulation.

The removal of dead trees to reduce long-term fuel loading and to reduce future fire severity would not occur. Reducing tree density by thinning live trees to increase the resiliency of the remaining live trees to insects and disease would not occur. The opportunity to increase the survival, growth, and vigor of the remaining live trees through less competition for water and nutrients would not occur. The opportunity to maintain and increase the vigor and health of aspen stands by removing live, dead, and dying conifers and by planting 2.75 acres of new aspen habitat along riparian corridors and meadow edges would not occur. Thus, there would be no improvement in marten foraging and dispersal opportunities within aspen habitat. Removal of some of the standing dead trees would not occur. These trees would fall and contribute to high fuel loads in about five to 10 years.

The conditions that could cause another stand-replacing fire would not be reduced. Over time, the excessive large woody debris and overall high fuel loads would increase the probability of future wildland fires that burn at high severity and provide conditions that make suppression of wildfires more difficult and ultimately increase the fire size. A high severity fire would impact developing marten habitat and increase the risk of fire adversely affecting adjacent marten habitat. While there are consequences of inaction, Alternative 1 would not affect marten or their habitat. No direct or indirect effects would occur as a result of Alternative 1.

Cumulative Effects

Alternative 1 (No–Action Alternative): No direct or indirect effects would occur; therefore, no cumulative effects would occur.

Alternative 2 (Proposed Action)

Direct and Indirect Effects

No adverse effects on marten reproduction are expected since this species has not been detected in the project area. If a den site is found in the project area before or during project activities, an LOP would be implemented from May 1 to July 31 within 100 acres surrounding the den site.

Although the majority of project activities would occur in unsuitable habitat, approximately 20% of the forested habitat within the project area is still suitable. Direct effects from the project could include disturbance during project activities due to human presence, mechanical activity, and noise. If they are present, martens may alter their behavior by avoiding affected portions of the project area during implementation. This displacement could result in a temporary spatial redistribution of individuals or habitat-use patterns during implementation. However, once the activity ceases, any martens could return. Project activities are scheduled to occur over several years and this seasonal disturbance could extend the period of time that martens might avoid the project area.

Prey species associated with marten may also be subject to individual behavioral changes or mortality during implementation. Prey species preferred by martens are likely to have already been reduced in numbers due to the changes in project area habitat caused by the Angora fire. Chang (Project Record Document 118) summarized faunal responses to fire for the Sierra Nevada Ecosystem Project, and found that fire may result in direct mortality of some of the small mammals that constitute much of the marten's diet, especially non-burrowing species. Conversely, vegetative biomass increases shortly after fire, leading to a greater abundance of food, cover, and structural heterogeneity, which may in turn lead to increased populations of some prey species (Project Record Document E118).

The most significant impact on any marten that occupied the project area and on their habitat was the Angora fire. The fire reduced habitat suitability by at least 80%, and fragmented suitable denning, resting, dispersal, and foraging habitat. Alternative 2 would result in an additional reduction of 15 acres of suitable denning, resting, and foraging habitat (Table 3.6-21). The loss of this patch of habitat is not considered significant because larger patch sizes of suitable habitat are present nearby in stand 997, which is not scheduled for any treatment. Moreover, 96% of the remaining suitable habitat would not be affected by Alternative 2 since it is located in the non-treatment stands.

Table 3.6.21. Estimated Acres of High- and Moderate-Capability Marten Denning, Resting, and Foraging Habitat within the Angora Project Area before and after Implementation of Alternative 1 (No-Action Alternative) and Alternative 2 (Proposed Action)

	Denning Habitat		Resting Habitat		Foraging Habitat	
	Before After	Change	Before After	Change	Before After	Change
Alternative 1 (No-Action Alternative)	382.1 382.1	0	409.8 409.8	0	437.5 437.5	0
Alternative 2 (Proposed Action)	382.1 367.1	-15	409.8 394.8	-15	437.5 422.5	-15

Fire fuel loading could contribute to a stand-replacing fire and subsequent loss of marten habitat. Treating the 1,541 acres with ground and aerial thinning would reduce this risk, which would reduce the potential loss of other suitable marten habitat in and near the project area. Aspen stands contribute to highly productive habitat for marten and their retention is considered desirable. Encroaching conifers would be removed from approximately six acres of aspen stands. In the short-term, this could affect habitat quality for martens as structural diversity and canopy closure would be reduced.

The Heavenly Mountain Resort Master Plan (Project Record Document E119) examined the potential impacts of Heavenly Ski Area on local populations of marten. It found marten were present throughout the ski area except for locations where human activity was highest, such as highways and parking lots. It concluded that ski runs did not exclude martens from using “tree islands” and that the fragmented environment may provide habitat for favored prey. While marten do appear to need mature forest for denning sites, small islands of unburned forest within a large burn can provide adequate cover (Project Record Document E120). Thus, it is possible that the ten “wildlife leave islands” within the treatment stands could provide similarly suitable habitat for marten.

Martens forage along the edges of meadows, and it is likely that the project would improve habitat for small mammals, which would improve the prey base for martens. The restoration portion of the project is expected to increase riparian habitat along the new and old stream channels. Post-project and in the long-term, this would increase the quantity and quality of cover (i.e., movement corridors, and protection from predators) and foraging habitat for martens.

Numerous and heavily traveled roads are not desirable within American marten habitat as they are associated with habitat disruption and animal mortality (Project Record Document E106). Roads may also reduce prey availability for marten by increasing road kills in prey populations and creating behavioral barriers to foraging movements. Occasional one and two lane forest roads with moderate levels of traffic are not believed to limit American marten movements (Project Record Document E106). The size of openings that martens have been observed to cross varies from 10 meters (m) (Project Record Document E111), 30 m (Project Record Document E121), 40 m (Project Record Document E122), to 100 m (Project Record Document E123). The width of the new administrative roads falls well within the size that martens cross. Thus, creation of new classified roads, and potential reclassification of unclassified roads into classified roads, would not be expected to affect foraging movements and dispersal by marten that could inhabit the project area. An unknown number of trees would be removed for new road creation and for log and staging landings. Although these features would primarily be sited in currently unsuitable habitat, they could contribute to future forest fragmentation if suitable habitat does develop in their vicinity.

Hiking trails alter habitat and compact soil, potentially affecting martens, their prey, and their habitat. Trails can fragment habitat, contribute to soil erosion, and increase the potential for noxious weed introduction. However, there is no evidence that they pose a significant risk to martens (Project Record Document E124).

This species is primarily nocturnal. Because project activities would occur during the day, disturbance to individuals active at night would not occur. Vehicle traffic from project activities would not be expected to increase the risk of fatality to martens from vehicle collisions since martens are naturally wary and speed limits would be reduced in work areas. Trash from project related activities, especially food waste, would be properly contained in wildlife-proof containers and removed at the end of each day. This would reduce the likelihood of attracting martens to active work sites where they could be accidentally killed by vehicles.

Cumulative Effects

Alternative 2 (Proposed Action): Cumulative effects of past, present and reasonably foreseeable future projects on martens include collective temporary displacement from project areas during project implementation. If the South Shore Project and the Angora Project occur simultaneously, there would be additive disturbance and less suitable habitat available for marten to seek refuge. However, sufficient amounts of suitable habitat exist within the cumulative effects analysis area that should provide marten with suitable areas of refuge during project implementation. No adverse impacts are expected to marten breeding activities, as no known den sites exist in the project area. If any den site is found, LOPs would be implemented if and when necessary to avoid project impacts on den sites.

In the short-term, the cumulative effect of Alternative 2 is to adversely affect individual martens and their habitat. In the long-term, cumulative effects of this alternative should be beneficial to martens and their habitat as (1) the risk of a stand-replacing fire is reduced; (2) a potential increase in habitat quality and quantity due to the eventual development of reforested acres into suitable habitat; and (3) habitat in the analysis area matures during the 20-year period following implementation of the Angora Project.

Townsend's Big-Eared Bat

Townsend's big-eared bat is found in a variety of habitat types including desert, native prairies, coniferous forests, mid-elevation mixed conifer, mixed hardwood-conifer forests, riparian communities, active agricultural areas, and coastal habitat types (Project Record Document E125). Occurrence of this species is strongly correlated with the availability of caves and cave-like roosting habitat (Project Record Document E126). Caves, abandoned mines (e.g., adits, shafts), and buildings that offer cave-like spaces provide preferred hibernation, nursery sites, or roosts for Townsend's big-eared bats. However, this species has also been reported roosting in tree hollows in coastal California (Project Record Documents E127 and E128).

Townsend's big-eared bats are very sensitive to roost disturbance and may abandon roost sites after even the slightest disturbance (Project Record Documents E129–E131). Night roosts might occur in more open settings, including under bridges (Project Record Document E132). Maternal colonies contain from 35 to 100 individuals and are located in the warmest part of the roost structure (Project Record Document E125). The colonies form between March and June, while males remain solitary during summer. Winter hibernating colonies can range in size from a few individuals to several hundred bats (Project Record Document E126). They hibernate throughout their range in caves and mines where temperatures are above freezing but below 55 degrees Fahrenheit.

The Townsend's big-eared bat is a moth specialist and more than 90% of its diet is composed of lepidopterans (Project Record Document E126). Preferred foraging habitat is edge habitats along streams and areas adjacent to and within a variety of wooded habitats (Project Record Document E126). They usually begin foraging well after dark (Project Record Document E125).

CWHR Types

The CWHR is not the best method to describe habitat for Townsend's big-eared bat. Roosting habitat cannot be described by the number of acres of a habitat type. Instead, roosting habitat is site specific and consists of either a cave, cave analogue (e.g., old mine workings), and possibly hollows in trees. Foraging habitat is closely associated with the proximity of suitable roosting habitat. It is not well described by CWHR habitat type or strata. Therefore, foraging habitat will be analyzed in terms of general changes to habitat within the project area.

Occurrence in Project Area

No surveys for Townsend's big-eared bat were conducted for this project. Acoustic surveys conducted for the Multispecies Inventory and Monitoring Program have documented Townsend's big-eared bats in two locations within the Tahoe Basin, one at Cookhouse Meadow, located more than six miles east of the project area, and one at Blackwood Canyon, located more than 16 miles northwest of the project area. No roosts are known on the LTBMU. Within the Lake Tahoe basin, Townsend's big-eared bats have not been associated with the presence of abandoned buildings or mine workings (e.g., adits, shafts). It is possible that they roost in rocky outcrops that form cave-like openings. Such potential roost sites are not present in or near the project area. However, it is also possible that they roost in tree hollows. No cave or cave analogues are present within the project area.

Alternative 1 (No-Action Alternative)

Direct and Indirect Effects

No short-term impacts on Townsend's big-eared bat roosting and foraging habitat would occur, but the opportunity to increase riparian and aspen habitat quality and quantity within the project area would also not occur. If Townsend's big-eared bats roost in tree hollows as is reported in coastal California, then the risk of a stand-replacing fire would continue to threaten this species habitat. While there are consequences of inaction, Alternative 1 would not affect Townsend's big-eared bat or their habitat. No direct or indirect effects would occur as a result of Alternative 1.

Cumulative Effects

No direct or indirect effects would occur; therefore, no cumulative effects would occur.

Alternative 2 (Proposed Action)

Direct and Indirect Effects

Townsend's big-eared bats are sensitive to disturbance at roost sites. This sensitivity likely reduces the potential for them to roost in tree hollows that are located in the project area, which is entirely within the WUI. Anthropogenic disturbance is typically greater within the WUI than it is in locations outside the WUI. Tree hollows similar to those reported by Project Record Document E127) and Fellers and Pierson (Project Record Document E128) are more likely to occur in larger, more decadent trees, especially those with structural defects. Dead and live trees with such characteristics are present in the project area, thus this species could potentially roost in tree hollows within the project area.

Within the 12 treatment stands, live tree removal would include trees ranging in size up to 24-inch dbh and dead trees greater than 16-inch dbh. Thus, larger trees and snags that could provide suitable roost sites for this species might be removed. Training of tree-marking personnel to retain "wildlife" trees (i.e., generally larger trees that appear to provide cavities, nesting platforms, or foraging opportunities) moderate the risk of removing a potential roost site for this species. Nonetheless, removal of a roost tree could potentially cause mortality to a bat if it is unable to leave the roost prior to or while the tree is felled. Bats that leave felled roost trees would be expected to relocate to a new roost. The availability of suitable roost trees is unknown, as is the effect of losing a roost tree. It is possible that the effect could vary from temporary disturbance to mortality. New roost sites are likely to develop over time as some retained large trees mature and become decadent or develop structural defects.

While no specific potential roost sites are known, it is possible that project actions could indirectly disturb any day-roosting bats, potentially causing them to abandon their roost. However, the literature on roost disturbance cites people entering mine adits or caves; there is no evidence of indirect effects (e.g., noise, felling of nearby trees) causing similar phenomena. Moreover, this species has not been documented in the Angora Project area.

Because Townsend's big-eared bats usually begin foraging well after dark, and project activities would primarily occur during the day, little to no disturbance to foraging bats is expected. There may be short-term, adverse effects on foraging habitat quality through reduced prey abundance, if project actions cause a reduction in the amount of vegetation fed on by lepidopteran larvae.

Foraging habitat is present within the project area along Angora Creek and its tributaries. Although the fire reduced the extent and vigor of the associated riparian habitat, the vegetation is beginning to recover. The channel restoration project component might temporarily reduce the amount of riparian habitat in specific locations, but in the long-term it will result in increased vigor and extent of riparian habitat (i.e., willows and alders would be planted in strategic locations in both the new and old channel). Such actions, along with the development of Seneca Pond into approximately 2.1 acres of functional wetland, would improve foraging habitat for any Townsend's big-eared bats. Alternative 2 would maintain and increase the vigor and health of aspen stands in the project area by removing encroaching conifers. It would also result in an increase of 2.75 acres of aspen stands along riparian corridors and meadow edges. To the extent that aspens provide forage for lepidopteron larvae, foraging habitat quantity and quality for Townsend's big-eared bat would increase.

Cumulative Effects

Cumulative effects on individuals from past, present and reasonably foreseeable future projects are unsubstantial as projects occurred in potential foraging habitat, and not near known potential roost sites. Caves and cave analogs are the most likely types of roosting habitat for this species. Alternative 2 does not include actions that would contribute to alteration of the following types of potential roosts: caves, mines, buildings, or cliffs. If this species uses tree hollows for roosts, some roosts might be removed during project implementation, but a cumulative effect is not expected as the Angora Project is located in the WUI, where this species is less likely to roost because of anthropogenic disturbance, and because suitable tree hollows are likely to occur in greater abundance in habitat outside the WUI. Most projects were and are implemented during the day, outside of the foraging period for these bats. Occasional temporary displacement of foraging individuals is a potential impact, but alternate suitable habitat occurs within their range and outside the area analyzed for cumulative effects. Beneficial cumulative effects on foraging habitat include an increase in foraging habitat within the project area.

Determinations

The determinations follow the guidelines and definitions established by the Pacific Southwest Region of the Forest Service (Project Record Document E132 and E115) for federally listed and sensitive species and are summarized as follows:

- Determinations of No Effect are usually appropriate only if the project is not located in (or does not affect) suitable or critical habitat and if disturbance or other direct or indirect impacts on the species are not an issue. Projects within suitable or critical habitat must demonstrate that there are no direct or indirect impacts on the species or its habitat to support a No Effect determination. No Effect determinations are unusual if suitable habitat for a species is in any way entered or otherwise affected.
- Determinations of Not Likely to Adversely Affect are usually appropriate when the project occurs in (or affects) suitable or critical habitat or results in disturbance to the species, but take criteria (e.g., quantity or quality of habitat, disturbance, etc.), recovery plan objectives, or regional aquatic conservation strategies are clearly met.
- Determinations of Not Likely to Lead to a Trend Toward Federal Listing are usually appropriate when the project occurs in (or affects) suitable habitat or results in disturbance to the species, but compliance with any existing terrestrial or aquatic conservation strategies can be shown.
- Determinations of Likely to Lead to a Trend Toward Federal Listing are usually appropriate when the project occurs in (or affects) suitable habitat or results in disturbance to the species,and compliance with existing conservation strategies cannot be demonstrated.

Based on the description of the proposed alternatives and the analysis considered, the following determinations were found (also see Table 3.6-22):

Alternatives 1 and 2 of the Angora Fire Restoration Project **will not affect** the following species:

- Great Gray Owl
- Sierra Nevada Red Fox
- Fisher

- Wolverine
- Sierra Nevada (Mountain) Yellow-Legged Frog
- Northern Leopard Frog
- Yosemite Toad
- Lahontan Cutthroat Trout
- Lahontan Lake Tui Chub
- Great Basin Rams-horn

Rationale: The proposed action and alternatives are located outside the current range of these species.

Alternative 1 (No–Action Alternative) will have **no effect** on the following species:

- Bald Eagle
- California Spotted Owl
- Northern Goshawk
- Willow Flycatcher
- American Marten
- Townsend's Big-eared Bat

Alternative 2 (Proposed Action) **may affect individuals but is not likely to result in a trend toward federal listing or loss of viability** for the following species:

- Bald Eagle
- California Spotted Owl
- Northern Goshawk
- Willow Flycatcher
- American Marten
- Townsend's Big-eared Bat

Rationale:

- Disturbance-type effects (e.g., individual bald eagles avoiding project equipment) to foraging bald eagles may occur during implementation.
- The quantity and distribution of suitable bald eagle habitat would not be altered by any of the project activities.
- Effects on reproduction are not expected as nesting bald eagles have not historically or currently been documented in or within 0.5 mile of the project area.
- The proposed action is consistent with the Recovery Plan for the Pacific Bald Eagle.
- Effects on spotted owls are expected to change from adverse disturbance-type effects during implementation to beneficial as habitat matures over the 20-year period following implementation.

- Alterations in suitable spotted owl habitats would be followed by growth of treated stands along trajectories more beneficial than current trajectories.
- Project implementation is expected to benefit spotted owls and their habitat in the long term.
- Effects on goshawks are expected to change from adverse disturbance-type effects during implementation toward beneficial as habitat matures over the 20-year period following implementation.
- Only a minor loss of suitable goshawk habitat (15 acres) would occur and would be followed by growth of treated stands along trajectories more beneficial than current trajectories.
- Project implementation is expected to benefit goshawks and their habitat in the long term.
- Disturbance-type effects on willow flycatcher, American marten and Townsend's big-eared bat (e.g., equipment flushing an individual) are unlikely, but may occur during implementation.
- Willow flycatcher habitat is not expected to increase or decrease in quality or quantity immediately after project implementation, but would increase during the 20 years after implementation due to restoration of Angora Creek.
- Only a minor loss of suitable marten habitat (15 acres) would occur and would be followed by growth of treated stands along trajectories more beneficial than current trajectories.
- Project implementation is expected to benefit martens and their habitat in the long term.
- The proposed action does not include actions that would alter potential roosts in caves, mines, buildings, cliffs, or talus fields.
- The proposed action would likely remove tree hollow-type roosts, if this type of roost is used within the Lake Tahoe basin.
- Tree hollow-type roosts would remain relatively abundant within the wildlife analysis area after project implementation.

Table 3.6-22. Summary of Threatened, Endangered, and Sensitive Species for the Lake Tahoe Basin Management Unit and Effect Determinations for Project-Level Analysis for the Proposed Angora Project

Species	Special Status	Known to Occur in the Project Area	Suitable Habitat in the Project Area	*Determination
Birds				
Bald Eagle (*Haliaeetus leucocephalus*)	Forest Sensitive Species	N	N	MANL
California spotted owl (*Strix occidentalis occidentalis*)	Forest Sensitive Species	N	Y	MANL
Northern Goshawk (*Accipiter gentiles*)	Forest Sensitive Species	Y	Y	MANL
Willow Flycatcher (*Empidonax traillii adastus*)	Forest Sensitive Species	N	Y	MANL
Great Gray Owl (*Strix nebulosa*)	Forest Sensitive Species	N	N	NE

Species	Special Status	Known to Occur in the Project Area	Suitable Habitat in the Project Area	*Determination
Mammals				
Sierra Nevada red fox (*Vulpes vulpes necator*)	Forest Sensitive Species	N	Y	NE
American marten (*Martes americana*)	Forest Sensitive Species	N	Y	MANL
Pacific fisher (*Martes pennanti*)	Forest Candidate Species	N	N	NA
California wolverine (*Gulo gulo luteus*)	Forest Sensitive Species	N	N	NE
Townsend's big-eared bat (*Corynorhinus townsendii*)	Forest Sensitive Species	Y	Y	MANL
Amphibians				
Sierra Nevada (mountain) yellow-legged frog (*Rana sierrae*)	Forest Sensitive Species	N	N	NE
Northern leopard frog (*Rana pipiens*)	Forest Sensitive Species	N	N	NE
Yosemite toad (*Bufo canorus*)	Candidate for Federal listing	N	N	NA
Fish				
Lahontan cutthroat trout (*Oncorhynchus clarkii henshawi*)	Federally Threatened	N	N	NA
Lahontan Lake tui chub (*Gila bicolor pectinifer)*	Forest Sensitive Species	N	N	NE
Delta Smelt (*Hypomesus transpacificus*)	Federally Threatened	N	N	NA
Central Valley Steelhead (*Oncorhynchus mykiss)*	Federally Threatened	N	N	NA
Invertebrates				
Great Basin rams-horn *(Helisoma newberryi newberryi*)	Forest Sensitive Species	N	N	NE

*Federally Listed Species

NA - Would not affect the species or its designated critical habitat.

NLAA - May affect not likely to adversely affect the species or its designated critical habitat.

LAA - May affect and is likely to adversely affect the [name of species] or its designated critical habitat

Sensitive Species

NE – Would not affect the species.

MANL – May affect individuals, but is not likely to result in a trend toward Federal listing or loss of viability. Also includes beneficial effects on species.

MALT - May affect individuals, and is likely to result in a trend toward Federal listing or loss of viability.

3.6.4 Management Indicator Species

This section discloses the impacts on the habitat of the thirteen (13) MIS identified in the NF Land and Resource Management Plan (LRMP) (Project Record Document E74) as amended by the Sierra Nevada Forests Management Indicator Species Amendment (SNF MIS Amendment) Record of Decision (Project Record Document E133). The effects are discussed (1) at the project scale, to analyze the effects of the project on the habitat of each MIS, and (2) at the bioregional scale, to monitor populations and/or habitat trends of MIS.

Selection of Project Level MIS

MIS for the Lake Tahoe Basin Management Unit are identified in the 2007 Sierra Nevada Forests Management Indicator Species (SNF MIS) Amendment (Project Record Document E133). The habitats and ecosystem components and associated MIS analyzed for the project were selected from this list of MIS, as indicated in Table 3.6-23. In addition to identifying the habitat or ecosystem components (1st column), the CWHR type(s) defining each habitat/ecosystem component (2nd column), and the associated MIS (3rd column), the table discloses whether or not the habitat of the MIS is potentially affected by the Angora Project.

Table 3.6-23. Selection of MIS for Project-Level Habitat Analysis for the Angora Project

Habitat or Ecosystem Component	CWHR Type(s) Defining the Habitat or Ecosystem Component[1]	Sierra Nevada Forests Management Indicator Species Scientific Name	Category for Project Analysis [2]
Riverine & Lacustrine	Lacustrine (LAC) and riverine (RIV)	aquatic macroinvertebrates	Category 3
Riparian	Montane riparian (MRI), valley foothill riparian (VRI)	yellow warbler *Dendroica petechia*	Category 3
Wet Meadow	Wet meadow (WTM), freshwater emergent wetland (FEW)	Pacific tree frog *Pseudacris regilla*	Category 3
Early Seral Coniferous Forest	Ponderosa pine (PPN), Sierran mixed conifer (SMC), white fir (WFR), red fir (RFR), eastside pine (EPN), tree sizes 1, 2, and 3, all canopy closures	Mountain quail *Oreortyx pictus*	Category 3
Mid Seral Coniferous Forest	Ponderosa pine (PPN), Sierran mixed conifer (SMC), white fir (WFR), red fir (RFR), eastside pine (EPN), tree size 4, all canopy closures	Mountain quail *Oreortyx pictus*	Category 3
Late Seral Open Canopy Coniferous Forest	Ponderosa pine (PPN), Sierran mixed conifer (SMC), white fir (WFR), red fir (RFR), eastside pine (EPN), tree size 5, canopy closures S and P	Sooty (blue) grouse *Dendragapus obscurus*	Category 2
Late Seral Closed Canopy Coniferous Forest	Ponderosa pine (PPN), Sierran mixed conifer (SMC), white fir (WFR), red fir (RFR), tree size 5 (canopy closures M and D), and	California goshawk *Strix occidentalis occidentalis* American marten *Martes americana*	Category 2

Habitat or Ecosystem Component	CWHR Type(s) Defining the Habitat or Ecosystem Component[1]	Sierra Nevada Forests Management Indicator Species Scientific Name	Category for Project Analysis [2]
	tree size 6.	Northern flying squirrel *Glaucomys sabrinus*	
Snags in Green Forest	Medium and large snags in green forest	hairy woodpecker *Picoides villosus*	Category 3
Snags in Burned Forest	Medium and large snags in burned forest (stand-replacing fire)	black-backed woodpecker *Picoides arcticus*	Category 3

[1] All CWHR size classes and canopy closures are included unless otherwise specified; **dbh** = diameter at breast height; **Canopy Closure classifications:** S=Sparse Cover (10%–24% canopy closure); P= Open cover (25%–39% canopy closure); M= Moderate cover (40%–59% canopy closure); D= Dense cover (60%–100% canopy closure); **Tree size classes:** 1 (Seedling)(< 1-inch dbh); 2 (Sapling)(1- to 5.9-inch dbh); 3 (Pole)(6- to 10.9-inch dbh); 4 (Small tree)(11- to 23.9-inch dbh); 5 (Medium/Large tree)(≥ 24 dbh); 6 (Multi-layered Tree) [In PPN and SMC] (Project Record Document E110).

[2] **Category 1:** MIS whose habitat is not in or adjacent to the project area and would not be affected by the project.
Category 2: MIS whose habitat is in or adjacent to project area, but would not be either directly or indirectly affected by the project.
Category 3: MIS whose habitat would be either directly or indirectly affected by the project.
* The 600 acres of low burn severity are assumed to provide snags in green forest habitat.

Category 2

Late Seral Open Canopy Coniferous Forest: Although there is approximately 86 acres of this habitat type within the project area, none of it would be directly or indirectly affected by any project activities. These habitat types are situated entirely within the non-treatment stands and represent less than 3% of the project area.

Late Seral Closed Canopy Coniferous Forest: Although there is approximately 28 acres of this habitat type within the project area, none of it would be directly or indirectly affected by any project activities. These habitat types are situated entirely within the non-treatment stands and represent less than 1% of the project area.

Category 3

The MIS whose habitat would be either directly or indirectly affected by the Angora Project, identified as Category 3 in Table 1, are carried forward in this analysis, which would evaluate the direct, indirect, and cumulative effects of the proposed action and alternatives on the habitat of these MIS. The MIS selected for Project-Level MIS analysis for the Angora Project are:

- Aquatic macroinvertebrates
- Yellow warbler
- Pacific tree frog
- Mountain quail – early and mid seral
- Hairy woodpecker
- Black-backed woodpecker

The following changes to MIS habitat acres (or linear feet) are anticipated as a result of the Angora Project (Table 3.6-24).

Table 3.6-24. Summary of Anticipated Changes in Acres (or linear feet) of Habitat within the Angora Project Area Due to Direct or Indirect Impacts from Alternative 1 (No-Action Alternative) and Alternative 2 (Proposed Action) (acres were determined based on existing vegetation GIS layers. For riparian habitat, deciduous riparian habitat is the type reported)

MIS Habitat Type	Pre-project MIS Habitat – Acres or linear feet	Change in MIS Habitat Acres – Alternative 1	Change in MIS Habitat Acres or linear feet – Alternative 2
Riverine and Lacustrine Habitat	23,157 feet	0 feet	+ 600 feet ~2.1 acres
Riparian Habitat	1.3	0 acres	Unknown increase acres
Wet Meadow Habitat	4.6 acres	0 acres	+ 8 acres
Coniferous Forest, early seral	0 acres	0 acres	0 acres
Coniferous Forest, mid seral	951 acres	0 acres	-15 acres
Coniferous Forest, late seral, open canopy	86 acres	0 acres	0 acres
Coniferous Forest, late seral, closed canopy	28 acres	0 acres	0 acres
Snags in green forest*	400 acres	0 acres	0 acres
Snags in burned forest	3,000 acres	0 acres	~1,542 acres

Effects of Proposed Action on the Habitat for the Selected Project-Level MIS

The following section documents the analysis for the following 'Category 3' species: aquatic macroinvertebrates, yellow warbler, pacific tree frog, mountain quail (early and mid seral coniferous forest), hairy woodpecker, and black-backed woodpecker (BBWP). The analysis of the effects of the Angora Project on the MIS habitat for the selected project-level MIS is conducted at the project scale. The analysis used the following habitat data: Existing vegetation GIS layer created in November 2005 and vegetation data collected for the Environmental Assessment Report. Detailed information on the MIS is documented in the SNF Bioregional MIS Report (Project Record Document E67), which is hereby incorporated by reference. Cumulative effects at the bioregional scale are tracked via the SNF MIS Bioregional monitoring, and detailed in the SNF Bioregional MIS Report (Project Record Document E67).

Lacustrine/Riverine Habitat (Aquatic Macroinvertebrates)

Habitat/Species Relationship

Aquatic or Benthic Macroinvertebrates (BMI) have been demonstrated to be very useful as indicators of water quality and aquatic habitat condition (Project Record Documents E134–137).

They are sensitive to changes in water chemistry, temperature, and physical habitat. Aquatic factors of particular importance are: flow, sedimentation, and water surface shade.

Project-Level Effects Analysis – Lacustrine/Riverine Habitat

Habitat Factor(s) for the Analysis: Flow, sedimentation, and water surface shade.

Current Condition of the Habitat Factor(s) in the Project Area

An estimated 2.1 acres of lacustrine habitat and 4.4 miles of perennial stream exist within the analysis area.

Flow: Angora Creek has a snowmelt hydrograph intermixed with occasional rainfall events. The range of flows associated with a complete yield cycle correlate to the amount and type of precipitation. Other factors that could influence base flows include ground water recharge zones (e.g., springs), solar input and upland/riparian vegetation. The loss of vegetation (trees, shrub) due to the Angora fire has reduced evapotranspiration rates, which could increase available ground and runoff water to the creek. Urbanization and forest management (roads, fire suppression, etc.) have also influenced the duration and magnitude for flows from peak runoff to base flow.

Sedimentation: Factors influencing sedimentation include channel condition (vertical and lateral stability), road and trail crossings, urbanization, and the Angora fire.

Water Surface Shade: The amount of stream shade is influenced by riparian shrubs, conifers, channel-spanning large woody debris, topographic features, and channel morphology. The Angora fire reduced the extent of riparian shrubs and conifers that provide shade along the creek. While some riparian vegetation is beginning to recover, the dead and dying conifers will not provide long-term shade.

Alternative 1 (No-Action Alternative)

Direct and Indirect Effects on Habitat

Selection of this alternative would not authorize any federal actions. Therefore, there would be no direct or indirect impacts on lacustrine or riverine habitat.

Cumulative Effects on Habitat in the Analysis Area

There are no cumulative effects of the No-Action Alternative because there are no direct or indirect effects. No changes to lacustrine/riverine habitats would occur as a result of the No-Action Alternative; therefore, this alternative would not alter the existing trend in the habitat.

Alternative 2 (Proposed Action)

Direct and Indirect Effects on Habitat

Flow: The restoration component of the project is expected to increase the length of Angora Creek by approximately 600 feet. Stream restoration is likely to lead to a higher elevation channel, which could lead to more overbank flow. The lacustrine habitat associated with Seneca Pond would be converted to a functional wetland. Along with the loss of trees due to the fire, the removal of green trees could potentially contribute to higher base flows, which might extend flow into the summer/fall months. Over time, as vegetation matures, this effect would recede.

Sedimentation: Sediment generation could occur during project construction, including construction of temporary roads. Potential sediment generated from temporary roads could cause a decrease in quality spawning sites for fish were small gravels occur, but would not be measurable due to implementation of BMPs. Restoration of geomorphic processes associated with Angora Creek would create new nursery sites for riparian vegetation through sediment deposition and change in flood inundation, timing, duration, and magnitude. Energy from high flows would be dissipated, reducing erosion and improving water quality. The creek would filter sediment, capture bedload, and aid in floodplain development. Root masses from vegetation would stabilize stream banks against cutting action.

Surface Water Shading: In the long-term, proposed actions are likely to increase stream shading along Angora Creek. Native riparian vegetation (e.g., willows and alders) would be planted along the restored creek channel to promote stream bank and floodplain surface stability, stream shading, and food for macro-invertebrates. It is expected that some plants would grow along a majority of the creek's banks while others would colonize locations at variable distances from the creek (i.e., where sediment was deposited).

Cumulative Effects on Habitat in the Analysis Area

Past, present, and reasonably foreseeable future actions affecting habitat in the analysis area are described in the Effects Analysis section of the Biological Evaluation/Biological Assessment (BE/BA) and Environmental Analysis documents for this project. The spatial scale of cumulative effects includes lacustrine and riverine habitat adjacent to or within 0.5 mile of the project area. Past activities in the project area that contributed to current conditions are primarily fire suppression, which resulted in the stand-replacing Angora fire. The South Shore Project will occur adjacent to and within 0.5 mile of the Angora Project. This project will decrease the amount of combustible fuels within RCAs, thus decreasing the future effects from wildfire on aquatic habitats.

Overall changes in flow due to cumulative effects of the proposed action and other past, present, and foreseeable future would include reduction in size of peak flows, reduction in flow velocity, and overall more natural patterns of water flow. Sedimentation processes would likely improve via floodplain absorption, which promotes sediment storage and deposition. The level of potential sedimentation would be dependent on precipitation events (during and after implementation) and the effectiveness of BMPs and design criteria. Overall changes in stream shading due to cumulative effects of the proposed action and other past, present, and foreseeable future would be beneficial and likely measurable over the long-term.

Summary of Aquatic Macroinvertebrate Status and Trend at the Bioregional Scale

The Lake Tahoe Basin Management Unit LRMP (as amended by the SNF MIS Amendment) requires bioregional-scale Index of Biological Integrity and Habitat monitoring for aquatic macroinvertebrates; hence, the lacustrine and riverine effects analysis for the Angora Project must be informed by these monitoring data. The sections below summarize the Biological Integrity and Habitat status and trend data for aquatic macroinvertebrates. This information is drawn from the detailed information on habitat and population trends in the Sierra Nevada Forests Bioregional MIS Report (Project Record Document E67), which is hereby incorporated by reference.

Habitat and Index of Biological Integrity Status and Trend. The data collected at the Bioregional scale indicate that the IBI metrics for macroinvertebrates are stable.

Relationship of Project-Level Habitat Impacts on Bioregional-Scale Aquatic Macroinvertebrates Habitat Trend. Changes in flow, sedimentation, and water surface shading as a result of the proposed action are positive and beneficial to aquatic macroinvertebrates at the scale of the project. However, they are not likely to impact a substantial amount of existing riverine habitat within the Sierra Nevada. Therefore, the effects of the Angora Project would not alter the existing stable trend in the habitat for aquatic macroinvertebrates across the Sierra Nevada bioregion.

Riparian Habitat (Yellow warbler)

Habitat/Species Relationship

The yellow warbler was selected as the MIS for riparian habitat in the Sierra Nevada. This species is usually found in riparian deciduous habitats in summer (cottonwoods, willows, alders, and other small trees and shrubs typical of low, open-canopy riparian woodland) (Project Record Document E138). It also breeds in montane shrubbery in open conifer forests. During migration, it visits woodland, forest, and shrub habitats.

Project-Level Effects Analysis – Riparian Habitat

Habitat Factor(s) for the Analysis: (1) Acres of riparian habitat (CWHR montane riparian (MRI) and valley foothill riparian (VRI)). (2) Acres with changes in deciduous canopy cover. (3) Acres with changes in total canopy cover. (4) Acres with changes in CWHR size class.

Current Condition of the Habitat Factor(s) in the Project Area

Acres of riparian habitat: Using EVEG _12_08, no montane riparian habitat is delineated within the project area. However, this habitat is likely present along Angora Creek but was not detected by the EVEG layer. Using the stand exam data for the 12 treatment stands (stand information is not available for the untreated stands) there are 9.2 acres of deciduous riparian habitat and 26.2 acres of deciduous/coniferous riparian habitat. This habitat condition was likely reduced immediately post-fire, but is currently recovering.

Deciduous canopy cover: No data on deciduous canopy cover are available. However, it is expected that levels were reduced immediately after the Angora fire, but are likely beginning to recover due to the loss of conifers and rapid growth of deciduous vegetation.

Total canopy cover: No data are available on total canopy cover. However, it is expected that levels would be reduced due to the Angora fire. Where the fire burned at high intensity, it is expected that loss of conifers will allow riparian vegetation (e.g., willows, alders) to grow and become the dominant vegetation type.

CWHR size class: No data are available on CWHR size class.

Alternative 1 (No-Action Alternative)

<u>Direct and Indirect Effects on Habitat</u>

Selection of this alternative would not authorize any federal actions, and therefore, no direct or indirect impacts on riparian habitat would occur.

Cumulative Effects on Habitat in the Analysis Area

There are no cumulative effects of the No-Action Alternative because there are no direct or indirect effects. No changes to riparian habitat would occur as a result of the No-Action Alternative; therefore, this alternative would not alter the existing trend in the habitat.

Alternative 2 (Proposed Action)

Direct and Indirect Effects on Habitat

Acres of Riparian Habitat: Proposed actions are expected to increase the total acreage of riparian habitat due to restoration of Angora Creek, actions to improve meadow habitat, and conversion of Seneca Pond into a functional wetland. At this time, no projections on how much of an increase would occur are available. Nonetheless, the expected increase would occur due to restoration actions. For Angora Creek, the increase would be due to increased stream-floodplain connectivity, which would increase streamside water availability, and to re-vegetate along the new channel, as well as to riparian vegetation colonizing locations along and at variable distances from the creek. For Seneca Pond, the presence of riparian vegetation would increase post-project and into the future. In addition, an increase would occur because willows and alders would be planted throughout construction areas where deemed appropriate. Recent observations indicate that riparian vegetation is recovering however the recovery is limited in its potential due to the incised condition of the channel. It is expected that Angora project (e.g., channel reconstruction, large wood placement, road/trail BMP improvements and meadow reclamation) would increase the rate of recovery within the Angora Fire.

Acres of Riparian Habitat with Changes in Deciduous Canopy Cover: At this time, no projections in acres of riparian habitat with changes in deciduous canopy cover are available. Over time, as the riparian vegetation matures and with less competition from conifers, it is expected that the acreage would increase.

Acres of Riparian Habitat with Changes in Total Canopy Cover: In the short-term, total canopy cover would be low until plants mature. In the long-term, the project is expected to produce riparian vegetation with a variety of canopy covers from low in areas with newly established plants to areas of moderate and dense cover.

Acres of Riparian Habitat with Changes in CWHR Size Class: Due to increased resource availability on the floodplain and reestablishment of natural hydrologic disturbances, it is anticipated that size classes would increase.

Cumulative Effects on Habitat in the Analysis Area

Past, present, and reasonably foreseeable future actions affecting habitat in the analysis area are described in the Effects Analysis section of the BE/BA and Environmental Analysis documents for this project, and include construction of a new stream channel and fuel reduction. The spatial scale of cumulative effects includes lacustrine and riverine habitat adjacent to or within 0.5 mile of the project area. Past activities in the project area that contributed to current conditions are primarily fire suppression, which resulted in the stand-replacing Angora fire. The Angora Project would have beneficial effects on riparian habitat. Post-project, the Angora Project would increase the number of acres of riparian habitat. The South Shore Project, which will occur adjacent to and within 0.5 mile of the Angora Project, will increase the amount of riparian habitat.

Overall changes in riparian habitat due to cumulative effects of the proposed action and other past, present, and foreseeable future projects would be positive, creating an increase in acres of riparian habitat. In addition, existing riparian habitat is likely to be enhanced due to loss conifers in and adjacent to the Angora Creek SEZ. However, these positive effects would not alter the existing trend in the habitat at the bio-regional scale.

Summary of Yellow Warbler Status and Trend at the Bioregional Scale

The Lake Tahoe Basin Management Unit LRMP (as amended by the SNF MIS Amendment) requires bioregional-scale habitat and distribution population monitoring for the yellow warbler; hence, the riparian habitat effects analysis for the Angora Project must be informed by both habitat and distribution population monitoring data. The sections below summarize the habitat and distribution population status and trend data for the yellow warbler. This information is drawn from the detailed information on habitat and population trends in the SNF Bioregional MIS Report (Project Record Document E67), which is hereby incorporated by reference.

Habitat Status and Trend. There are currently 29,000 acres of riparian habitat on National Forest System lands in the Sierra Nevada. Within the last decade, the trend is stable.

Population Status and Trend. The yellow warbler has been monitored in the Sierra Nevada at various sample locations by avian point counts and breeding bird survey protocols, including Lassen NF (Project Record Documents E139 and E140) and Inyo NF (Project Record Document E141) point counts; California Partners in Flight monitoring and studies; and 1968 to present – BBS routes throughout the Sierra Nevada (Project Record Document E142). Current data at the rangewide, California, and Sierra Nevada scales indicate that the distribution of yellow warbler populations in the Sierra Nevada is stable.

Relationship of Project-Level Habitat Impacts on Bioregional-Scale Yellow Warbler Trend. The anticipated increase in riparian vegetation, and the increase in deciduous canopy closure within the existing riparian vegetation out of 29,000 acres of riparian habitat on National Forest System lands in the Sierra Nevada, while an important contribution to wildlife and habitat integrity within the project area, would not alter the existing trend in the habitat, nor would it lead to a change in the distribution of yellow warblers across the Sierra Nevada bioregion.

Wet Meadow Habitat (Pacific Tree Frog)

Habitat/Species Relationship

The Pacific tree frog was selected as an MIS for wet meadow habitat in the Sierra Nevada. This broadly distributed species requires standing water for breeding; tadpoles require standing water for periods long enough to complete aquatic development, which can be as long as 3 or more months at high elevations in the Sierra Nevada (Project Record Document E38). During the day during the breeding season, adults take cover under clumps of vegetation and surface objects near water; for the remainder of the year, they leave their breeding sites and seek cover in moist niches in buildings, wells, rotting logs or burrows (Project Record Document E38).

Project-Level Effects Analysis – Wet Meadow Habitat

Habitat Factor(s) for the Analysis: (1) Acres of wet meadow habitat [CWHR wet meadow (WTM) and freshwater emergent wetland (FEW)]. (2) Acres with changes in CWHR herbaceous height classes [short herb (< 12 inches), tall herb (> 12 inches)]. (3) Acres with changes in CWHR herbaceous ground cover classes (Sparse = 2%–9%; Open = 10%–39%; Moderate = 40%–59%; Dense = 60%–100%). (4) Changes in meadow hydrology.

Current Condition of the Habitat Factor(s) in the Project Area

Acres of Wet Meadow Habitat: Within the project area, there is approximately 4.6 acres of wet meadow habitat. It is assumed the acreage of wet meadow habitat was not altered by the fire. It's possible the loss of vegetation due to the fire, has increased the amount of water available to the wet meadow habitat.

Acres with Changes in CWHR Herbaceous Height Classes: Data regarding herbaceous height classes are not available. Therefore, this habitat factor is discussed in general qualitative and quantitative terms (i.e., increases and decreases). It is assumed that post-fire, the wet meadow in the analysis area is composed of a heterogeneous distribution of tall and short herb height classes.

Acres with Changes in CWHR Herbaceous Ground Cover Classes: Data regarding herbaceous ground cover classes are not available. Therefore, this habitat factor is discussed in general qualitative and quantitative terms (i.e., increases and decreases). It is assumed that post-fire, the wet meadow in the analysis area is composed of a heterogeneous distribution of ground cover classes.

Changes in Meadow Hydrology: Past land uses (e.g., grazing, fire suppression) in the wet meadow have likely altered the meadow's ecological function. These alterations might have caused the conversion of some wet meadow into drier meadows, which are susceptible to conifer encroachment.

Alternative 1 (No-Action Alternative)

Direct and Indirect Effects on Habitat

Selection of this alternative would not authorize any federal actions. Therefore, no direct or indirect impacts on wet meadow habitat would occur.

Cumulative Effects on Habitat in the Analysis Area

There are no cumulative effects of the No-Action Alternative because there are no direct or indirect effects. No changes to wet meadow habitat would occur as a result of the No-Action Alternative; therefore, this alternative would not alter the existing trend in the habitat.

Alternative 2 (Proposed Action)

Direct and Indirect Effects on Habitat

Acres of Wet Meadow Habitat: An unknown amount of meadow sod will be removed from various locations within the meadow to vegetate stream banks along the new channel and place over the soil cap of the old channel. While exact acres are unknown, the general trend of the Alternative 2 is to increase the amount of wet meadow habitat, as follows. The 1,200 feet of channel reconstruction through the meadow above Lake Tahoe Boulevard could increase the amount of wet meadow habitat. The planned restoration of 13-acre Gardner Meadow (i.e., fill and plug 1,500 feet of incised channel and installation of grade control structures to maintain the new elevation) could increase the amount of wet meadow habitat. Restoration of Seneca Pond into a functional wetland could include an increase of wet meadow habitat within the restoration site. Roads and trails routed out of the SEZ could allow habitat to revert to native conditions and potentially increase the number of acres of wet meadow.

Acres with Changes in CWHR Herbaceous Height Classes: The desired future condition for meadow vegetation is late seral (50% or more of the relative cover of the herbaceous layer is late seral with high similarity to the potential natural community). The Proposed Action is expected to move meadow vegetation toward this condition. The distribution of tall and short herbaceous height classes in wet meadows would be affected by project actions such as increased stream-floodplain connectivity. Species adapted to drier conditions would move slightly upslope while those adapted to wetter soil conditions would colonize or expand into lower areas. Ground cover suitable for pacific tree frog in wet meadows would be expected to increase following project implementation, and is expected to persist in the long term.

Acres with Changes in CWHR Herbaceous Ground Cover Classes: Herbaceous ground cover in wet meadows would increase due to the restoration components of the Proposed Action. Increased ground cover would increase soil moisture retention and would improve habitat quality for post-metamorphic frogs.

Changes in Meadow Hydrology: The restoration component of the project would create a new channel for Angora Creek. The restoration could create a shallower channel with less streamflow capacity. As a result, adjacent meadow surfaces might be restored to active floodplain areas and flood more often than currently occurs. Over time, the increased presence of saturated soils and more sunlight would stimulate a healthier wet meadow habitat. Stream crossings would be designed to facilitate natural hydrologic processes and geomorphic function. They would not create barriers to aquatic dependent species.

<u>Cumulative Effects on Habitat in the Analysis Area</u>

Past, present, and reasonably foreseeable future actions affecting habitat in the analysis area are described in the Effects Analysis section of the BE/BA and Environmental Analysis documents for this project, and include construction of a new stream channel. The spatial scale of cumulative effects includes wet meadows adjacent to or within 0.5 mile of the project area. Past activities in the project area that contributed to current conditions are primarily fire suppression, which resulted in the stand-replacing Angora fire. Some past actions have likely contributed to the loss or alteration of an unknown number of acres of wet meadow habitat. No past vegetation management projects with the objectives of reclaiming meadow landscapes from encroaching conifers have been implemented. The South Shore Project, which will occur adjacent to and within 0.5 mile of the Angora Project, will increase the amount of wet meadow habitat. Overall changes in wet meadow habitat due to cumulative effects of Alternative 2 and other past, present and foreseeable future projects would be positive, creating at least eight acres in the long-term and would improve how these systems function hydrologically. Any other future projects are unlikely to adversely affect the number of acres of wet meadow habitat, being either neutral or beneficial.

Summary of Pacific Tree Frog Status and Trend at the Bioregional Scale

The LTBNF LRMP (as amended by the SNF MIS Amendment) requires bioregional-scale habitat and distribution population monitoring for the Pacific tree frog; hence, the wet meadow effects analysis for the Angora Project must be informed by both habitat and distribution population monitoring data. The sections below summarize the habitat and distribution population status and trend data for the Pacific tree frog. This information is drawn from the detailed information on habitat and population trends in the SNF Bioregional MIS Report (Project Record Document E67), which is hereby incorporated by reference.

Habitat Status and Trend. There are currently 66,000 acres of wet meadow habitat on National Forest System lands in the Sierra Nevada. Within the last decade, the trend is stable.

Population Status and Trend. Since 2002, the Pacific tree frog has been monitored on the Sierra Nevada forests as part of the SNFPA monitoring plan (Project Record Documents E26, E143, and E144). These data indicate that Pacific tree frog continues to be present at these sample sites, and current data at the rangewide, California, and Sierra Nevada scales indicate that the distribution of Pacific tree frog populations in the Sierra Nevada is stable.

Relationship of Project-Level Habitat Impacts on Bioregional-Scale Pacific Tree Frog Trend

The increase of eight acres of wet meadow habitat as a result of the proposed action, while positive and potentially beneficial to Pacific tree frogs at the scale of the project, and possibly the Lake Tahoe basin, would not alter the existing stable trend for wet meadow habitat. Therefore, the effects of the Angora Project would not alter the existing stable trend in the habitat for Pacific tree frog across the Sierra Nevada bioregion.

Early and Mid Seral Coniferous Forest Habitat (Mountain Quail)

Habitat/Species Relationship

The mountain quail was selected as the MIS for early and mid seral coniferous forest (ponderosa pine, Sierran mixed conifer, white fir, red fir, and eastside pine) habitat in the Sierra Nevada. Early seral coniferous forest habitat is comprised primarily of seedlings (< 1-inch dbh), saplings (1- to 5.9-inch dbh), and pole-sized trees (6- to 10.9-inch dbh). Mid seral coniferous forest habitat is comprised primarily of small-sized trees (11- to 23.9-inch dbh). The mountain quail is found particularly on steep slopes, in open, brushy stands of conifer and deciduous forest and woodland, and chaparral; it may gather at water sources in the summer, and broods are seldom found more that 0.8 km (0.5 mi) from water (Project Record Document E138).

Project-level Effects Analysis – Early and Mid Seral Coniferous Forest Habitat

Habitat Factor(s) for the Analysis: (1) Acres of early (CWHR tree sizes 1, 2, and 3) and mid seral (CWHR tree size 4) coniferous forest (ponderosa pine, Sierran mixed conifer, white fir, red fir, and eastside pine) habitat [CWHR ponderosa pine (PPN), Sierran mixed conifer (SMC), white fir (WFR), red fir (RFR), eastside pine (EPN), tree sizes 1, 2, 3, and 4, all canopy closures]. (2) Acres with changes in CWHR tree size class. (3) Acres with changes in tree canopy closure. (4) Acres with changes in understory shrub canopy closure.

Current Condition of the Habitat Factor(s) in the Project Area

Acres of Early and Mid Seral Coniferous Forest: Currently 0 acres of early seral coniferous forest and 951 acres of mid seral coniferous forest occur within the project area. Approximately 627 acres of mid seral coniferous forest occur within the twelve treatment stands planned for treatment as part of the Angora Project.

CWHR Tree Size Class: The mid seral habitat type is comprised of CWHR size class 4 (951 acres).

Tree Canopy Closure: Canopy closure for mid seral coniferous forest in the project area includes 693 acres of sparse (10%–24%), 174 acres of open (25%–39%), and 84 moderate (40%–59%).

Understory Shrub Canopy Closure: Data regarding understory shrub cover are not available.

Alternative 1 (No–Action Alternative)

Direct and Indirect Effects on Habitat

Selection of this alternative would not authorize any federal actions, and therefore, no direct or indirect effects would result. Therefore, no direct or indirect impacts on early or mid seral coniferous forest would occur.

Cumulative Effects on Habitat in the Analysis Area

No direct or indirect effects would occur; therefore, no cumulative effects would occur. No changes to early and mid-seral coniferous forest would occur as a result of the No-Action Alternative; therefore, this alternative would not alter the existing trend in the habitat.

Alternative 2 (Proposed Action)

Direct and Indirect Effects on Habitat

Acres of Early and Mid Seral Coniferous Forest: Ground and aerial removal of dead and live trees would affect 159 acres of early seral coniferous forest and 627 acres of mid seral coniferous forest. Post project, the number of acres of early and mid seral coniferous forest would remain unchanged. However, in the long term (20 years), tree size and canopy closure would change within the majority of the treated stands. Early seral coniferous forest is expected to develop on 460 acres that were formerly classified as barren. While 356 acres of SMC4S would remain the same (stand 12), tree size would increase from 11- to 24-inch dbh to greater than a 24-inch dbh in 271 acres; canopy closure would change from 10%–24% to 25%–39% in 67 acres (Table 3.6-6). However, because the species composition is expected to be dominated by Jeffrey pine, which is not listed as a suitable CWHR habitat, this early seral coniferous forest would not provide habitat for mountain quail.

CWHR Tree Size Class: Post-project, the proposed dead tree removal would have no effect on residual live tree size. There would be no change in early or mid seral habitat as a result of removing hazard trees. Post-project, the removal of live trees could reduce the amount of mid seral habitat in 15 acres in stand 4 (Table 3.6-6). In the long term, 356 acres of SMC4S would remain the same (stand 12), but tree size would increase from 11- to 24-inch dbh to greater than 24-inch dbh in 271 acres.

As the decommissioned roads become re-vegetated, it is possible early seral forest could develop on the former road beds. Early seral coniferous forest is expected to develop on 460 acres that were formerly classified as barren. However, because the species composition is expected to be dominated by Jeffrey pine, which is not listed as a suitable CWHR habitat, this early seral coniferous forest might not provide habitat for mountain quail.

In other locations, such as aspen stands, confer thinning is likely to lead to a loss of conifer habitat. Conifers would be removed from approximately six acres of aspen stands. Removal of encroaching conifer may reduce tree size class in the short-term. In the long-term (20 years), aspen tree size is likely to increase in some stands due to decreased competition from conifers.

Tree Canopy Closure: Dead or hazard tree removal would not change the CWHR type within any stand as dead trees do not contribute to canopy closure. Post-project, the removal of live trees could reduce the amount tree canopy closure in 15 acres in stand 4 (Table 3.6-6). In the long term (20 years), tree canopy closure is expected to increase on 460 acres that were formerly classified as barren. Because the species composition is expected to be dominated by Jeffrey pine, which is not listed as a suitable CWHR habitat, this increased tree canopy closure might not contribute to suitable habitat for mountain quail.

Understory Shrub Canopy Closure: Project activities, such as mechanical removal of live and dead trees, might cause a short-term alteration in the shrub component of early and mid seral forest that was not affected by the fire. However, the shrubs would recover and no long term adverse effects on understory shrub canopy closure are expected. In the long term, understory shrub canopy closure might be reduced due to the eventual development of early seral coniferous forest and late seral stage forest.

Cumulative Effects on Habitat in the Analysis Area

Past, present, and reasonably foreseeable future actions affecting habitat in the analysis area are described in the Effects Analysis section of the BE/BA document for this project, and include construction of a new stream channel; mechanical removal of live and dead trees; and decommissioning approximately four miles of roads and trails. The spatial scale of cumulative effects includes early and mid seral coniferous forest adjacent to or within 0.5 mile of the project area. Past activities in the project area that contributed to current conditions are primarily fire suppression, which resulted in the stand-replacing Angora fire. These past actions might have contributed to an increase in the number of acres of early and mid seral coniferous habitat. The South Shore Project, which will occur adjacent to and within 0.5 mile of the Angora Project, will include an increase in average tree size class of stands due to the removal of smaller trees and retention of the largest trees within stands, reduction in total canopy cover, and a short term reduction in understory shrub cover. Cumulative effects of the proposed action along with other present and foreseeable future projects in the Angora Project area that may affect early and mid seral coniferous forest are expected to result in a net loss of this habitat type (seral stage) and to increase the representation of late seral forest.

Summary of Mountain Quail Status and Trend at the Bioregional Scale

The Lake Tahoe Basin Management Unit LRMP (as amended by the SNF MIS Amendment) requires bioregional-scale habitat and distribution population monitoring for the mountain quail; hence, the early and mid seral coniferous forest effects analysis for the Angora Project must be informed by both habitat and distribution population monitoring data. The sections below summarize the habitat and distribution population status and trend data for the mountain quail. This information is drawn from the detailed information on habitat and population trends in the SNF Bioregional MIS Report (Project Record Document E67), which is hereby incorporated by reference.

Habitat Status and Trend. There are currently 546,000 acres of early seral and 2,766,000 acres of mid seral coniferous forest (ponderosa pine, Sierran mixed conifer, white fir, and red fir) habitat on National Forest System lands in the Sierra Nevada. Within the last decade, the trend for early seral is slightly decreasing (from 9% to 5% of the acres on National Forest System lands) and the trend for mid seral is slightly increasing (from 21% to 25% of the acres on National Forest System lands).

Population Status and Trend. The mountain quail has been monitored in the Sierra Nevada at various sample locations by hunter survey, modeling, and breeding bird survey protocols, including California Department of Fish and Game hunter survey, modeling, and hunting regulations assessment (Project Record Documents E145 and E146) and 1968 to present – BBS routes throughout the Sierra Nevada (Sauer et al. 2007 as cited in Project Record Document E142). These data indicate that mountain quail continue to be present across the Sierra Nevada, and that the distribution of mountain quail populations is stable.

Relationship of Project-Level Habitat Impacts on Bioregional-Scale Mountain Quail Trend

The changes in tree size class, tree canopy closure, and understory shrub cover within 786 acres of early and mid-seral coniferous habitat in the project area may convert early and mid-seral dominated coniferous forest towards late seral stages, but would not likely alter the existing trend in the habitat at the Sierra Nevada scale.

Snags in Green Forest Ecosystem Component (Hairy Woodpecker)

Habitat/Species Relationship

The hairy woodpecker was selected as the MIS for the ecosystem component of snags in green forests. Medium (diameter breast height between 15 to 30 inches) and large (diameter breast height greater than 30 inches) snags are most important. The hairy woodpecker uses stands of large, mature trees and snags of sparse to intermediate density; cover is also provided by tree cavities (Project Record Document E138). Mature timber and dead snags or trees of moderate to large size are apparently more important than tree species (Project Record Document E147).

Project-level Effects Analysis – Snags in Green Forest Ecosystem Component

Habitat Factor(s) for the Analysis: (1) Medium (15- to 30-inch dbh) snags per acre. (2) Large (greater than 30-inch dbh) snags per acre.

Current Condition of the Habitat Factor(s) in the Project Area

Medium and Large Snags (Greater than 30 inches dbh) per Acre: Within the project area, approximately 2,258 acres of forest habitat in the 11- to 24-inch dbh to > 24-inch dbh range is present (see Table 3.6-25). Approximately 927 and 931 acres burned at high and moderate fire severity, respectively. Approximately 400 acres burned at low fire severity. For the purposes of this analysis, the forest habitat that burned at low severity is considered green forest with snags. However, no specific data exist on snag densities in this acreage. Pre-fire, there was 35.4 acres of coniferous forest greater than 24-inch dbh. It is possible that some of these trees might be burned and still standing within green forest.

Data from common stand exam data were available for characterizing snag densities in burned forest within the project's proposed treatment areas. Twelve stands dominated by burned forest were surveyed for snags. Average snag densities in burned forest were calculated using weighted averages based on the size of each stand.

1. Medium (15- to 30-inch dbh) snags per acre: An average of 13.9 medium snags occur per acre in burned forest within the wildlife analysis area.
2. Large (greater than 30-inch dbh) snags per acre: An average of 2.3 large snags occur per acre within burned forest stands in the wildlife analysis area, based on data from 12 burned stands in the wildlife analysis area.

Alternative 1 (No-Action Alternative)

<u>Direct and Indirect Effects on Habitat</u>

Selection of this alternative would not authorize any federal actions. Therefore, no direct or indirect effects would result.

<u>Cumulative Effects on Habitat in the Project Area</u>

No direct or indirect effects would occur; therefore, no cumulative effects would occur. No changes to snags in green forest would occur as a result of the No-Action Alternative; therefore, this alternative would not alter the existing trend in the habitat.

Alternative 2 (Proposed Action)

<u>Direct and Indirect Effects on Habitat</u>

Medium and Large Snags (Greater than 30 inches dbh) per Acre: No changes in the total area of green forest containing snags would be expected as a result of the Proposed Action. Of the 400 acres of low severity burned forest, approximately 160 acres within treatment stands 1-12 would be treated for live and dead tree removal. The Proposed Action would reduce the density of existing medium snags and future recruitment of snags (due to removal of green trees) by an unknown amount. However, an average of four of the largest diameter snags would be retained per acre. (Thus, it is unlikely that large snags (greater than 30-inch dbh) would be removed.) Snags would have at least a 15-inch dbh in clumped and irregular spacing, depending on the average size class of trees in the stand.

<u>Cumulative Effects on Habitat in the Project Area</u>

Past, present, and reasonably foreseeable future actions affecting habitat in the analysis area are described in the Effects Analysis section of the BE/BA document for this project, and include construction of a new stream channel; mechanical removal of live and dead trees; and decommissioning approximately four miles of roads and trails. The spatial scale of cumulative effects includes early and mid seral coniferous forest adjacent to or within 0.5 mile of the project area. Past activities in the project area that contributed to current conditions are primarily fire suppression, which resulted in the stand-replacing Angora fire. The South Shore Project will occur adjacent to and within 0.5 mile of the Angora Project, and will include (1) removal of excessive fuels loads of all size classes in the short-term, and (2) thinning of the forest to promote growth of larger trees that would ultimately become decadent and contribute to increased average size class of snags in the future. Cumulative effects of proposed actions along with past, present and foreseeable future projects that may affect snags in green forest would likely result in the reduction of both medium and large snags in the short-term, but long-term retention of snag recruitment for both medium and large snags. Minimum levels of snag retention would occur for both the South Shore Project and Angora Project.

Summary of Hairy Woodpecker Status and Trend at the Bioregional Scale

The Lake Tahoe Basin Management LRMP (as amended by the SNF MIS Amendment) requires bioregional-scale habitat and distribution population monitoring for the hairy woodpecker; hence, the snag effects analysis for the Angora Project must be informed by both habitat and distribution population monitoring data. The sections below summarize the habitat and distribution population status and trend data for the hairy woodpecker. This information is drawn from the detailed information on habitat and distribution population trends in the SNF Bioregional MIS Report (Project Record Document E67), which is hereby incorporated by reference.

Ecosystem Component Status and Trend. The current (based on 2001–2004 inventory sources) average number of medium-sized and large-sized snags (> 15-inch dbh, all decay classes) per acre across major coniferous and hardwood forest types (west-side mixed conifer, ponderosa pine, white fir, productive hardwoods, red fir, eastside pine) in the Sierra Nevada ranges from 1.4 per acre in eastside pine to 8.3 per acre in white fir. Detailed information by forest type, snag size, and snag decay class can be found in the SNF Bioregional MIS Report (Project Record Document E67).

Population Status and Trend. The hairy woodpecker has been monitored in the Sierra Nevada at various sample locations by avian point counts and breeding bird survey protocols, including 1997 to present – Lassen National Forest (Project Record Documents E148 and E149); 2002 to present - Plumas and Lassen National Forests (Project Record Document E150); and 1968 to present – BBS routes throughout the Sierra Nevada (Project Record Document E142). These data indicate that the hairy woodpecker continues to be present at these sample sites, and that the distribution of hairy woodpecker populations in the Sierra Nevada is stable.

Relationship of Project-Level Habitat Impacts on Bioregional-Scale Hairy Woodpecker Trend

The changes in medium and large-sized snags per acre on 160 acres in the Angora Project Area would not alter the existing trend in the ecosystem component, nor would it lead to a change in the distribution of hairy woodpecker across the Sierra Nevada bioregion.

Snags in Burned Forest Ecosystem Component (Black-Backed Woodpecker)

Habitat/Species Relationship

The BBWP was selected as the MIS for the ecosystem component of snags in burned forests. Recent data indicate that black-backed woodpeckers are dependent on snags created by stand-replacement fires (Project Record Documents E151–E153). The abundant snags associated with severely burned forests provide both prey (by providing food for the specialized beetle larvae that serve as prey) and nesting sites (Project Record Document E154). Black backed woodpeckers were also found to select for moderate burn severity (Project Record Document E155). Thus, suitable habitat would be considered in moderate to high vegetation burn severity areas of the pre-fire CWHR types listed below (Tables 10 and 11). Low vegetation burn severity habitat is not considered suitable BBWP habitat at present but would contribute future snag habitat for BBWP foraging and nesting near moderate and high burn severity areas (Project Record Document E151).

Project-level Effects Analysis – Snags in Burned Forest Ecosystem Component

Habitat Factor(s) for the Analysis: (1) size 4 (small tree) (11- to 23.9-inch dbh) snags per acre within burned forest created by stand-replacing fire. (2) size 5 (medium/large tree (> 24-inch dbh) snags per acre within burned forest created by stand-replacing fire, CWHR types, 4M, 4D, 5M, 5D, and 6 (Project Record Document E156).

Current Condition of the Habitat Factor(s) in the Project Area

Prior to the Angora fire, the existing vegetation within the analysis area (EVEG GIS layers for the Lake Tahoe basin [12/08]) was dominated by mid-seral stage Jeffrey pine and Sierran mixed conifer forest (Table 3.6-25). Vegetation structure in conifer forests within the project area was dominated by CWHR (California Wildlife Habitat Relationship system (CWHR v. 8.1)) tree size class 4 (11- to 24-inch dbh), and by open (25%–39%) to moderate (40%–59%) overstory canopy cover (Table 3.6-25).

Table 3.6-25. Pre-Fire Acres in Conifer CWHR 4M, 4D, 5M, 5D, and 6

CWHR Habitat Type	CWHR Size (diameter at breast height, inches) [1]	CWHR Density (canopy Closure) [2]	CWHR Acres in the Project Area
Jeffrey Pine	11–24	60–100	0.6
Jeffrey Pine	11–24	40–59	785.8
Jeffrey Pine	> 24	40–59	8.9
Lodgepole Pine	11–24	60–100	7.2
Lodgepole Pine	11–24	40–59	250.6
Lodgepole Pine	> 24	60–100	0.6
Lodgepole Pine	> 24	40–59	3.6
Red Fir	11–24	60–100	15.1
Red Fir	11–24	40–59	64.4
Subalpine Conifer	11–24	40–59	0.2
Sierran Mixed Conifer	11–24	60–100	4.0
Sierran Mixed Conifer	11–24	40–59	1095.0
Sierran Mixed Conifer	> 24	40–59	22.3
TOTAL ACRES			2,258.1

[1] Tree size class: 1 = < 1-inch dbh; 2 = 1- to 6-inch dbh; 3 = 6- to 11-inch dbh; 4 = 11- to 24-inch dbh; 5 = > 24-inch dbh; 6 = size 5 over size 4 or 3, with total tree crown closure greater than 60%.
[2] Canopy closure class: S (sparse) = 10%–24%; P (open) = 25%–39%; M (moderate) = 40%–59%; and D (dense) = 60%–100%.

Specific to the black-backed woodpecker, Table 3.6-25 shows a total of 2,258.1 acres of pre-fire conifer CWHR 4M, 4D, 5M, 5D, and 6 within the analysis area. Within these same CWHR types, the current number of acres of suitable moderate and high burn severity habitat for the black-backed woodpecker totals 1,858 acres (Table 3.6-26). The majority of these CWHR types burned at high (41%) and moderate (41.2%) severity.

Table 3.6-26. Acres of Conifer CWHR 4M, 4D, 5M, 5D, and 6 Within the Angora Project Area Affected by Different Burn Severities from the Fire

CWHR Type	CWHR Size	CWHR Density	Area (acres)	High Burn Severity (acres)	Moderate Burn Severity (acres)	Low Burn Severity (acres)
ASP	4	D	1.2	1.2	0	0
JPN	4	D	0.6	0	0	0.6
JPN	4	M	785.8	197.6	373.1	215.1
JPN	5	M	8.9	0	3.1	5.8
LPN	4	D	7.3	4.4	0.8	2.0
LPN	4	M	250.7	71.7	126.7	52.2
LPN	5	D	0.6	0	0.6	0
LPN	5	M	3.7	0	3.7	0
RFR	4	D	15.2	12.2	0.7	2.2
RFR	4	M	64.4	41.7	21.2	1.6
SCN	4	M	0.2	0	0	0.2
SMC	4	D	4.1	0	0	4.1
SMC	4	M	1094.9	596.4	388.2	110.4
SMC	5	M	22.3	2.9	13.0	6.5
TOTAL			2,259.3	928.1	931.1	400.7

A total of 2,258 acres of burned forest containing a snag component exist within the wildlife analysis area. Data from common stand exam data were available for characterizing snag densities in burned forest within the project's proposed treatment areas. Twelve stands dominated by burned forest were surveyed for snags. Average snag densities in burned forest were calculated using weighted averages based on the size of each stand.

1. Medium (15–30-inch dbh) snags per acre: An average of 13.9 medium snags occur per acre in burned forest within the wildlife analysis area.
2. Large (greater than 30-inch dbh) snags per acre: An average of 2.3 large snags occur per acre within burned forest stands in the wildlife analysis area, based on data from 12 burned stands in the wildlife analysis area.

The number of acres of each of the pre-fire conifer CWHR 4M, 4D, 5M, 5D, and 6 moderate and high burn severity that will be treated in the 12 treatment stands is illustrated in Table 3.6-27.

Table 3.6-27. Acres of Suitable Black-Backed Woodpecker Habitat Affected by Moderate and High Burn Severity and That Will be Treated in the Angora Project

CWHR Type	CWHR Size	CWHR Density	Acres Treated High Burn Severity	Acres Untreated High Burn Severity	Acres Treated Moderate Burn Severity	Acres Untreated Moderate Burn Severity
JPN	4	D	0	0	0	0
JPN	4	M	158.3	39.2	209.7	163.4
JPN	5	M	0	-	0	3.1
LPN	4	D	4.4	0	0.8	0
LPN	4	M	71.7	0	121.3	5.5
LPN	5	D	0	0	0.1	0.5
LPN	5	M	0	-	0	3.6
RFR	4	D	12.2	0	0.7	0
RFR	4	M	23.4	18.2	4.5	16.6
SCN	4	M	0	-	0	-
SMC	4	D	0	-	0	-
SMC	4	M	380.5	215.9	161.4	226.7
SMC	5	M	0	2.9	0	13.0
TOTAL			650.5	276.1	498.7	432.4

Alternative 1 (No-Action Alternative)

Direct and Indirect Effects on Habitat

Selection of this alternative would not authorize any federal actions. Therefore, no direct or indirect effects would result.

Cumulative Effects on Habitat in the Project Area

No direct or indirect effects would occur; therefore, no cumulative effects would occur. No changes to snags in burned forest would occur as a result of the No-Action Alternative; therefore, this alternative would not alter the existing trend in the habitat.

Alternative 2 (Proposed Action)

Direct and Indirect Effects on Habitat

Direct effects include removal of burned trees and live trees and downed woody fuel. Under the proposed action, dead and live tree removal would occur on approximately 1,542 acres (56% of Forest Service lands) within the analysis area, while a total of 1,196 acres (44% of Forest Service lands) would not have any treatment. As shown in Table 3.6-27, 1,149 acres out of a total of 1,858 acres of suitable BBWP habitat (61.6%) within the analysis area would be treated in the proposed action. Approximately 69% of the high burn severity habitat would be treated and approximately 53% of moderate burn severity habitat would be treated.

The 713 untreated acres of suitable BBWP habitat within the analysis area would be retained and available to support 16 to 23 territories, assuming a territory size of 30-62 acres (Project Record Document E157). (For moderate burn severity habitat, there would be seven to 14 territories; for high burn severity habitat there would be four to nine territories.) Likewise, treatment in the 1,149 acres could reduce potential BBWP territories by 18 to 32 territories. Although Hutto and Gallo (Project Record Document E154) found fewer BBWP nests in salvage-logged plots than in unlogged plots in the Northern Rockies, they concluded that this was a matter of reduction in food source (wood-boring beetle larvae) rather than nest site availability. Thus, while live and dead tree removal would occur within suitable habitat, the extent to which this reduces nesting habitat is not entirely predictable.

Hutto (Project Record Document E151) concluded that it is possible that BBWP populations are maintained by source refuges of low numbers in unburned forests. The results of the Multi-Species Inventory and Monitoring (Project Record Document E158) for the Lake Tahoe Basin Management Unit detected BBWP at 12 of 105 forestwide sites; these sites did not include burned forest. The BBWP was also detected at nine of 148 lentic sites. The black-backed woodpecker was also captured during mist netting in aspen habitats in Marlette Basin (Project Record Document E159). Thus, the BBWP appears to be distributed within the Lake Tahoe Basin at low numbers regardless of the availability of burned forest.

Medium and large snag densities would be reduced on approximately 1,149 acres of burned forest. Outside of the Wildlife Snag Zone Acreages, an average of four of the largest diameter snags would be retained. Snags would have at least a 15-inch dbh in clumped and irregular spacing, depending on the average size class of trees in the stand. Under Alternative 2, snags would be reduced by approximately 70% from current post-fire conditions. Removal of snags with a dbh of more than 30 inches is likely to be limited due to design features. Overall, the project area would retain a mosaic of areas with low to high densities of snags, consisting of a variety of sizes.

The 1,149 acres of suitable BBWP habitat proposed for dead tree removal represents 41.8% of the total area that burned. The proposed action would leave approximately 1,196 acres untreated where snag recruitment and BBWP invasion could occur. The burned areas of suitable and non-suitable BBWP habitat that would not be treated would retain their existing snags. Over the next 5 years, additional snags would be recruited in untreated areas (and potentially in treated areas following completion of project activities) because some trees that survived the immediate effects of the fire would eventually die from the combined stresses of the fire, subsequent insect attacks, and multiple years of drought.

High Burn Severity Patch Size Analysis

Assuming a minimum territory size of 30 acres (Project Record Document E157), it is possible that severely burned habitat patches, which will not be treated and are less than 30 acres, might not provide sufficient suitable habitat for BBWP. A GIS analysis was performed to analyze the effects of Alternative 2 on large patches (greater than 30 acres) of CWHR types 4M, 4D, 5M, 5D, and 6 that experienced high vegetation burn severity effects in the Angora Fire. The analysis showed four patches over 30 acres in size of suitable BBWP habitat meeting these criteria. The total acreage in these four large habitat patches is 854 acres.

When adjacent and connected patches of high burn severity suitable habitat were combined with the large (over 30 acres) patches, a total of 696 acres were considered large patches of suitable high burn severity BBWP habitat. (Two patches of 645.1 and 31.9 acres were combined with an adjacent patch that is 19.3 acres.)

Alternative 2 would treat approximately 598 acres (70%) of the 854 acres of this suitable BBWP habitat. Hence, Alterative 1 would retain the remaining 256 acres (30%) of suitable BBWP high burn severity habitat in large patch configurations (patch sizes greater than 30 acres and including adjacent/connected suitable habitat of smaller patch sizes) in the Analysis Area in an untreated condition (Table 3.6-28).

These 256 acres would support 4.2 to 8.5 BBWP territories. The 223 acres of untreated large patches combined with contiguous adjacent habitat patches would support 3.7 to 7.4 BBWP territories.

Table 3.6-28. Comparison of Amounts of High Burn Severity Black-Backed Woodpecker Habitat Impacted Under the Angora Project, Based on Different Definitions of Suitable Patch Size

	High Burn Severity BBWP Habitat Patches Larger than 30 acres	High Burn Severity BBWP Habitat Patches Larger than 30 acres Combined with Contiguous Adjacent Habitat Patches	High Burn Severity BBWP Habitat of All Patch Sizes
Amount of BBWP Habitat within the 2,738-acre Analysis Area	854 acres	696 acres	939 acres
Amount of Suitable BBWP Habitat Treated under Alternative 2	598 acres (70%)	473 acres (68%)	650 acres (69%)

Wildlife Snag Zones

The project design includes 12 Wildlife Snag Zones, which range in size from 7.4 to 38.6 acres, and are described as (1) leave islands; (2) leave/plant islands; (3) modified fuels/SEZ; and (4) modified fuels/subdivision. These zones would receive minimal to no treatment and are being retained as habitat for a diverse set of species including the BBWP. No treatment would occur in types one and two. Type three would retain 40 snags per acre of the largest (greater than a 20-inch dbh) size class while type four would retain 15 snags of the largest (greater than a 15-inch dbh) size class.

These Wildlife Snag Zones are primarily located within areas of high burn severity. None of the patches by themselves are 30 acres in size. However, four of the patches are within 194 to 242 feet of each other. These patches contain suitable habitat for BBWP and will not be treated. This analysis considers them close enough together to form a patch of suitable habitat that is approximately 49 acres in size.

Cumulative Effects on Habitat in the Project Area

The spatial boundary for analyzing cumulative effects on habitat for the black-backed woodpecker is the Angora Project area and the southern portion of the Lake Tahoe Basin. This analysis area was chosen in order to encompass other locations within the Lake Tahoe Basin that have experienced fire in the previous eight years. Two other fires have occurred within the analysis area: the Gondola Fire and the Shower Fire. This spatial scale would also cover the probable source of BBWP invasion into the analysis area and subsequent establishment of new breeding territories. The temporal boundary is eight years and is based on published research of BBWP use and densities years after stand replacing fires (Project Record Documents E160–E162).

There are 276 acres of private land within the Angora fire perimeter. Activities on private lands are regulated by the state and are outside of the jurisdiction of the Forest Service. Live and dead tree removal on the private lands may not retain all attributes believed important to sensitive wildlife species. Information on any removal that might have occurred on the private lands is not available. Therefore, this analysis assumes that the 276 acres is not suitable habitat for BBWP

Since 2001, there have been two other wildfires in the cumulative effects analysis area. The Gondola and Shower fires encompassed 649 and 289 acres, respectively. A total of 24% (153 acres) of the Gondola fire contains suitable BBWP habitat (as defined above). A total of 51% (148 acres) of the Showers fire contains suitable BBWP habitat. Because no salvage logging occurred at either fire, together the fires contribute 301 acres of suitable BBWP habitat. Therefore, the cumulative acreage of burned forest with potential reductions in medium and large snag densities is limited to the 1,149 acres that would be affected by the Angora Project.

The South Shore Project is the only other project known to be scheduled within the cumulative effects analysis area that could affect BBWP habitat. This project is scheduled to treat 315 acres of the Angora Fire and includes a potential reduction of medium and large snag densities to three to eight snags per acre within the burned forest, per Forest Plan guidelines and project design features. These levels of snag retention are within the range of average snag densities observed across the Sierra Nevada bioregion.

Past, present, and future harvests, including the Angora Project, will remove 53% of the suitable BBWP habitat created by wildfires during the past eight years on the LTBMU (2,159 total acres of suitable BBWP habitat from the Showers, Gondola, and Angora fires with retention of 1,014 acres). Therefore, the cumulative effect would be 53% of the suitable BBWP habitat removed and 47% of the suitable BBWP habitat retained.

Summary of Black-Backed Woodpecker Status and Trend at the Bioregional Scale

The Lake Tahoe Basin Management Unit LRMP (as amended by the SNF MIS amendment) requires bioregional-scale habitat and distribution population monitoring for the black-backed woodpecker; hence, the analysis for the Angora Project must be informed by both habitat and distribution population monitoring data. The sections below summarize the habitat and distribution population status and trend data for the black-backed woodpecker. This information is drawn from the detailed information on habitat and distribution population trends in the SNF bioregional MIS report (Project Record Document E67).

Ecosystem Component Status and Trend

The current (based on 2001–2004 inventory sources) average number of medium-sized and large sized snags (> 15-inch dbh, all decay classes) per acre across major coniferous and hardwood forest types (west-side mixed conifer, ponderosa pine, white fir, productive hardwoods, red fir, eastside pine) in the Sierra Nevada ranges from 1.4 per acre in eastside pine to 8.3 per acre in white fir. Detailed information by forest type, snag size, and snag decay class can be found in the SNF bioregional MIS report (Project Record Document E67). These data include snags in both green forest and burned forest. 211,000 acres were severely burned in the Sierra Nevada between 2000 and 2007. Data from the mid-to-late 1990s were compared with the current data to calculate the trend in total snags per acre by regional forest type for the 10 Sierra Nevada National Forests and indicate that, during this period, snags per acre increased within west-side mixed conifer (+0.80), white fir (+1.98), and red fir (+0.68) and decreased within ponderosa pine (-0.17), productive hardwoods (-0.17), and eastside pine (-0.16).

Population Status and Trend

The black-backed woodpecker has been monitored in the Sierra Nevada at various sample locations by avian point counts, spot mapping, mist-netting, and breeding bird survey protocols, including: ongoing monitoring through California Partners in Flight Monitoring Sites (Project Record Document E163); 2002 to present - Plumas and Lassen National Forests (Project Record Document E164); 1992 to 2005 – Sierra Nevada Monitoring Avian Productivity and Survivorship (MAPS) stations (Project Record Document E165); 1970 to present – various Sierra Nevada monitoring and study efforts (see Project Record Document E67, Table BLWO-IV-1); and 1971 to present – BBS routes throughout the Sierra Nevada (Project Record Document E142). These data indicate that black-backed woodpecker continue to be distributed across the Sierra Nevada; current data at the rangewide, California, and Sierra Nevada scales indicate that the distribution of black-backed woodpecker populations in the Sierra Nevada is stable.

Relationship of Project-Level Habitat Impacts on Bioregional-Scale Trend

The change in snag densities on 1,145 acres out of 3,072 acres of burned forest in the Angora analysis area would not alter the existing trend in the ecosystem component, nor would it lead to a change in the distribution of black-backed woodpecker across the Sierra Nevada bioregion. The 1,145 acres represents 0.5% of the total acres of 211,000 acres that severely burned in the Sierra Nevada Bioregion between 2001 and 2007. The forecast for increasing stand replacing fires for the foreseeable future across a significant part of the western United States (Project Record Document E166) indicates an increase in BBWP habitat availability for continued BBWP population growth.

3.6.5 Tahoe Regional Planning Agency Species and Habitat Analysis

In order to help maintain and protect natural resources in the Lake Tahoe Basin, the Tahoe Regional Planning Compact formed the TRPA Regional Plan which created and adopted environmental threshold carrying capacities ("thresholds" or "threshold standards").

The LTBMU LRMP directs that projects be guided by both the LRMP and the TRPA Regional Plan to support attainment of Environmental Thresholds (LRMP, pg IV-18). TRPA Thresholds refer to both habitats and species of interest. This section responds to LRMP direction by summarizing the consistency of the project's effects with relevant thresholds and the nature of potential effects to TRPA species of interest.

Impact Analysis for Wildlife Threshold Standards and Indicators (W-1, W-2)

W-1: Threshold Standard for Wildlife

Standard: Provide a minimum number of population sites and disturbance zones for TRPA listed species. Perching trees and nesting sites shall not be physically disturbed, nor shall the habitat within disturbance zone be manipulated in any manner, unless needed to enhance habitat quality.

Indicator: The minimum number of population sites and disturbance zones maintained as determined by inspection by qualified experts.

Table 3.6-29. W-1 Standard Threshold for Wildlife (Special Interest Species)

Species	Population Sites[1]	Disturbance Zone (mi.)[2]	Potential for this project to Impact Threshold Standard? Y/N
Northern goshawk (*Accipiter gentiles*)	12	0.50	Y
Osprey (*Pandion haliaetus*)	4	0.25	N
Bald eagle (winter) (*Haliaeetus leucocephalus*)	2	Mapped	N
Bald eagle (nesting)	1	0.50	N
Golden eagle (*Aquila chrysaetos*)	4	0.25	N[2]
Peregrine falcon (*Falco peregrinus anatum*)	2	0.25	N
Waterfowl	18	Mapped	N
Mule deer (*Odocoileus hemionus*)	Critical fawning habitat	Meadows-Critical fawning habitat is mapped	N

[1]Based on the Threshold Evaluation by TRPA (2002), many of the population site goals have not been attained, and may never be realized for species like the golden eagle and peregrine falcon because the Lake Tahoe basin has historically been considered suboptimal nesting habitat for both of these species. The northern goshawk threshold standard has a low likelihood of attainment by 2006 due to habitat fragmentation attributed to recreation encroachment nesting areas. The mule deer threshold is not likely to be realized due to recreational encroachment into meadows during fawning season (TRPA 2002 as cited in Project Record Document E14).

[2]Project activities are greater than 0.25 mile from the closest known golden eagle threshold nesting site. No project activities will occur within or adjacent to any golden eagle disturbance zones.

Disturbance zones for osprey, peregrine falcon, bald and golden eagle, waterfowl, and mule deer would apply as described in TRPA Code of Ordinances, Chapter 78.

Individual TRPA Special Interest Species

The USDA LTBMU Aquatic and Terrestrial Species Impact Analysis Report for the Tahoe Regional Planning Agency requires that Special Interest Species that occur in or adjacent to the project area, and for which there is the potential for disturbance or impacts, documentation of resource protection measures/mitigations must be provided and cumulative effects must be addressed. The one TRPA Special Interest Species that might be affected is the northern goshawk. See the section on Northern Goshawk above for analysis of effects to this species.

In order to provide clear ties to the individual species that are TRPA special interest species, the existing conditions for the wildlife habitats and the effects of the alternatives to those habitat conditions will be discussed specifically to these individual special interest species.

Vegetation treatment prescriptions within goshawk disturbance zones would be acceptable (i.e., meet the TRPA nondegradation standard) if they are consistent with prescriptions suitable for PACs.

W-2: Habitats of Special Significance

The Wildlife Threshold Standard W-2 states: A non-degradation standard shall apply to significant wildlife habitat consisting of deciduous trees, wetlands, and meadows while providing for opportunities to increase the acreage of such riparian associations.

The SC-2 (Soil Conservation) Threshold Standard Indicator states that to preserve existing natural functioning SEZs in their natural hydrological condition, restore all disturbed SEZ in undeveloped, unsubdivided lands, and restore 25% of the SEZ lands that have been identified as disturbed, developed or subdivided, to attain a 5% total increase in the naturally functioning SEZ land (Project Record Documents E167 and E168). The Threshold Standard can be met by avoiding negative effects on meadows, deciduous trees, and wetlands, and if these features are already disturbed, or developed in the project, look for restoration opportunities.

Is the proposed action within a SEZ? Yes

If yes, what kind of management or restoration work is proposed? Restoration activities for aquatic habitat and streams are proposed in four areas—the channel above Lake Tahoe Boulevard, portions of Angora Creek and its tributaries, Gardner Mountain Meadow, and the wetland complex at Seneca Pond. Proposed activities are described below.

Channel Reconstruction

Twelve hundred feet of channel through the meadow above Lake Tahoe Boulevard would be reconstructed. The old channel would be filled by utilizing excavated material from the new channel. Sod would be borrowed from various locations within the meadow to vegetate stream banks along the new channel and place over the soil cap of the old channel. Construction of the new channel would utilize heavy equipment (track hoe and a dump truck). Access to the work site would be from Lake Tahoe Boulevard by installing a temporary road, which would be rehabilitated upon completion of the new channel. Other site preparation would involve felling the remaining live and dead conifers from the meadow and placing this material along the floodplain margins and as in-channel grade control. Riparian shrubs (willow and alder) would be planted in strategic areas of the new and old channel to provide soil stability and resistance to scour. The new channel location would be tied in at 50 to 70 feet above the Lake Tahoe Boulevard road crossing structure (bottomless arch).

Large Wood Placement

Large woody debris would be placed in 2 miles of Angora Creek and tributaries. Existing large wood that is currently spanning the channel or along the floodplain margins would be utilized as source material. Wood would be placed in the channel as debris jams. These jams would function to induce fine sediment deposition, control grade, and increase the complexity of aquatic pool and cover habitat. Work would be accomplished with either a spider excavator ("walking backhoe") or hand crews. It is estimated that an average of three structures per 200 feet would be constructed.

Gardner Mountain Meadow (above Highway 89)

Live encroaching conifers within the 13-acre Gardner Mountain Meadow would be removed. The incised channel (1500 feet) would be filled in and plugged with soil material and grade control structures would be installed to maintain the new elevation. Riparian shrub and sod planting would be conducted as needed to stabilize areas of exposed soil.

Restore Wetland Complex

Seneca Pond would be completely drained and partially filled with onsite materials. The clay liner would be left in place to encourage a localized high groundwater table. The pond banks and earthen dam would be recontoured to decrease height and slope to match the surrounding area. Fill from the area that is currently crossed by the road/trail would be removed and the area would be recontoured to create a hydrologic connection between the pond area and lower SEZ. The upslope stream diversion would be removed, flow would be rerouted back into the natural stream channel (flows to lower SEZ to be connected with pond area), and the diversion ditch would be decommissioned. Riparian willows and alder would be planted throughout construction area where deemed appropriate.

Due to the concern over bull frog presence, bull frog removal may be carried out pre- and post-project implementation and most likely would involve manual removal methods (i.e., netting). Opportunities exist to integrate bull frog control activities with the environmental education and Kids in the Woods programs to help accomplish yearly maintenance surveys and removal efforts.

Replacing Seneca Pond with a functional wetland would decrease the depth of the pond and increase the presence of riparian vegetation while still providing recreation access. The loss of waterfowl habitat may occur if the area of open stagnated water is decreased where ducks prefer deeper pond areas for feeding and swimming. However, the loss of Seneca Pond as a primary breeding and rearing habitat is small when compared to other primary habitats in more open meadow/lake settings (i.e. South Shore of Lake Tahoe).

Impact Analysis for Fisheries Threshold Standards and Indicators (F1-F4)

F-1 Lake Habitat

Standard: Achieve the equivalent of 5,948 total acres of excellent lake fish habitat.

Indicator: Physical disturbance of rocky (spawning and feed/cover habitats) substrate (acres).

Does the proposed action have the potential to degrade fish habitat, substrate conditions (Y/N)? No, although the project ultimately drains into Lake Tahoe, it is more than 0.5 miles upstream from the lake. Any potential effects would be mitigated through project design features and BMPs described in the Angora Fire Restoration Project Proposed Action.

F-2 Stream Habitat

Standard: Maintain 75 miles of excellent, 105 miles of good, and 38 miles of marginal stream habitat as indicated by the Stream Habitat Quality Overlay map (Project Record Document E169).

Indicator: Miles of stream habitat in the various categories based on field investigations of habitat. A qualified fisheries biologist using empirical data should make determinations of stream quality.

Would the proposed action affect stream habitat quality (Y/N)? Yes

If yes, state how effects can be mitigated, short-term effect(s) versus long-term benefit(s), or discuss BMP implementation. The Angora Project has the potential to impact stream habitat quality. The potential for the Angora Project to degrade fish habitat would be mitigated through application of BMPs and design criteria described in the Angora Fire Restoration Project Proposed Action for action items such as system roads, new/existing temporary roads and new/existing temporary landings. These BMPs and design criteria would conserve aquatic habitats in the project area. Long-term benefits include a substantial improvement in stream habitat through restoration of natural geomorphic processes and increased habitat complexity (e.g., pools, cover, gravel sorting for spawning) as a result of large wood placement.

F-3 In-stream Flow

Standard: Until instream flow standards are established in the Regional Plan to protect fisheries values, a non-degradation standard shall apply to instream flows.

Indicator: Instream flows evaluated by the use of an instream beneficial use assessment, such as the type established by Title 23, Section 670.6 of the California Administrative Code.

Does the proposed action include new construction or maintenance of a water diversion (Y/N)? Yes.

Potential to affect instream flows (Y/N)? Yes, temporarily during stream channel reconstruction.

Twelve hundred feet of channel through the meadow above Lake Tahoe Boulevard would be reconstructed. The new channel location would be connected to the existing channel approximately 50 to 70 feet above the Lake Tahoe Boulevard road crossing structure (bottomless arch).

F-4 Lahontan Cutthroat Trout

Standard: It shall be the policy of the TRPA Governing Board to support, in response to justifiable evidence, state and federal efforts to reintroduce Lahontan cutthroat trout.

Indicator: (Project Record Document E170): Threshold would be achieved with the successful establishment of a Lahontan cutthroat trout population.

Are fish species present/suspected? Lahontan Cutthroat Trout do not occupy the project area.

Is there an adjacent Lahontan cutthroat trout population which could be affected by the project? No.

Impact Summary

No TRPA Special Interest Species, fish, or wildlife habitats of significance would be adversely affected by the proposed Angora Fire Restoration Project. Any sighting of SIS, or nest locations of these species would be reported to a Forest Service or TRPA biologist. These nest locations would be protected in accordance with the Sierra Nevada Forest Plan Amendment (Project Record Document E171) and the Environmental Threshold Carrying Capacities for the Lake Tahoe Region guidelines (Project Record Document E170). LOP that apply to TRPA Special Interest Species that occur in the project include the following: for goshawks, the LOP is February 15 to September 15 applied within 0.5 miles of any active nest. Project actions and design features that protect species and avoid impacts are fully described in the Angora Fire Restoration Project BE/BA (Project Record Document E64).

3.6.6 Migratory Land Bird Conservation

Regulatory Guidance

Under the National Forest Management Act (NFMA) and per the Migratory Bird Treaty Act of 1918, the Forest Service is directed to "provide for diversity of plant and animal communities based on the suitability and capability of the specific land area in order to meet overall multiple-use objectives." (P.L. 94-588, Sec 6 (g) (3) (B)). The January 2000 USDA Forest Service (FS) Land Bird Conservation Strategic Plan, followed by Executive Order 13186 in 2001, in addition to the Partners in Flight (PIF) specific habitat Conservation Plans for birds and the January 2004 PIF North American Land Bird Conservation Plan reference goals and objectives for integrating bird conservation into forest management and planning.

In late 2008, a *Memorandum of Understanding between the USDA Forest Service and the USDI Fish and Wildlife Service to Promote the Conservation of Migratory Birds* was signed. The intent of the MOU is to strengthen migratory bird conservation through enhanced collaboration and cooperation between the Forest Service and the Fish and Wildlife Service as well as other federal, state, tribal and local governments. Within the National Forests, conservation of migratory birds focuses on providing a diversity of habitat conditions at multiple spatial scales and ensuring that bird conservation is addressed when planning for land management activities.

The Lake Tahoe Basin Management Unit (LTBMU) is proposing to manage Forest System lands following management direction contained within the LTBMU Land and Resource Management Plan (LRMP, USFS 1988, as amended). Opportunities to promote conservation of migratory birds and their habitats in the project area were considered during development and design of the Angora Fire Long Term Restoration project.

Migratory Land Birds – LTBMU

To facilitate a regional approach to bird conservation, regional geographic units called bird conservation regions (BCRs) were developed under the North America Bird Conservation Initiative (http://www.nabci-us.org/bcrs.html). BCRs encompass landscapes with similar bird communities, habitats, and resource issues. In *Birds of Conservation Concern 2008*, the U.S. Fish and Wildlife Service (FWS) (2008) identified the species in each BCR in greatest need of conservation action and proactive management to prevent the need for listing them as endangered or threatened. These species are termed Birds of Conservation Concern (BCC), and a list is given for each BCR. A BCC may be present in a BCR but not included in that BCR's list because its population numbers are not a concern in that region.

Project Effects to Migratory Land Birds

The Biological Assessment, Biological Evaluations, Management Indictor Species Report, and the Tahoe Regional Planning Agencies Special Interest species reports analyzed project level impacts on special status species located in the project record folder(s). Portions of the analysis are incorporated by reference in the Environmental Assessment (EA) and this document. Additionally, elements of the Partners in Flight (PIF) conservation strategy objectives were integrated into restoration design of the project to increase, restore, and improve specific unique ecological communities for diversity of species.

The Angora Fire Restoration Project would not adversely impact any populations or habitat of migratory birds. The original 1918 statute implemented the 1916 Convention between the United States and Great Britain (for Canada) for the protection of migratory birds. Later amendments implemented treaties between the United States and Mexico, Japan, and the Soviet Union (now Russia). Specific provisions in the statute include the establishment of a federal prohibition, unless permitted by regulations, to "pursue, hunt, take, capture, kill, attempt to take, capture or kill, possess, offer for sale, sell, offer to purchase, purchase, deliver for shipment, ship, cause to be shipped, deliver for transportation, transport, cause to be transported, carry, or cause to be carried by any means whatever, receive for shipment, transportation or carriage, or export, at any time, or in any manner, any migratory bird, included in the terms of this Convention . . . for the protection of migratory birds . . . or any part, nest, or egg of any such bird." Because forestlands provide a substantial portion of breeding habitat, land management activities within the LTBMU can have an impact on local populations.

Project activities occurring within the meadow complex, aspen stands, and riparian corridor were designed to benefit species in the long-term resulting in a net positive improvement in these unique environments. Potential impacts to migratory species would be minimized through the adherence of LRMP Standards and Guidelines for snags/down woody debris, restoration of riparian reserve areas, and integration of elements in the Partners in Flight Conservation strategies. Habitats structure for species was altered due to the fire which changed the existing environment. Portions of the project are designed to improve habitat conditions through the improvement of meadow systems, riparian corridors, and aspen stand habitat characteristics, while still maintaining current functional habitat.

3.6.7 Analytical Conclusions

This section provides a brief summary of the conclusions of effects analysis for terrestrial and aquatic wildlife resources. It provides a summary of the environmental effects and their significance to terrestrial and aquatic wildlife resources from project activities.

Lahontan cutthroat trout (ESA listing status – threatened) does not occur within the project area. The closest known population of Lahontan cutthroat trout occur in the Upper Truckee River, located approximately 2.5 miles southeast of the project area. Therefore, both Alternatives 1 and 2 will not affect this species.

Spotted owl and goshawk PACs that existed in the project area prior to June 2007 were lost as a result of the fire. A process for PAC re-mapping has occurred within a 1.5 mile radius of the burn area. Vegetation burn severity maps were used to evaluate post-fire habitat conditions and a new PAC, called Tahoe Mountain, was delineated. The forecast for increasing stand replacing fires for the foreseeable future across a significant part of the western United States indicates an increase in BBWP habitat availability for continued BBWP population growth.

Alternative 1 would result in high fuel load and severity fire conditions which would impact developing spotted owl and goshawk habitat and increase the risk of fire adversely affecting adjacent spotted owl and goshawk habitat. In the short-term, the cumulative effect of Alternative 1 is to adversely affect individual goshawks associated with the Tahoe Mountain and Seneca Pond PACs and their habitat. In the long-term, cumulative effects of this alternative should be beneficial to spotted owls and goshawks and their habitat as (1) the risk of a stand-replacing fire is reduced; (2) a potential increase in habitat quality and quantity due to the eventual development of reforested acres into suitable habitat; and (3) habitat in the analysis area matures during the 20-year period following implementation of the Angora Project. Early pioneer species, such as BBWP would continue to use the burned area for foraging and nesting. No adverse effects will occur to sensitive status wildlife species from Alternative 1.

Due to the effect of the fire on PACs and project activities occurring over multiple years, spotted owl and goshawk nesting displacement and prolonged changes in foraging behaviors resulting from Alternative 2 will not cause adverse effects to reproducing spotted owls and goshawks. More permanent occupancy of nesting pairs within the fire area may occur in the long-term as project activities move to restore upland and riparian vegetation structure. Fuels treatments incorporate retention of both standing and down wood in order to maintain habitat structure for early pioneer species such as BBWP. No adverse effects will occur to sensitive status wildlife species from Alternative 2.

Section 3.7
Riparian Resources

3.7 Riparian Resources

3.7.1 Introduction

Riparian resources are also discussed in Section 3.3, “Soil and Watershed Resources,” and Section 3.5, “Wildlife Resources.” These sections discuss relevant species and habitat characteristics that are associated with management of riparian areas. Upper Angora Creek, Seneca Pond, and Upper Garner Meadow are the three key riparian area features that would be affected by the proposed action. This section discusses the potential impacts to these key features. The amount of improved habitat (either linear feet or acreage) is used as the indicator to quantify impacts.

3.7.2 Existing Conditions

Angora Creek

Angora Creek is the main perennial stream that runs through the project area. This stream has been adversely affected by historic uses in the early 1900s that altered the natural function of the stream and floodplain. These uses included grazing, diversion of natural flows, and installation of road crossings that were not designed to accommodate peak channel flows. These practices led to the downcutting and channel widening of Angora Creek, a gradual lowering of the water table, and drying of adjacent meadow environment. The Angora Fire has led to an increase in water flow, as dense coniferous forests no longer are helping to store and utilize soil moisture. Post-fire fish census data reveals that there are still populations of brook trout in Angora Creek (Project Record Document E172); however, the opportunity exists to improve fisheries and aquatic habitat by restoring a stream channel pattern that is reflective of historic conditions, and that would include higher amounts of pools, improved riffle-to-pool ratios, stable stream banks, and greater diversity of habitat. The characteristic riparian areas within the SEZ adjacent to Angora Creek (associated with meadows and intermittent/ephemeral stream channels) are generally in fair-to-poor condition due to the loss of canopy cover and minor amount of riparian vegetation from the Angora Fire. The areas adjacent to stream systems lack the woody vegetation structure common to other stream systems in the basin, e.g., Trout Creek and the Truckee River, which include aspen, willow, and alder.

Seneca Pond

Seneca Pond is a riparian feature of particular note, as it is also a popular destination spot for local recreationists. The pond is approximately 0.5 acre in size, and is supported by a small perennial stream that was diverted in the 1990s. This stream diversion helped create and sustain Seneca Pond, but also reduced stream flow into Angora Creek, thereby reducing downstream flow and associated riparian habitat. The hardened bank of Seneca Pond and the artificial lining that allows the pond to remain as a year-round feature tend to suppress the establishment of a natural riparian community. The pond also supports a population of non-native bullfrogs, which tend to displace native amphibian species. There is no evidence that the bullfrog population has expanded into adjacent downstream riparian habitat along Angora Creek.

Gardner Mountain Meadow

Gardner Mountain Meadow is located along the lower elevation of the project area, immediately above Highway 89. This 13-acre meadow is showing signs of drying out, as the gully is downcutting, effectively lowering the water table. This drying condition is leading to the encroachment of conifers along the edge of the meadow, as well as a loss of riparian vegetation within the meadow and on the stream banks that are dependent upon moist meadow conditions.

3.7.3 Direct, Indirect, and Cumulative Effects

Alternative 1—No Action

Direct and Indirect Effects

There would be no direct effects from taking no action. Indirectly, the riparian habitat along Angora Creek would continue to decline due to the legacy effects of past management activities, such as grazing, water diversion, and adjacent urbanization. These indirect effects include continued downcutting and straightening of the stream channel and gradual loss of riparian habitat as stream banks erode. The invasive bullfrog population in Seneca Pond would continue to thrive and pose a continued threat to spread downstream and threaten native amphibian populations. Their continued presence in Seneca Pond would continue to suppress the development of native amphibian populations as the bullfrogs prey on native species. Gardner Mountain Meadow would continue to gradually dry up as conifers encroach upon the meadow. There would be reduced amounts of water available to riparian species and aquatic habitat as conifers use increased amounts of groundwater. The incised channel condition would continue, and would likely worsen given the increased flows from upstream due to the Angora Fire. There would be no cumulative effects, as there are no other reasonably foreseeable actions beyond the past actions and the proposed action.

Alternative 2—Proposed Action

Direct and Indirect Effects

Approximately 1,200 feet of Angora Creek above Lake Tahoe Boulevard would be restored to reflect a historic channel pattern of greater sinuosity and shallower depth. Direct effects of channel reconstruction in Angora Creek would potentially include short-term stunting of riparian recovery as mechanized equipment accesses the stream channel, new channels are created, and portions of the existing channel are abandoned. Existing sod and excavated material would be saved during the construction of the new stream channel and used to fill in the abandoned channel. These materials would also be used to stabilize and revegetate the newly formed banks of the new stream channel. The sod would be placed over the top of the soil that would be “capping” the abandoned channel, minimizing potential for soil erosion from exposed soil. Minor amounts of riparian vegetation would be lost along the abandoned channel segments; however, the establishment of new riparian vegetation along the new channel segments would offset this short-term loss in 1 to 2 years. There would be a short-term (1- to 2-year) impact from the temporary road needed to access Angora Creek by mechanized equipment. This impact is due to short-term compaction and loss of meadow vegetation along the temporary road; however, this temporary access road would be restored by de-compacting the surface and covering it with mulch to restore conditions to pre-project levels. There would be a long-term increase in riparian vegetation as the channel of Angora Creek would be lengthened over the existing channel length. This positive effect would occur due to the increase in sinuosity and meandering of the new channel location. The saturation of meadow soils would increase (both in area and in duration) as the water table rises, leading to wetter soils for longer periods adjacent to the creek in the flood plain. This increase in wet soils would increase the amounts of riparian-dependent plant species.

Approximately 2 miles of upper Angora Creek would have large woody material placed in strategic areas along the stream channel to promote riparian habitat diversity and reduce the risk of scour from stream flows. Direct effects of the placement of large woody material in Angora Creek would potentially include short-term stunting of riparian recovery as mechanized equipment accesses the stream channel along the upper bank. This vegetation would re-establish rapidly due to the high amounts of available seed in the soil and available moisture. The material would also improve the diversity, quantity, and quality of fish habitat as streambank cover and submerged material is increased.

There would be short-term (3- to 5-year) impacts to the riparian area surrounding Seneca Pond in years 1, 2, and 3 of the project (see Table 2-2). The existing pond banks and the associated stream channel would be disturbed by heavy equipment as the banks of the pond are re-contoured and the adjacent channel is filled. The re-contoured banks and filled areas would be revegetated with natural species and mulched to minimize impacts from erosion of barren soil. Best management practices would be implemented to minimize impacts to soil and water quality. It is expected that the riparian area around Seneca Pond would fully recover within 5 years of implementation and that there would be an increase in natural species diversity as a result of the revegetation plan that emphasizes natural species. The pond would be reduced in depth, and the slope and height of the pond's banks would be lessened, leading to an increase in native riparian plant diversity and quantity. There would be an increased likelihood of native amphibian species due to the elimination of the bullfrog population, which is a non-native species that impacts other invertebrate species by predation and displacement. There would be an increase in riparian habitat in Angora Creek due to the increased flow from the stream re-routed to flow more directly into Angora Creek, rather than into Seneca Pond. This channel re-route would provide increased water flow for a longer duration of time.

Approximately 1,500 feet of a gully within and upstream of Gardner Mountain Meadow would be stabilized to stop the on-going downcutting and incisement of the channel. The proposed stabilization would raise the water table and improve conditions to allow for the re-establishment and maintenance of riparian conditions and associated vegetation. The removal of encroaching conifers would increase water availability for meadow and stream vegetation to improve riparian habitat.

Overall, the proposed channel construction, channel stabilization, increased large woody material, and increased flow would combine to re-elevate the ground water and increase the health of adjacent SEZ areas along Angora Creek and Gardner Mountain Meadow. These treatments, coupled with planting native riparian woody vegetation stock along the new channels, are expected to result in a vigorous streamside riparian system within the SEZ in a short period of time. Stabilization of riparian vegetation in concert with erosion reduction is expected to result in viable streamside vegetative communities essential to terrestrial and aquatic ecosystems.

Over the long-term, the likelihood of severe effects from future wildfires would be reduced due to the reduction in fuel loadings. The combined effects of removing user-created roads and trails, ensuring proper design and placement of all system roads and trails, and in-channel improvements would promote improved riparian area conditions both within the project area and downstream. The net effects of proposed actions are expected to result in viable streamside riparian networks of woody vegetation, stable stream banks, and good habitat for terrestrial and aquatic species.

Cumulative Effects

The cumulative effects on riparian resources from historic uses, such as roads, trails, logging, channelization, and grazing would be reversed by the proposed action. This project proposes restoration of riparian resource activities in Angora and Camp Richardson Frontal subwatersheds. Other restoration projects in these subwatersheds (outside the fire boundary on adjacent state lands) include stream channel restoration and treatment of urban lot storm water runoff to decrease undesired fine sediment and nutrient delivery to streams. When combined with other restoration projects the project would provide an overall improvement in riparian resources. This improvement is centered around ground water availability in stream channels and meadow systems and increasing riparian vegetation species composition and vigor.

3.7.4 Analytical Conclusions

This section provides a brief summary of the conclusions for the analysis of effects to riparian resources. It provides linkage between design features in Chapter 2 and the magnitude, scope, intensity, and significance of the environmental effects from project activities on riparian resources.

For Alternative 1, the effect of the fire resulted in an increase of riparian plant cover and ground water availability where large scale tree mortality occurs. However, meadow systems and other stream channels will continue to remain in degraded states limiting riparian plant growth potential and aquatic habitat quality.

Alternative 2 includes stream channel, meadow aspen stand restoration treatments with goals of increasing groundwater levels, enhancing floodplain connectivity, decreasing fine sediment produced from stream banks and improving aquatic and riparian habitats. Alternative 2 includes design features to protect water quality, fen habitats, and local fishery resources when performing restoration activities. This alternative also includes restoring and re-routing roads and trails outside of SEZs and identifies design features that implement BMPs when such features need to cross streams. Overall the project will result in upward trends in riparian resource conditions (stream channel form and function, vegetation and aquatic habitat) as those trends relate to the above stated goals.

Section 3.8
Air Quality

3.8 Air Quality

3.8.1 Introduction

The area of analysis for air quality effects is the Lake Tahoe Basin, including the project area extending beyond the watersheds that define the Angora project analysis area. Air quality effects from implementation of the proposed action would be expected to occur mainly within the spatial boundary of the project analysis area for two reasons: 1) because these watersheds extend beyond the treatment units to the crest of the mountains surrounding the Angora project activities, and 2) because both vertical and horizontal mixing of air within the treatment units would reduce effects to air quality through dispersion over distance from the treatment activities. However, the effects to air quality could potentially spread further into the Lake Tahoe Basin during weather conditions that prevent dispersion. The timeframe for effects to air quality would be from the beginning of thinning and fuel removal operations through final prescribed fire activities and aquatic restoration, a period of potentially 4 to 5 years, depending on the length of time needed for project implementation and prescribed burning conditions to be met, both for fuels to be dry enough to produce a minimum amount of smoke and for availability of approved burn days.

The potential impacts of concern to air quality are associated primarily with 1) temporary dust from equipment that is used for the removal of trees to landings, 2) dust from the surface of roads (both permanent and temporary) from truck traffic, and 3) smoke emissions from the burning of activity-related fuels to ensure that desired fuel loading conditions are met.

3.8.2 Existing Conditions

The project area lies within the El Dorado Air Quality Management District (EDAQMD). As a matter of regional policy, a smoke management plan would be submitted to and approved by involved agencies prior to any burning activity that would occur within the Angora project area. The city of South Lake Tahoe is immediately adjacent to proposed treatment areas where both pile and prescribed burning is proposed to occur. The project area is within the Lake Tahoe Air Basin. This basin has very good air quality and is in attainment for all designated state and federal standards for ambient air quality with the exception of PM10 (particulate matter less than 10 micrometers in size). The Lake Tahoe Air Basin is in nonattainment for the state standard for PM10 (Project Record Document E173). PM10 emissions are commonly associated with the following sources:

- motor vehicles,
- wood burning stoves and fireplaces,
- dust from construction, landfills, and agriculture,
- wildfires and brush/waste burning,
- industrial sources, and
- windblown dust from open lands

The temperature of the earth's atmosphere is regulated by a balance between the amount of radiation received from the sun that is reflected by the earth's surface and clouds, vs. the amount absorbed by the earth and atmosphere.

3.8.3 Direct, Indirect, and Cumulative Effects

Alternative 1—No Action

Direct and Indirect Effects

Under this alternative, no increase in dust or PM10 emission levels would be produced from burning of activity-generated fuels or from mechanical operations for removal of dead trees or for thinning. There would be an increase in fuel loading as the dead trees fall and the area is revegetated primarily with grasses and shrubs in the short-term. In the event of another wildfire in the area, there is a greater potential for substantial degradation of air quality from the wildfire because of the heavier fuel loading and possibly more intense fire behavior, as compared to Alternative 2 due to the continuous fuel bed made up of downed trees and limbs, grasses, and shrubs that would have accumulated since the Angora Fire.

Cumulative Effects

While the risk for wildfire effects would increase, an actual wildfire occurrence is not a reasonably foreseeable or predictable event. Therefore, there are no cumulative effects associated with no action on air quality.

Alternative 2—Proposed Action

Direct and Indirect Effects

The removal of dead trees and green trees as described in the proposed action is most likely to affect air quality by generating short-term and minor amounts of vehicle exhaust, fugitive dust, and smoke from prescribed burning of piles of fuel. The design features would minimize the production and transport of fugitive dust on permanent roads, temporary roads, and landings by providing dust abatement through such measures such as regular watering, rocking of the road surface, or providing surface chipping to neighborhood entry and exit points. Smoke emissions would be minimized by implementation of the Smoke Management Plan, which is a part of the Prescribed Burn Plan. Long-term benefits would occur because restoration actions restore vegetative structure on temporary access paths, aspen release sites, stream banks, and floodplains, which stabilize the soils and reduce the potential for airborne transport of fugitive dust. There would be a reduced potential for catastrophic fire with the removal of dead trees because future possible wildfires would have less fuel to consume. Wildfires are a key source of PM10 pollutants. Adherence to the smoke management plan for pile and understory burning would reduce negative impacts to communities. By adhering to a smoke management plan approved by the LTBMU Forest Supervisor and the EDAQMD, particulate matter emissions from pile or understory burning would not violate CAAQ emission standards. Short-duration production of smoke and associated emissions would occur during pile and understory burning. The pollutants that would be released are the criteria pollutants, i.e., PM10, PM2.5, carbon monoxide (CO), nitrogen oxides (NO_X), volatile organic carbons (VOCs), and minute quantities of non-criteria air toxics. Staging the burning of piles to be consistent with the approved Burn Plan would ensure compliance with federally mandated threshold levels for ozone precursors (VOC and/or NO_X). The proposed action is in conformity with the state implementation plan and, therefore, further air quality analysis is not required.

Fugitive dust could result from thinning operations, such as skidding and hauling during dry seasons. Fugitive dust caused by construction and use of unpaved roads can produce PM10 in quantities great enough to impair the visual quality of the air for a few hours (less than 5). Dust generated by skidding and loading logs onto trucks also contributes to fugitive dust. Dust would be limited to a few hours a day along skidding and forwarding trails and this would be minimized by careful selection of routes next to neighborhood boundaries. Skidding and forwarding routes would be temporary in one location within the project area (usually lasting no more than 2 weeks in one spot) and would continue to move away from neighborhoods as treatments are completed. Furthermore, effects are localized and would be mitigated by effective dust abatement methods on landings and dirt-surfaced roads as required by the design features of the proposed action, which would be included as contractual requirements. BMPs are specified in Appendix A and would mitigate dust produced from operations.

Temporary and short-term visibility impacts can be expected in the immediate project area during actual ignition and would be affected by inversions as well as wind speed and direction. Smoke from burning the hand piles can impact human health, particularly for the ground crews at the site. The localized effects of burning in the project area would be short-term degradation of air quality, primarily during the burnout stage and during nighttime inversions. Pile burning affects air quality in ways similar to wildfires; however, prescribed burning offers many advantages over wildfire. The effects of prescribed fire can be manipulated to reduce negative effects to air quality. Guidelines that would reduce the negative effects of burns are termed best available control measures (BACM) and are based on the EPA's "Prescribed Burning Background Document and Technical Information Document for Prescribed Burning Best Available Control Measures" (Project Record Document E175). BACMs are based on avoidance, dilution, and emission reduction strategies. Smoke mitigation techniques include consideration of atmospheric conditions, season of burn, fuel and duff moisture, diurnal wind shifts, appropriate ignition techniques and rapid mop-up. Following these BACMs and identifying them in burn plans is critical in prevention of negative air quality effects.

Cumulative Effects

All prescribed burning is coordinated with the state and local air quality agencies to ensure that atmospheric stability and mixing heights are advantageous for dispersion of emissions. El Dorado County Air District is the permitting agency for a required smoke management plan. The smoke management plan would prescribe weather conditions (mixing heights and transport winds) that would avoid smoke effects as much as possible in the City of South Lake Tahoe and other communities near the Angora project area and in Desolation Wilderness, a Class 1 airshed. In addition to prescribed burning for the South Shore and Angora projects, other vegetation burning on public and private land is expected to contribute short-duration smoke and associated particulate matter to existing emissions from residential heating and vehicle traffic into the atmosphere. Although prescribed fire would contribute to cumulative effects, the effects would not exceed state and local air quality standards. If a wildfire event does occur within the project area after implementation of the proposed action, concentrations of all smoke related emissions would likely be expected to be less than in the no-action alternative due to the reduced levels of fuel available.

In addition to fugitive dust from implementation of the Angora and South Shore projects, there is likely to also be fugitive dust from recreational activities and firewood cutting of local residents. The cumulative effect from the Angora project and the South Shore project for fugitive dust would be minimal due to implementation of BMPs and required road watering to prevent dust. The managed and clearly identified road and trail system would be subject to regular maintenance, leading to a reduction in user-created occasional dust, and motorized vehicle use on NFS lands would not be allowed, except for occasional administrative access.

3.8.4 Analytical Conclusion

This section provides a brief summary of the conclusions for the analysis of effects to air quality resources. It provides linkage between design features in Chapter 2 and the magnitude, scope, intensity, and significance of the environmental effects from project activities on air quality.

The no-action alternative would not result in any direct, indirect, or cumulative effects to air quality.

Adherence to the smoke management plan for pile and understory burning would reduce negative direct effects to communities. Effective dust abatement methods on landings and dirt-surfaced roads as required by the design features of the proposed action, and which would be included as contractual requirements, would ensure that there are minimal to no direct effects. BMPs would reduce dust produced from operations. Temporary and short-term visibility impacts can be expected in the immediate project area during actual ignition and would be affected by inversions as well as wind speed and direction. Although prescribed fire could contribute to cumulative effects (from other prescribed burns or chimney smoke), the effects will not exceed state and local air quality standards.

Section 3.9
Heritage and Cultural Resources

3.9 Heritage and Cultural Resources

3.9.1 Introduction

Forest Service policy (Project Record Document E176) requires that projects with the potential to affect cultural resources be surveyed for cultural resources in order to comply with applicable federal laws and regulations. These include 36 CFR 800, the NHPA of 1966, as amended, the Antiquity Act of 1906, the Archeological Resources Protection Act of 1979, Executive Order 11593, the Archaeological and Historic Preservation Act of 1974, and the American Indian Religious Freedom Act of 1978. The LTBMU and the Forest Service currently operate under two major Programmatic Agreements with the California State Historic Preservation Officer (CA-SHPO). Direct SHPO consultation is not required.

Forest Plan objectives and Forest-wide standards and guidelines are designed to ensure protection of cultural resources. An archaeological assessment is required for any area where the Forest is considering activities in order to determine their potential for having historic resources. This assessment determines the type and extent of new field surveys required with reference to existing surveys and data. Because the proposed undertaking has the potential to adversely affect listed and eligible cultural properties, Forest Service archaeologists developed a cultural resources inventory strategy to identify all such properties. It was determined that all areas proposed for rehabilitation treatment should be surveyed or have been previously surveyed. Under normal circumstances, areas with adequate previous survey coverage do not require resurvey; however, the project area was thoroughly covered due to high site density in the area and the possibility that the Angora Fire may have uncovered previously undocumented sites. Survey crews covered greater than 95% of the project area with a pedestrian survey. The new survey and site revisits occurred during August 2007.

All known cultural resources with *undetermined* status or that are listed on or determined eligible for inclusion on the National Register of Historic Places (NRHP) and are referred to as *historic properties* were assessed for the potential of the proposed project to affect these resources.

This cultural resource inventory was conducted for the federally owned land portion of the Angora Fire Restoration Project to determine if cultural resources were present in the area of potential effects (APE), and if such resources would be affected by project actions. Forest Plan objectives and Forest-wide standards and guidelines are designed to ensure protection of archaeological and historic sites.

Archaeological inventories have been conducted in the recent past within the project area. Additional pedestrian surveys were conducted specifically for the proposed project to identify, record, and assess potential effects on cultural resources on NFS land. This analysis is in conformance with regulations of the NHPA of 1966, as amended (PL 89-665); the National Environmental Policy Act of 1969 (PL 91-190); the Archaeological and Historic Preservation Act of 1974 (PL 86-523); the Archaeological Resources Protection Act of 1979 (PL 96-95); the Native American Grave Protection and Repatriation Act of 1990 (PL 101-601); the 2001 *First Amended Regional Programmatic Agreement Among The USDA Forest Service, Pacific Southwest Region California State Historic Preservation Officer, And Advisory Council On Historic Preservation Regarding The Process For Compliance With Section 106 Of The National Historic Preservation Act For*

Undertakings On The National Forests Of The Pacific Southwest Region (Regional PA) (Project Record Document E177); and the 2004 *Interim Protocol for Non-Intensive Inventory Strategies for Hazardous Fuels and Vegetation Reduction Projects* (Interim Protocol) (Project Record Document E178).

The survey and recording strategies for the project were developed using the Regional PA and the Interim Protocol as guidelines. These documents allow for non-intensive surveys on this specific type of project proposed on Forest Service land.

The current project consists of road and trail maintenance, fuel reduction (by hand and mechanical means), and prescribed burn treatments. The road and trail maintenance will be addressed under the Regional PA (Project Record Document E177) by Attachment A, Section II, Part i as a Screened Exemption. Fuel reduction and prescribed burn treatments are addressed in accordance with the Interim Protocol (USDA Project Record Document E178). Following the Interim Protocol, a non-intensive survey protocol was employed on federal lands within the project area. The APE for the proposed action was defined as all NFS lands within the burn perimeter upon which any earth-disturbing rehabilitation activity was proposed.

Two areas of the project were expressly excluded from the APE and are out of the scope of the inventory report. Recreation residence tracts that lie within the project APE, and any buildings or sites on them, were not surveyed or considered for this inventory. Additionally, no non-federally owned lands were surveyed. Therefore, the APE was determined to be the rehabilitation treatment areas on federal land, excluding recreation residence tracks and non-federally owned land.

Direct physical impacts to heritage resources can occur if alterations are made to the integrity of the resource itself or to its surroundings. A project is regarded as having an effect on a heritage property if it alters any of the characteristics that qualify the property for inclusion in the NRHP. An adverse effect is one that diminishes the integrity of any of those characteristics that qualify the resource for inclusion in the NRHP. Projects are considered to have no adverse effect or no effect if sites in the area have been shown to be ineligible or the impacts to the qualities that make the heritage resource important are mitigated as defined in 36 CFR 800.9(c)1.

Although the APE received systematic surface archaeological investigations, it is possible that buried or concealed heritage resources could be present and detected during project ground disturbance activities. In the event of fortuitous discoveries of additional heritage resources that have not previously been inventoried, project activities would cease in the area of the find and the project operator would consult the LTBMU archaeologist for recommended procedures. In the event that human remains are discovered during project activity, law requires that project managers contact the county coroner. If the remains are determined to be of Native American origin, both the Native American Heritage Commission and any identified descendants should be notified (Health and Safety Code Section 7050.5, Public Resources Code Section 5097.94 and 5097.98).

3.9.2 Existing Conditions

There were 15 previously recorded sites within the Angora Fire APE. The eligible and unevaluated sites were revisited. The three sites previously determined not eligible for the NRHP with SHPO concurrence (05-19-000070, 05-19-000390, and 05-19-000416) were not revisited and do not require further management consideration for this or future undertakings. There were nine new sites discovered during the survey work associated with the proposed action. Eight of these new sites are historic in nature and are generally associated with trash sites or old roadbeds. One site is prehistoric. Management recommendations have been developed for each site in order to ensure appropriate protection of the sites and their setting. These recommendations will be implemented during the project.

3.9.3 Direct, Indirect, and Cumulative Effects

Alternative 1—No Action

Direct and Indirect Effects

Under the no-action alternative, there would be no direct effects to any known or unknown cultural sites. There would continue to be potential impacts to cultural sites from recreational activities that occur on non-system trails and roads or from cross-county travel by forest users, particularly vehicles. This is due to the lack of a clearly defined and administratively controlled network of user-created roads and trails immediately adjacent to the private residences along the east edge of the project area.

Cumulative Effects

Other project in the project area would have design features incorporated into them which would remove or reduce the possibility of cumulative effects.

Alternative 2—Proposed Action

Direct and Indirect Effects

The general approach to protecting sites from project activities is to flag and avoid them. If other measures were deemed necessary by the recording crew, the Standard Resource Protection Measures package will be applied as outlined in the Regional PA and the Interim Protocol (Project Record Documents E177 and E178). Sections of the Regional PA and the Interim Protocol that apply to site treatment are included in Project Record Documents E29 and E30.

Table 3.9-1. Heritage Sites with Applicable Standard Resource Protection Measures

Site Number	Standard Resource Protection Measure
05190000070	Not eligible, none required
05190000261	I.B.1, I.B.2, I.E, II.A.1.a.1, II.A.1.b, II.A.1.c,
05190000265	I.B.1, I.B.2, I.E, II.A.1.a.1, II.A.1.b, II.A.1.c,
05190000350	I.B.1, I.B.2, I.E, II.A.1.a.1, II.A.1.b, II.A.1.c, II.A.1.d
05190000377	I.A.3
05190000390	Not eligible, none required
05190000391	I.B.1, I.B.2, I.E, II.A.1.a.1, II.A.1.b, II.A.1.c,
05190000392	I.B.1, I.B.2, I.E, II.A.1.a.1, II.A.1.b, II.A.1.c,
05190000393	I.B.1, I.B.2, I.E, II.A.1.a.1, II.A.1.b, II.A.1.c,
05190000400	I.B.1, I.B.2, I.E, II.A.1.a.1, II.A.1.b, II.A.1.c,
05190000411	I.B.1, I.B.2, I.E, II.A.1.a.1, II.A.1.b, II.A.1.c,
05190000416	Not eligible, none required

Site Number	Standard Resource Protection Measure
05190000456	I.A, I.B.1, I.B2
05190000481	I.A, I.B.1, I.B2
05190000911	I.B.1, I.B.2, I.E, II.A.1.a.1, II.A.1.b, II.A.1.c,
05190001149	I.B.1, I.B.2, I.E, II.A.1.a.1, II.A.1.b, II.A.1.c,
05190001150	I.A.3, I.B.1, I.B.2, I.E, II.A.1.a.1, II.A.1.b, II.A.1.c,
05190001151	I.B.1, I.B.2, I.E, II.A.1.a.1, II.A.1.b, II.A.1.c,
05190001152	I.A, I.B.1, I.B2
05190001153	I.B.1, I.B.2, I.E, II.A.1.a.1, II.A.1.b, II.A.1.c,
05190001154	I.A.3
05190001155	I.B.1, I.B.2, I.E, II.A.1.a.1, II.A.1.b, II.A.1.c,
05190001156	I.B.1, I.B.2, I.E, II.A.1.a.1, II.A.1.b, II.A.1.c,
05190001244	I.B.1, I.B.2, I.E, II.A.1.a.1, II.A.1.a.2, II.A.1.b, II.A.1.c

Any proposed site activities that do not conform to the Regional PA and Interim Guidelines will require individual site consultation with the CA-SHPO. Any adverse effects will be addressed prior to project implementation. The Heritage Resources Manager (HRM) is responsible for decisions regarding site treatments within the context of the aforementioned programmatic agreements.

The removal of burned trees could have an adverse effect on historic properties. These could include physical damage to artifacts and features caused by felling trees onto them and equipment operation within site boundaries. Mulching has little direct effect on historic properties unless vehicles operate within site boundaries.

Tree removal could have an adverse effect on historic properties because of associated increases in erosion and rainfall impact due to canopy and ground cover removal. These potential effects will be minimal, as there is no expected reduction of canopy in the areas burned by the fire, and there is not expected to be a reduction in ground cover where green trees are thinned. Other indirect effects include greater access by the public to previously heavily vegetated areas. This may increase the chance for vandalism, collecting, camping, and other disturbance on cultural resources.

In summary, this project has the potential to directly or indirectly impact cultural resources located in the project area. The design features in the proposed action are designed to remove the possibility of effects to all identified cultural resources in the project area.

No direct or indirect negative impacts are anticipated because project activities would be controlled through identification and protection of sites, either through avoidance or implementation of hand treatments to reduce fuels in sites recommended by the Forest Service archeologist. The survey work associated with the proposed action will increase the protection of heritage and cultural resources in the future by improving the information regarding newly discovered sites identified in the project surveys or from project implementation. In the long term, possible damage to undiscovered sites may be avoided by maintaining a lowered risk for high intensity wildfires in the project area and through project design features.

Cumulative Effects

None of the proposed activities in the proposed action or the other reasonably foreseeable future projects (including the South Shore project) would negatively affect the physical attributes of the cultural and heritage resources in the project areas due to the implementation of protection measures. Therefore, there would also be no cumulative effects.

3.9.4 Analytical Conclusions

This section provides a brief summary of the conclusions for the analysis of effects to cultural resources. It provides linkage between design features in Chapter 2 and the magnitude, scope, intensity, and significance of the environmental effects from project activities on heritage and cultural resources.

Under the no-action alternative there would be no direct effects to any known or unknown heritage resources. There would continue to be potential indirect effects from recreational activities that occur on non-system trails and roads or from cross-county travel by forest users, particularly vehicles. There would be no cumulative effects to cultural sites as other projects would have design features incorporated into them which would remove or reduce the possibility of effects.

No direct, indirect, or cumulative effects are anticipated because project activities would be controlled through project design features including identification and protection of sites, either through avoidance or implementation of hand treatments in sites recommended by the Forest Service archeologist.

Section 3.10
Transportation

3.10 Transportation

3.10.1 Introduction

The transportation system plays a critical role in supporting project activities through providing access to, from, and within treatment units. The transportation analysis for this project is limited to the roads in the immediate vicinity of the project area. The temporal scope for analysis of the environmental effects of the transportation system includes short term (1–5 years) during project activities and long term (5+ years) following vegetation and fuels treatment. This timeframe would capture both the immediate effects of the proposed action activities and extend to follow the expected impacts to the point where disturbed areas are stabilized.

The transportation system includes Forest Service System roads and trails, existing temporary roads, temporary roads constructed for the project, plus existing state, county, and city roads and streets. This analysis covers Forest System roads (classified), non-system roads (unclassified), and temporary roads constructed for use in the project.

Environmental effects of the transportation system are dependent on miles of road, types of roads, the road surface, maintenance, and decommissioning. The items of concern for use of the transportation system include effects from ground disturbance, maintenance during project activities, and management of these routes at the completion of project activities.

3.10.2 Existing Conditions

The Angora Fire led to a critical examination of the purpose, need, and effectiveness of serving the public and supporting long-term restoration and management of the fire area. The most immediate potential is that the high and moderate intensity burn areas expose the existing roads and trails to more direct impacts from intense rainfall and spring snow melt. The absence of a forest canopy and heavy ground litter means this unmanaged system is no longer sheltered from the weather elements.

The project area contains a combination of classified and unclassified roads and trails as shown in Table 3-10.1. Classified roads are generally inadequate to meet public and administrative needs. Existing classified roads have a combination of steep grades, stream crossings in low capability soils, and some crossings inappropriately located in SEZs that could be relocated to reduce impacts. These roads contribute to degraded water quality downstream. This classified system generally lacks the application of current design and adequate maintenance using best management practices. It is inadequate to provide access to landings for vegetative management, ongoing fuel reduction treatments, forest stand management, and fire suppression.

Table 3.10-1. Existing Mileage of Classified and Unclassified Roads and Trails included in Angora Fire Restoration Project

	Classified	Unclassified
Road	5.0	3.8
Trail	5.4	16.7

The unclassified road system further contributes to greater erosion risk due to the lack of designed best management practices and this system has adverse environmental effects similar to the classified road system.

The proposed action would utilize roads owned and managed by the City of South Lake Tahoe and the County of El Dorado in order for trucks to remove the dead trees from the immediate project site for transport to possible mill or biomass chipping sites. See Map # 5 for the roads that are proposed to be utilized in the proposed action.

See Figure 2-4 for a display of the existing transportation system and proposed changes. The difference is that the trail system has a much higher ratio of classified to unclassified mileage and the unclassified routes are user generated. Approximately 75% of the existing trails are user generated and are not a part of the approved trail system. The classified trail system serves some of the general public demands but does not meet the local trail user needs. This unmet demand is reflected in the amount of user-created roads and trails. In addition, several relocations are needed to move trails outside SEZs, improve stream crossings, or move crossings away from erosive soils. The unclassified trail systems originate in the nearby private subdivisions where there are no rights-of way for general public passage. Trail and road signage is very limited, and signs were destroyed in the fire, so legal access to the National Forest on the managed routes to NFS lands is not clearly defined or marked. The unclassified trail system is not recognized by the Forest Service so trail maintenance, when performed, is accomplished by unsolicited volunteers. Generally, these routes lack erosion control devices and are constructed without design, without using best management practices, and without approval from the Forest Service. Some trails are improperly located in SEZs, which are sensitive and can easily erode. Other trail sections traverse steep portions and do not meet Forest Service Standards, and these locations contribute to degraded water quality downstream.

Portions of the existing transportation system exist without a clear objective, proper design, or appropriate maintenance to Forest Service standards. In addition, a significant portion of the existing roads and trails does not serve public and administrative needs effectively and needs to be decommissioned, rerouted, or restored. These routes currently contribute excessively to environmental degradation in some areas and yet fail to meet natural resource and public needs in other areas. There is a clear lack of logical public routes to access NFS lands as well as a lack of information and guidance to non-motorized recreation users seeking access into the project area.

3.10.3 Direct, Indirect, and Cumulative Effects

Alternative 1—No Action

Direct and Indirect Effects

Under the no-action alternative, none of the road or trail activities for the Angora Fire Restoration Project would be implemented. The direct effects would be to continue the existing 3.8 miles of unclassified roads and 16.7 miles of unclassified trails in an unmanaged condition. This would contribute to unacceptable erosion rates and water quality degradation because designed BMPs would not be implemented and because of their locations in low capability soils and in steep sections. Existing road and trail crossings are often in lower capability soils where the stream crossings have been widened and eroded due to users avoiding crossings during seasonal wet periods. These conditions would continue. Some Forest Service administrative road needs would remain unmet, compromising the ability of the agency to conduct future management activities in the area through continued poor or limited access. Specified roads and trails needing upgrades or relocation for recreation or other resources needs would also not be met. The absence of a well managed trail and road system would immediately be evident in this denuded landscape, and the ability of these systems to sustain themselves during significant rainfall periods would be substantially reduced. Unmanaged use would continue, and it is likely that the unmanaged use would increase given the open conditions of the NFS lands after the fire, leading to an increase in user-created roads and trails, attendant environmental impacts to soil and water quality, and illegal uses.

The effects would continue with the potential for erosion rates and water quality degradation to accelerate due to the lack of management. Eventually, natural processes, such as a heavy rainstorm or accelerated spring runoff, would likely result in a natural decommission of portions of these systems. This would disrupt users' travel routes or result in additional user-developed reroutes, especially at unacceptable locations within SEZs.

Cumulative Effects

There would be no cumulative effects to transportation as a result of the no-action alternative.

Alternative 2—Proposed Action

Direct and Indirect Effects

This alternative brings management into the classified and unclassified system of roads and trails using BMPs, decommissioning, or restoration to reduce soil erosion rates and sedimentation into water courses. Classified roads and trails, including previously mentioned reroutes, are managed to Forest Service standards using BMPs, which would result in reduced erosion and sedimentation rates.

Approximately 6.4 miles of roads would be constructed with 2.6 miles being on top of existing road and trail prisms. The road system would provide needed administrative road access to areas within the Angora Fire area to serve immediate and future resource management needs. Approximately 0.3 miles of road would be relocated out of SEZs, which would eliminate the existing resource conflicts within riparian areas. All existing classified roads and all new constructed road segments would be managed as Maintenance Level 2 roads, which means administrative vehicle access, non-motorized recreation, and OSV recreation use only is permitted. OSV use is regulated by Forest Order and is not changed by this project. The road system would result in 9.5 miles of classified roads, and its direct and indirect effects would substantially reduce its impacts on soil, water, and other resources when compared with the current conditions. See Table 3.10-2 for a summary of mileages of roads and trails under the fully-implemented proposed action.

Table 3.10-2. Mileage[1] of Classified and Unclassified Roads and Trails after Implementation of Proposed Action

	Classified	Unclassified
Road	9.5	0
Trail	10.4	0

[1]Totals come from GIS data that is shown in Figure 2-5.

To improve the tie into the Fallen Leaf Lake Access and Travel Management system, the area bounded by Tahoe Mountain north to Hwy 89 and by the high school to Fallen Leaf Lake Road west was evaluated in detail for its roads and trails connectivity. Currently, Forest Roads 12N19 and 12N27 traverse the same general geographic area and travel in an east/west direction. Under this alternative, Forest Road 12N27 would be relocated to higher ground and would better serve the administrative needs as the single road into this area. This proposed reroute would locate Forest Road 12N27 outside SEZs and outside lower capable soils. Forest Road 12N19 has steep grades, which contribute to higher erosion rates and has limited use for fuels management work due to the steep slopes adjacent to the road. Forestry equipment cannot access areas adjacent to the road due to steep side slopes, fill slopes, and cut slopes. Road 12N19 would be converted to a trail and added to the approved trail system. This conversion of Forest Road 12N19 would better serve public use by providing improved connectivity between the origins of users for non-motorized recreation use (neighborhoods, the high school, and visitors) and for forest management activities. Specifically, these proposed actions would provide a road that better meets the administrative access needs for current and future fuels management work while eliminating road sections in the SEZs and in steep slopes where the soils are more erosive. Up to 7.7 miles of temporary roads would be constructed using BMPs and additional design features to facilitate fuel removal and vegetative treatments. Direct and indirect effects on soil, water, and other resources would be minimal and temporary (1–3 years).

The 2.4 miles of unclassified roads would be restored and 0.5 miles of classified roads would be decommissioned. This action would have positive direct and indirect effects on soil, water, and other resources. This would not have an impact to recreation users because the decommissioned unclassified and non-system roads would remain open to non-motorized use. Approximately 6.4 miles of roads would be constructed (with 2.6 miles on top of existing prisms) for a total planned classified system of 9.5 miles after implementation.

The installation of 3 new locked gates (see Figure 2-4 in Chapter 2, "Alternatives, Including the Proposed Action") would eliminate unauthorized public vehicle access and provide clearly designated routes for non-motorized public use into the project area. This would be complemented with the installation of 14 way-finding signs at public access points into the project area. The parking upgrade on Sawmill Road east of Tahoe Boulevard includes the above improvements and implementation of BMPs and would result in positive direct and indirect effects on public use and improved management of this area.

Approximately 8.9 miles of trail would be constructed, with 1.2 miles of this system using existing managed or unmanaged prisms (see Figure 2.4, "Alternatives, Including the Proposed Action"). The planned classified system would be constructed and maintained using BMPs and would meet Forest Service construction and maintenance standards and recreation use patterns. Approximately 16.7

miles of unclassified trail routes would be restored to near natural conditions. The combined direct and indirect effects of these actions would result in positive impacts on soil erosion, water quality, SEZs, and improved management of the trail network. Construction of two trail crossing upgrades and relocation of 1.4 miles of trail and 0.3 miles of road outside of SEZs are additional examples of activities that would reduce impacts from erosion, improve water quality, and improve trail management. The changes to the transportation system were also evaluated for their potential effects on public use patterns and access to available opportunities on NFS lands. The proposed changes were based solely on the existing and desired condition and the need for restoration action in response to the purpose and need. In no case was the treatment prescription design based on the demographic makeup, occupancy, property value, income level, or any other criteria reflecting the status of adjacent non-federal land. The proposed changes to the roads and trails would improve overall access to recreational opportunities for all users and would have a positive indirect benefit of improving ecological conditions. There would be no adverse effect to any minority or low income groups or neighborhood, nor is there any evidence that any individual, group, or portion of the community would benefit unequally from any of the actions in either of the alternatives.

There would be no negative impacts to City of South Lake Tahoe roads or El Dorado County roads (improvements would be made to the water tank access road off of FS road 12N19A) because these roads are currently adequate to accommodate the projected use. The City or County may require rocking or stabilization of road entrances onto city or county roads in order to avoid depositing mud or dust on these roads. These requirements would be made a part of the service or timber sale contract to ensure that operators protect these roads during project implementation.

The resulting road and trail system links itself outside the project area and facilitates administrative and improved public use inside, outside, and through the project area. Route connections are usually greater than the project area itself because they provide connections to other roads and trails as well as loops that can meander in and out of the project area. The proposed action recognizes this important function by including minor construction, decommission, and restoration work necessary to create an overall transportation system that is usable and manageable.

The overall quality of recreation visits would be improved for most visitors and would be noticed as each of the planned actions are implemented (see Section 3.3, "Soil and Watershed Resources"). The principle factors include an improved trails system with additional loop opportunities in locations that guide the visitors through the same general areas they have historically preferred. One exception is the restoration of user established routes originating from residential areas where some would react with disapproval. The most likely scenario is that some residents would continue to use the restored routes or establish similar unofficial routes after the existing routes have been restored. Access routes and legal public access points would be created in high capability areas to discourage the reestablishment of unapproved routes originating in the residential areas. The overall mileage of approved NFS trails would increase as a result of this proposal.

The establishment of a well-managed road system would also improve opportunities for future management access because administrative vehicles and equipment would have better access. This would have economic benefits as travel times would be reduced and more areas could potentially be treated with activities such as vegetation or fuels management. Managed roads and trails would have less economic and environmental impact than the existing unmanaged routes because the managed routes would be analyzed, designed, constructed, reconstructed, rerouted, inspected, and maintained to established standards.

All of the above effects would be effective as the proposed action is implemented and would continue into the foreseeable future.

Cumulative Effects

The long-term cumulative effects would continue to be positive over the next several years due to the improvement in road and trail standards and maintenance. This would result in fewer long-term environmental effects and a reduction in the amount of funds necessary to maintain the overall transportation system due to the establishment of properly designed, constructed, and maintained roads and trails. There would be improvements to water quality and streamside and meadow environments as the roads are stabilized and recover due to a comprehensive transportation system.

3.10.4 Analytical Conclusions

This section provides a brief summary of the conclusions for the analysis of effects to riparian resources. It provides linkage between design features in Chapter 2 and the magnitude, scope, intensity, and significance of the environmental effects from project activities on transportation.

Under the no-action alternative, none of the transportation activities for this project would occur. Therefore, there would be no direct effects from the project. Indirect effects would be limited to ongoing erosion and water quality effects from stream crossings that presently contribute sediment or restrict flow and fish passage that would not be repaired or upgraded to implement this project. There would be no cumulative effects from the no-action alternative.

Under the proposed action alternative, approximately 6.4 miles of roads would be constructed with 2.6 miles being on top of existing road and trail prisms. Approximately 7.7 miles of temporary roads would also be constructed, but restored following implementation. One road would be located outside of an SEZ and off of steep slopes, while another would be converted to a trail. With implementation of the Chapter 2 design features and BMPs (see Appendix A); impacts would be reduced to a level less than significant under the proposed action. The road system would result in 9.5 miles of classified roads, and its direct and indirect effects would provide positive impacts on soil, water, and other resources when compared with the current conditions. Furthermore, the classified road system would increase administrative access.

The installation of 3 new locked gates would eliminate unauthorized public vehicle access and provide clearly designated routes for non-motorized public use into the project area. This would be complemented with the installation of 14 way-finding signs at public access points into the project area.

Approximately 8.9 miles of trail would be constructed, with 2.6 miles of this system using existing managed or unmanaged prisms. Construction of two trail crossing upgrades and relocation of 1.4 miles of trail and 0.3 miles of road outside of SEZs are additional examples of activities that would reduce impacts from erosion, improve water quality, and improve trail management. The planned classified system (10.4 miles) would be constructed and maintained using BMPs and would meet Forest Service construction and maintenance standards and recreation use patterns. Approximately 16.7 miles of unclassified trail routes would be restored to near natural conditions. The combined direct and indirect effects of these actions would result in positive impacts on soil erosion, water quality, SEZs, and improved management of the trail network.

Section 3.11
Greenhouse Gases

3.11 Greenhouse Gases

3.11.1 Introduction

This section discusses the existing conditions and any direct, indirect, or cumulative environmental effects that would result from the proposed action or alternative. The discussion addresses the following major topics: magnitude of greenhouse gases (GHG), forest management in relation to carbon cycle, leakage, biomass energy compared to fossil fuels, and the connection between fuels/vegetation projects and climate change.

Ongoing climate change research was summarized in reports by the United Nations Intergovernmental Panel on Climate Change (IPCC) (www.ipcc.ch), U.S. Climate Change Science Program's Science Synthesis and Assessment Products and the U.S. Global Change Research Program. These reports concluded that climate is already changing, that the change will accelerate, and that human GHG emissions, primarily carbon dioxide emissions (CO2), are the main source of accelerated climate change.

Global climate change is dramatically altering forests and many of the most urgent forest management problems of the past 20 years—wildfires, changing water regimes, and expanding forest insect infestations—have been driven in part by changing climate. Climate change is one of the greatest challenges to human well being and sustainable management of forests and grasslands because the rates of change will likely exceed many ecosystems' abilities to adapt.

Vegetation management (thinning, fuel treatment, planting, etc) is designed to achieve desired conditions in the face of climate change by making stands less susceptible to wildfire, drought, and insect and disease mortality. However, actions such as removing trees, burning fuels, and transporting biomass inherently release greenhouse gasses (such as CO2, CH4, SO2, CO, N2O, etc.) into the atmosphere.

Widespread concern about global climate change has led to interest in reducing emissions of CO2 and, under certain circumstances, in counting additional carbon absorbed in soils and vegetation as part of the emissions reductions. Forests are an important part of the global carbon cycle. Plants use sunlight to convert CO2, water, and nutrients into sugars and carbohydrates, which accumulate in leaves, twigs, stems, and roots. Plants also respire, releasing CO2. Plants eventually die, releasing their stored carbon to the atmosphere quickly or to the soil where it decomposes slowly and increases soil carbon levels.

Land use changes, especially afforestation and deforestation, can have major impacts on carbon storage. Thinning is usually done to enhance growth of desired trees. Enhanced growth of trees stores more carbon, but the cut vegetation releases CO2. The net effect depends on many factors, such as prior and subsequent growth rates and the quantity and disposal of cut vegetation.

Some argue that the carbon released by cutting exceeds the carbon stored in wood products and in tree growth by new forests. Others counter that old-growth forests store little or no additional carbon (Fellow and Goulden 2008), and that new forest growth and efficient wood use can increase net carbon storage. The impacts vary widely and depend on many factors, including soil impacts, treatment of residual forest biomass, proportion of carbon removed from the site, and duration and disposal of the products. To date, the quantitative relationships between these factors and net carbon storage have not been clearly established.

The mission of the Forest Service is to sustain the health, diversity, and productivity of the Nation's forests and grasslands to meet the needs of present and future generations. In the Pacific Southwest Region, ecological restoration is a central driver of our wildland and forest stewardship work. Part of this restoration work includes treatment of overly dense forests to make them better able to adjust and thrive in the face of climate change and large scale disturbances such as fire, drought, and insect and disease attacks.

Currently the Pacific Southwest Region treats approximately 150,000 acres a year through a variety of means including prescribed fire and thinning. Site-specific projects are derived from land and resource management plans (LRMP) based on land allocations that prescribe desired conditions to be achieved over time. Desired conditions for the various national forests in California are generally aimed at developing healthy stands, dominated by large fire resistant trees. National forests are important refugia for a variety of threatened, endangered, and sensitive species that rely on mature and old growth forests for their survival. Forest treatments are designed to foster conditions conducive to preserving the diversity of plant and wildlife species therein, with emphasis on those species at risk. Most treatments are intended to address conditions that impede achievement of desired conditions such as uncharacteristic fuel loads that pose high wildfire risk or dense tree stands that limit the ability of desirable tree species to reach the desired height and girth.

In the Pacific Southwest Region, fuels treatments and vegetation management play an important role in regulating the storage and release of carbon. An accounting of carbon emissions is necessary in order to quantify emissions and disclose fuels treatment and vegetation management project contributions to climate change.

This project is designed to restore the area burned by the Angora Fire to a sustainable forest once again. Specific sources of carbon release in the Angora Fire Restoration Project include:

1. Mechanical Tree Removal: Removing live and dead trees (standing and down) in the project area to meet fuel loading and forest health objectives. This project includes thinning of live trees to increase growing space for larger trees and remove "fuel ladders," which allow fire to climb into the crowns of overstory trees. The merchantable sized pieces are trucked off site for use as lumber, pulp, or biofuels. Most of the dead trees and the smaller diameter live trees will be hauled to Carson City, Nevada, and Loyalton, California, for disposal at those biomass energy facilities. Some of the dead and live trees will be hauled to Camino for processing into wood products.

2. Burning: The limbs and boles of trees are cut and piled in stacks for burning. Such prescribed fires consume small trees and brush that would otherwise grow into ladder fuels and become a fuels hazard.

3. Equipment Use: Use of mechanical equipment will burn fossil fuels and release CO_2. Mechanical equipment will be used in most phases of this project, including restoration of Gardner Mountain Meadow, Angora Creek and Seneca Pond; road reconstruction, decommissioning, and construction; and tree removal.

Although this project will release GHGs, it is impossible to correlate this release with a specific effect on climate change. The only way to meaningfully address GHG emissions and carbon sequestration effects from forest management practices is at the bioregional or global scale. Project-scale analysis of GHG emissions and carbon sequestration is meaningless in terms of detecting impacts on climate change because there is no direct linkage from the project scale to the global scale.

Washington Office and Council on Environmental Quality Guidance on Addressing Climate Change in NEPA

In January 2009, the Forest Service's Washington Office released a document titled "Climate Change Considerations in Project Level NEPA Analysis." This document provides initial Forest Service guidance on how to consider climate change in project-level NEPA analysis and documentation, and it was therefore considered in this EA. In addition, in February 2010 the Council on Environmental Quality (CEQ) provided a draft guidance memorandum for public consideration and comment on the ways in which Federal agencies can improve their consideration of the effects of GHG emissions and climate change in their evaluation of proposals for Federal actions under NEPA.

The 2009 Washington Office document, acknowledges that "some proposals will not have cause-effect relationships to greenhouse gas emissions (GHG) or the carbon cycle, or are at such minor scale that direct effects would be meaningless to a reasoned choice among alternatives." Similarly, the 2010 CEQ draft guidance memo notes that "in many cases, the GHG emissions of the project action may be so small as to be a negligible consideration." Importantly, *all NEPA documentation needs to be relevant to informing the decisionmaker and the public about pertinent environmental effects relevant to the decision being made*. As such, per the 2009 Washington Office guidance, "an analysis of GHG emissions and carbon cycles is not always appropriate for every NEPA document. As with any environmental impact, GHG emissions and carbon cycling should be considered in proportion to the nature and scope of the federal action in question and its potential to either affect emissions or be affected by climate change impacts." This is reaffirmed by the 2010 CEQ draft guidance memo, which states: "… for Federal actions that require an EA or EIS the direct and indirect GHG emissions from the action should be considered in scoping and, to the extent that scoping indicates that GHG emissions warrant consideration by the decision maker, quantified and disclosed in the environmental document." This chapter quantifies and discloses the effects on GHG emissions.

Finally, the 2009 Washington Office guidance indicates that "actions potentially having effects on climate change that are not discernible at the global scale are unlikely to be determined significant from a climate change standpoint for that reason. The determination is relative to the scope of the environmental effects described in an environmental assessment. Because the context of individual projects and their effects cannot be meaningfully evaluated globally to inform individual project decisions, it is not possible and it is not expected that climate change effects can be found to be "significant" under NEPA and, therefore, require EIS preparation."

3.11.2 Existing Conditions

Based on forest inventory data from the USDA Forest Service Region 5 Remote Sensing lab, there is a total of 6,056,994 metric tons (mt) of carbon on NFS lands managed by the LTBMU.

The Angora Fire contributed a large release of GHG. It is estimated that the Angora Fire released 130,117 mt of CO_2 (Bonnicksen 2008).

Through the burning of biomass, energy is produced. We assumed that this energy offsets energy that would otherwise be derived from fossil fuels. Specifically, we assumed that biomass produced from this project would displace power generated from natural gas. Natural gas is considered the cleanest burning of fossils fuels so our estimates are conservative. If coal were displaced instead of natural gas, the savings would be greater while if the displacement is of electricity generated by nuclear power, solar, wind, or hydro power, then the result is an emission with no net saving.

Because of the biomass removal treatment some amount of natural gas does not need to be burned to produce electricity. The conversion for calculating emission offsets is equal to 27.2%. So, for every 1,000 mt of carbon emitted through energy production at a biomass facility, 272.2 mt of carbon would be offset by not burning natural gas. Therefore, burning biomass to produce energy results in a net emission of 727.8 mt of carbon.

If the stand is not treated, the fuels are available in the forest to be emitted to the atmosphere through wildfires. However, this should not be considered under the biomass energy calculations. If it is, then double-counting would occur. The baseline fire risk multiplied by the stock gives the baseline emission from wildfires, which is the emission from fuels in the absence of fuel treatment. Biomass treatment also leaves increased dead wood stocks in the forest as not all biomass is extracted. This results in a longer term release of carbon as dead wood decays.

The most serious concern in any effort where forest management is changed for carbon benefits is leakage – changes outside of the project boundary that reduce or eliminate the carbon benefit. Leakage might occur when, for example, a landowner opts not to harvest timber in order to sequester carbon. That action would reduce the supply of lumber but leave demand unchanged. Therefore, biomass removal in any one project would be provided from other sources leaving no net change in the contribution of $CO2$ to the atmosphere by foregoing biomass removal in individual projects. Leakage occurs, but is very difficult to measure because of its global nature and the difficulty of identifying cause and effect.

3.11.3 Direct, Indirect, and Cumulative Effects

Alternative 1—No Action

Direct and Indirect Effects

Alternative 1 would provide both sequestration and release of carbon. There would be no biomass removed so no biomass energy would be produced. Sequestration would continue as the vegetation in the area continues to recover. As the forest re-grows, the amount of carbon sequestered would increase. Dead materials in the project area would decompose and release carbon. Over the short term (5-10 years), the project area would be a net releaser of carbon through decomposition of dead material. Over the long term (20+ years) as vegetative recovery continues, there would be a point where the project area would start to sequester more carbon (through vegetation growth) than is released (through decomposition).

Taking no action would eventually re-create the conditions (i.e., heavy fuel loading and high risk of severe fire behavior) that existed prior to the Angora Fire (see Section 3.1.3 for direct, indirect, and cumulative effects on Fire and Fuels of Alternative 1). Future wildfire events could release carbon from the project area, including that remaining on the site and new growth since the fire.

There would also be an indirect effect of leakage by not removing biomass from this project area as biomass and wood products would be removed elsewhere to take its place. Therefore, by taking no action, the project would not prevent a release of carbon as it would take place elsewhere.

Cumulative Effects

Due to cumulative effects from leakage, CO2 would still be released into the atmosphere from other sources and energy would still be produced from fossil fuels.

Reforestation occurred in the spring of 2010. New seedlings will continue to grow in height and diameter as well as increase individual crown structure. In doing so, carbon will be sequestered. The long term goal is to achieve a landscape with a healthy, forested condition composed of multiple species that is resilient in drier climates and will be more resistant to insects, disease, drought, and wildfire.

Alternative 2—Proposed Action

Direct and Indirect Effects

The ID Team reviewed the tools available to quantify and model the greenhouse emissions associated with Angora Fire Restoration Project level forest management activities, harvest, and conversion of harvested materials into lumber, renewable energy and wood products. Models do exist to track carbon pools through the forest system into the environment. Quantifying, tracking, and modeling GHG implications of project activities is possible though it is not currently feasible to quantify the actual climate effects of these projects on local, regional, or global climate systems.

Across the project area, 16,164 metric tons carbon (or 59,272 mt of CO2e) would be released through fuels reduction and vegetation removal project activities. This does not take into account the contributions of trucks and equipment used to remove trees and haul. It also does not take into account the different treatment types that are prescribed across the project area, including some areas which are untreated, such as in wildlife snag zones. Conversion of total cubic feet to bone dry tons (BDT) was done by multiplying cubic feet by the specific gravity of each species or group of species. BDT was converted to carbon by multiplying by 0.5 and to CO2e by multiplying carbon by 3.667. This method of estimation was used for total cubic feet of aboveground biomass and does not include any downed wood or underground biomass.

For the mechanically treated units, up to 75% would go to a biomass power plant. Up to 10% would be piled within the unit for burning because it is too deteriorated for use as biomass fuel. Up to 10% would go as sawlogs for wood processing (lumber), and up to 5% would be left on site in the form of slash and tops that would be lopped and scattered for soil cover. This equates to 7,423 mt of carbon (or 27,222 mt of CO2e) that would go to biomass energy production. When taken into account with the offsets of not burning fossil fuels, this equals 7,204 mt of carbon (or 26,416 mt of CO2e) produced from mechanical operations. The 10% that is piled would be directly released in the short-term (2-5 years), and that equates to 990 mt of carbon (3,630 mt CO2e). The 10% that would be removed as sawlogs would go into wood products and be stored as carbon for a longer period of time (decades), accounting for 990 mt of carbon (3,630 mt CO2e). The remaining 5% that is left on site would decompose naturally (in around 5-10 years) and accounts for the balance of 495 mt of carbon (or 1,815 mt CO2e).

For the hand treated units, 100% of the biomass would be piled within the unit for burning (not accessible for public fuelwood or removal for biomass fuel). This equates to 6,266 mt of carbon (or 22,977 mt of CO_2e).

Cumulative Effects

Even if quantified, the cumulative effects of all statewide public forest sectors management activities are demonstrated to be a significant net sink of carbon dioxide, sequestering 25 to 30 million tons of carbon each year through net forest growth (IPCC 2007, Kurz et al 2002, Goines and Nechodom 2009, Robards 2010, and EPA 2008).

Adjacent to the Angora Fire Restoration project is the South Shore Fuels and Healthy Forest Restoration Project. The South Shore project proposes to restore stand conditions by reducing live and dead tree (from insect and disease mortality) stocking in forested stands within the Wildland Urban Interface. Residual tree stand conditions (post thinning) are expected to continue to sequester carbon as individual conifers increase in size (diameter and height). Other LTBMU on-going and proposed forest health projects within the Lake Tahoe Basin (i.e. Spooner, Carnelian, Roundhill, etc) have similar goals for forested conditions. In addition, watershed restoration projects within Alternative 2, Upper Truckee River Watershed, and in other Lake Tahoe Basin watersheds have objectives to increase the amount of riparian vegetation, which have ability to sequester carbon. Although there will be short term releases in CO_2 levels from these projects, these would be non-significant in relation to activities occurring on both forested and non-forested lands that produce such emissions, especially taking into account that vegetation will develop over time.

The preponderance of evidence indicates that land use change, deforestation, and poor management practices that degrade global forest resources contributed significant levels of global GHG releases in 2004 (IPCC 2007). The scientific literature shows that sustainably managed forests can help mitigate climate change by sequestering atmospheric carbon dioxide in woody biomass and forest soils. In the United States, forests and forest products are estimated to sequester a net of 745 million metric tons of carbon dioxide ($TgCO_2$) under current land use and management practices (EPA 2008). Sustainable forest management benefits include reforestation, forest re-growth after harvest, lower risk of wildfire, production of energy efficient and renewable building materials, and renewable biomass energy (Schlamadinger and Marland 1996; Marland and Schlamadinger 1997; Kurz et al. 2002). In the most recent report, the International Panel on Climate Change concluded “In the long term, sustainable forest management strategy aimed at maintaining or increasing carbon stocks, while producing an annual yield of timber, fiber, or energy from forests will generate the largest sustained mitigation benefit” (IPCC 2007).

In California, recent analyses have estimated public forest lands sequester a net of around 25 $TgCo_2e$ carbon dioxide per year under current and projected management practices (Robards 2010), and slightly over 30 $TgCO_2e$ (Goines and Nechodom, 2008). These studies attempt to account for growth, harvest, disturbance from fires and mortality and count wood products from forest management activities at the California statewide level. Angora Fire dead tree removal and green tree thinning treatments are consistent with the activities analyzed in these statewide assessments.

Currently, on the LTBMU there is a total of 6,056,994 mt of Carbon (6 teragrams (Tg)). The proposed action would release approximately 0.19% of the total forest inventory on the LTBMU.

3.11.4 Analytical Conclusions

Due to the small scale of carbon released from activities in the proposed action when compared to the amount of carbon sequestered regionally and nationally on forest lands, GHG emissions and carbon sequestration effects from the proposed action are not significant issues. The overriding goal of this project is to achieve resilient, sustainable forests, dominated by large trees. In addition, other watershed restoration projects strive to increase the amount and vigor of riparian vegetation species, which have ability to sequester carbon. These goals are consistent with forest management recommendations provided by Ryan et al. (2010), Canadell and Raupach (2008), Kashian et al. (2006), Finkral and Evans (2008), and Fellows and Goulden (2008) for sustaining forests as carbon sinks during the predicted period of global warming that potentially lies ahead.

Chapter 4
Consultation and Coordination

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Consultation and Coordination

The following individuals, agencies, and organizations were consulted during the preparation of this report.

4.1 Interdisciplinary Team Members

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Appendix A
Best Management Practices

Appendix A

Best Management Practices for the Angora Fire Restoration Project

This document discusses the applicable best management practices (BMPs) for the proposed action's design features. Details are provided for application of the BMPs. These BMPs are designed to reduce or eliminate direct, indirect, and cumulative impacts to soil and hydrologic conditions and to reduce potential impacts (nutrient and sediment loads, affecting lake clarity) to Lake Tahoe, a unique national feature. Actual application of these BMPs are based on the proposed action and integration (further refinement) with project design features (EA, Section 2.3.2)

Forest management and associated road building in the steep rugged terrain of forested mountains has long been recognized as a source of non-point water quality pollution. Non-point pollution is not, by definition, controllable through conventional treatment plan means. Containing the pollutant at its source, thereby precluding delivery to surface water, controls non-point pollution. Sections 208 and 319 of the federal Clean Water Act, as amended, acknowledge land treatment measures as being an effective means of controlling non-point sources of water pollution and emphasize their development.

Working cooperatively with the California State Water Quality Control Board (SWQCB), the Forest Service developed and documented non-point pollution control measures applicable to National Forest System (NFS) lands. Following evaluations of the control measures by SWQCB personnel as they were applied on site during management activities, assessment of monitoring data, and the completion of public workshops and hearings, the Forest Service's measures were certified by the state and approved by the U.S. Environmental Protection Agency (EPA) as the most effective means the Forest Service could implement to control non-point source pollution. These measures were termed best management practices. BMP control measures are designed to accommodate site-specific conditions. They are tailor-made to account for the complexity and physical and biological variability of the natural environment. In the 1981 Management Agency Agreement between the SWQCB and the Forest Service, the State agreed that "the practices and procedures set forth in the Forest Service document constitute sound water quality management and, as such, are the best management practices to be implemented for water quality protection and improvement on NFS lands." The implementation of BMPs is the performance standard against which the success of the Forest Service's non-point pollution water quality management efforts are judged.

The Clean Water Act provided the initial test of effectiveness of the Forest Service non-point pollution control measures because it required the evaluation of the practices by the regulatory agencies (SWQCB and EPA) and the certification and approval of the practices as the *best* measures for control. Another test of BMP effectiveness is the capability to custom fit the measures to a site-specific condition where non-point pollution potential exists. The Forest

Service BMPs are flexible in that they are tailor-made to account for diverse combinations of physical and biological environmental circumstances. A final test of the effectiveness of the Forest Service BMPs is their demonstrated ability to protect the beneficial uses of the surface waters in the state. The BMPs incorporate 75 years of erosion control and watershed protection experience and are based on sound scientific principles. The land treatment measures incorporated into Forest Service BMPs evolved through research and development and have been monitored and modified over several decades with the expressed purpose of improving the measures and making them more effective. Onsite evaluations of the control measures by state regulatory agencies found the practices were effective in protecting beneficial uses and certifiable for Forest Service application as their means to protect water quality.

Implementation, effectiveness, and forensic monitoring will be performed to monitor project activity. Implementation monitoring consists of detailed visual monitoring of treated areas and roads/landings prior to the rainy season with emphasis placed on determining if management measures (such as erosion control measures or riparian buffers) were implemented or installed in accordance with approved timber harvest projects including waiver eligibility criteria.

The Sierra Nevada Forest Plan Amendment Record of Decision (2004, SNFPA ROD) provides the directive for the use of regional stream condition inventory (SCI) protocol to assess the effectiveness of the prescribed suite of BMPs on protection of physical, biological, and chemical conditions in a project area. SCIs and channel stability analyses (CSAs) were performed in most of the watersheds associated with the project.

Existing and ongoing water quality monitoring information can be obtained from the United States Geologic Survey (USGS), which maintains stream gages at several locations within the Angora analysis area. The USGS monitoring sites in the analysis area are located on the Upper Truckee River near Highway 50 at Meyers and in South Lake Tahoe. Continuous stream flow data is collected at these sites, and periodic water quality samples (approximately 25–30 samples) are also collected each year. The water quality data collected by the USGS at these stations would be monitored periodically throughout project implementation to track Angora project effects on stream water quality. No additional water quality sampling is proposed for this project.

Included within the Tahoe Regional Planning Agency (TRPA) 2008 Water Quality Management Plan for the Tahoe Basin is a section devoted to stream environment zone (SEZ) protection and restoration. The term SEZ was developed by TRPA to denote perennial, intermittent, and ephemeral streams and drainages, as well as marshes and meadows. SEZs generally possess the following characteristics: riparian or hydric (wet site) vegetation; alluvial, hydric soils; and the presence of surface water or near-surface groundwater at least part of the year. SEZs are essential because they provide multiple resource benefits; provide natural treatment and conveyance of surface runoff; contain significant fish and wildlife habitat; improve and maintain environmental amenities of the Lake Tahoe region; and achieve TRPA's environmental thresholds for water quality, vegetation preservation, and soil conservation.

As stated in the Water Quality Management Plan, TRPA's environmental threshold goal is to "preserve existing naturally functioning SEZ lands in their natural condition and restore 25% of the SEZ lands that have been identified as disturbed, developed, or subdivided, to attain a 5% total increase in the area of naturally functioning SEZ lands" (TRPA 2008)

The TRPA revised their Code of Ordinances in December 2004, in response to the Lahontan Water Board updating their basin plan in 1995, to allow for the use of "innovative technology equipment" for vegetation management treatments in SEZs (State of CA WQCP 2005, TRPA 2004).[1]

BMPs, as described in this document, have been effective in protecting beneficial uses within the affected watersheds and have been applied in other projects within the Lake Tahoe Basin Management Unit. Where proper implementation has occurred, there have not been any substantive adverse impacts to cold-water fisheries habitat conditions or primary contact recreation use of the surface waters. The practices specified herein are expected to be equally effective in maintaining the identified beneficial uses.

The following management requirements are designed to address the watershed management concerns. BMPs are derived from the Forest Service publication *Water Quality Management for National Forest System Lands in California* (USDA Forest Service 2000). All applicable water quality BMPs would be implemented. BMPs used within the Angora Fire Restoration Project are listed in Table 1.

Table 1. Angora Fire Restoration Project Best Management Practices

PSW Region BMPs	Best Management Practice Description
BMP 1-1: Timber sale planning process	Earth scientists or other trained individuals will evaluate onsite watershed characteristics and the potential environmental consequences of activities related to the proposed timber harvest activities. They will design the timber sale to include site-specific prescriptions for each area of water quality concern.
BMP 1-2: Timber harvest unit design	Earth scientists or qualified specialists will conduct a hydrologic and geologic survey of the area affected by proposed harvest activities. Mitigations or changes needed to stabilize slopes or improve streamcourses will be incorporated into the harvest unit design.

1 The first projects to apply this new guidance have been completed and include the LTBMU Heavenly Valley Creek SEZ demonstration (HSEZ) project (Norman et al. 2008) and the Celio Ranch project (Goldberg 2006). The HSEZ fuel reduction project was implemented in summer 2007. The project utilized low ground pressure (i.e., 6 pounds per inch [psi] alone or 13 psi fully loaded) mechanical equipment (CTL harvester and forwarder) to treat heavy fuel loads in the SEZ, and included an intensive monitoring program to evaluate the soil and water resource effects of the project. The results of that study demonstrated that the CTL mechanical operations resulted in a minor decrease in saturated hydraulic conductivity (Ksat, a measure of soil infiltration capacity) (Norman et al. 2008). However, the established threshold for Ksat was not reached, and the difference between pre- and post-project values did not result in ecologically significant impacts to soil hydrologic function such as infiltration, permeability, and runoff (Norman et al. 2008). In addition, there was no statistically significant difference between pre- and post-project soil bulk density. The 11% reduction in soil cover measured was well within the range of acceptable soil cover set forth in the USFWS Region 5 soil quality standards (SNFPA FEIS Appendix F). Additional details about the results from the HSEZ monitoring effort are available in the hydrology specialist report (located in the project file. The HSEZ project monitoring results showed that mechanical treatment of SEZs with CTL forwarding and harvesting technology could be safely implemented under favorable soil moisture conditions (i.e., relatively high Ksat and low soil moisture content) without causing ecologically adverse impacts to soil or water quality (Norman et al. 2008).

PSW Region BMPs	Best Management Practice Description
BMP 1-3: Determination of erosion hazard rating (EHR) for timber harvest unit design	Use the EHR system developed by the California Soil Survey. Committee to evaluate the potential erosion hazard of proposed timber harvest units during the pre-sale planning process, and use this information to help design the timber sale and to select appropriate erosion control measures.
BMP 1-4: Use of sale area maps (SAMs) for designating water quality protection needs	The Interdisciplinary Team (IDT) will identify and delineate water quality protection features, such as the location of streamcourses and riparian zones to be protected, wetlands to be protected, boundaries of harvest units, and roads where log hauling is prohibited or restricted, as part of the environmental documentation process. The Sale Preparation Forester will include them on the SAM at the time of contract preparation.
BMP 1-5: Limiting the operating period of timber sale activities	Limited operating periods will be identified and recommended during the TSPP by the IDT. Purchaser must submit a general plan of operation which will identify planed periods for, and methods of road construction, timber harvesting, completion of slash disposal, erosion control work and other contractual requirements. The purchaser will provide an annual schedule of anticipated activities. Limited operating period will be used to limit the purchaser's operation to specified periods when adverse environmental effects are not likely.
BMP 1-6: Protection of unstable lands	The IDT will prepare plans and environmental documents, utilizing information provided from specialists trained and qualified to identify unstable areas. Where unstable lands are presently classified as suitable forest lands, the classification is changed to unsuitable forest lands, which will not be harvested until they can be harvested without irreversible adverse effects to soils, productivity, or watershed conditions.
BMP 1-8: Streamside management zone designation	Roads, skid trails, landings and other timber harvesting facilities will be kept at a prescribed distance from designated stream courses. Factors such as stream class, channel aspect, channel stability, sideslope steepness, and slope stability will be considered in determining the activities limited within Streamside Management Zones (SMZs). Aquatic and riparian habitat, beneficial riparian zone function, and their condition and estimated response to the proposed timber sale will also be evaluated in designating the SMZ.
BMP 1-9: Determine tractor loggable ground	To minimize soil erosion and subsequent sedimentation and water quality degradation resulting from ground disturbance of logging systems. To determine tractor loggable ground, consider physical site characteristics such as steepness of slopes and soil properties. The Erosion Hazard Rating is one method that can be used.
BMP 1-10: Tractor skidding design**	Watershed factors such as slope, soil stability, exposure, SMZs, meadows, and other factors that may affect surface water runoff and sediment yield potential will be considered when designing skidding patterns. The careful control of skidding patterns serves to avoid onsite and downstream channel instability, build-up of destructive runoff flows, and erosion in sensitive watershed areas such as meadows and SMZs.

PSW Region BMPs	Best Management Practice Description
BMP 1-12: Log landing location	Landing locations proposed by the purchaser or their representatives must be agreed to by the Sales Administrator (SA). An acceptable landing will be evaluated according to a set of criteria that includes the following: the cleared or excavated size of landings should not exceed that needed for safe and efficient skidding and loading operations; landing locations that involve the least amount of excavation and the least erosion potential will be selected; landings will be located near ridges away from headwater swales, in areas that will allow skidding without crossing stream channels or causing direct deposit of soil and debris to the stream; landings will be located where the least number of skid roads will be required, and sidecast material can be stabilized without entering drainages; skid approach will be as nearly level as feasible; and the number of skid trails entering a landing will be minimized.
BMP 1-13: Erosion Prevention and Control Measures During Timber Sale Operations	Equipment will not be operated when ground conditions are such that excessive damage will result. Erosion control measures will be kept current, which means daily, if precipitation is likely, or at least weekly, when precipitation is predicted.
BMP 1-14: Special Erosion Prevention Measures on Disturbed Lands	Where required by the contract, the purchaser will give adequate treatment by spreading slash, mulch, wood chips, or some other treatment (if agreed upon) on portions of tractor roads, skid trails, landings, cable corridors, or temporary road fills. This provision is to be used only for timber sales that contain special soil stabilization problems that are not adequately treated by normal methods.
BMP 1-15: Revegetation of Areas Disturbed by Harvest Activities	Where soil has been severely disturbed and the establishment of vegetation is needed to control accelerated erosion, the purchaser will be required to establish an adequate ground cover of grass or other vegetative stabilization measures approved by the USFS.
BMP 1-16: Log Landing Erosion Prevention and Control	• Timber Sale Contract (TSC) requirements provide for erosion prevention and control measures on all landings, which will include provisions for proper drainage. After landings have served purchaser's purpose, the purchaser will ditch or slope the landings and may be required to rip or subsoil and make provisions for revegetation to permit the drainage and dispersal of water.
BMP 1-17: Erosion Control on Skid Trails	To protect water quality by minimizing erosion and sedimentation derived from skid trails, erosion control measures are required on a skid trails, tractor roads, and temporary roads. Normally, such measures involve constructing cross ditches and water spreading ditches. The location of all erosion control measures are designated and agreed to on the ground by the SA.
BMP 1-18: Meadow Protection	At a minimum, meadow protection requirements contained in Forest Land and Resource Management Plans must be identified and implemented. Unauthorized operation of vehicular or skidding equipment in meadows or in protection zones is prohibited by the TSC. Damage to designated meadows and/or their associated protection zones will be repaired by the purchaser in a timely manner, as agreed to by the SA. Damage to a streamcourse or streamside management zone (SMZ) caused by unauthorized purchaser operations will be repaired by the purchaser in a timely manner and agreed upon manner.
BMP 1-19: Streamcourse	Streamcourse protection principles including but not limited to the following will be carried out: location and method of streamcourse crossings must be agreed to

PSW Region BMPs	Best Management Practice Description
Protection (Implementation and Enforcement)	by the SA prior to construction; all damage to streamcourses, including banks and channels, must be repaired to the extent practicable; all debris generated by the project will be removed from streamcourses in an agreed upon manner that will cause the least disturbance; equipment use in SMZs will be limited or excluded; water bars and other erosion control structures will be located to disperse concentrated flows and filter out sediments prior to entry into a streamcourse; and material from temporary road and skid trail streamcourse crossings will be removed and streambanks restored to the extent practicable.
BMP 1-20: Erosion Control Structure Maintenance	During the period of the TSC, the purchaser will provide maintenance of soil erosion structures constructed by purchaser until they become stabilized, but not for more than 1 year after their construction. After 1 year, needed erosion control maintenance will be accomplished using other funding sources under TSC provisions B6.6 and B6.66.
BMP 1-21: Acceptance of Timber Sale Erosion Control Measures Before Sale Closure	“Acceptable” erosion control means only minor deviation from established objectives, so long as no major or lasting damage is caused to soil or water. SAs will not accept erosion control measures that fail to meet these criteria.
BMP 1-22: Slash Treatment in Sensitive Areas	Special slash treatment site preparation will be prescribed in sensitive areas to facilitate slash disposal without the use of mechanized equipment.
BMP 1-25: Modification of Timber Sale Contract	Once timber sales are sold, they are harvested as planned in the TSC. Occasionally, however, it will be necessary to modify a TSC due to new concerns about the potential effects of land disturbance on a water resource. Where the project is determined to unacceptably affect watershed values, the appropriate Line Officer will take corrective actions, which may include contract modification.
BMP 2-1: General Guidelines for the Location and Design of Roads	Location, design and construction of roads will be agreed upon by the IDT in order to result in minimal resource damage.
BMP 2-2: Erosion Control Plan	Within a specified period after the award of a contract (currently 60 days prior to the first operating season), the purchaser will submit a general plan that, among other things, establishes erosion control measures. Operations cannot begin until the Forest Service has approved the plan in writing.
BMP 2-3: Timing of Construction Activities	Temporary road construction and road re-construction activities will be conducted during the dry season, when rain and runoff are unlikely and weather and ground conditions are such that impacts to soils and water quality will be minimal. Construction of drainage facilities and performance of other contract work to control erosion and sedimentation is required in conjunction with earthwork projects. The operator shall limit the amount of area being graded at a site at any one time, and shall minimize the time that an area is left bare.

PSW Region BMPs	Best Management Practice Description
BMP 2-4: Stabilization of Road Slope Surfaces and Spoil Disposal Areas	Minimize or prevent erosion from exposed cut slopes, fill slopes, and spoil disposal areas by using bioengineering and other techniques. Depending on site factors such as slope angle, soil type, climate, and proximity to waterways, many fill slopes, some cut slopes, and some spoil disposal areas will require vegetative and/or mechanical measures to provide surface soil stability.
BMP 2-5: Road Slope Stabilization Construction Practices	To reduce sedimentation by minimizing erosion from road slopes and slope failure along roads, plan all road construction considering erosion prevention and adequate stabilization needs. Application is commonly in conjunction with BMP 2-4. Complete most, if not all, of the stabilization measures prior to the first winter rains.
BMP 2-6: Dispersion of Subsurface Drainage From Cut and Fill Slopes	Minimize the possibilities of cut or fill slope failure and the subsequent production of sediment. Since the angle and height of cut and fill slopes can increase the risk of instability, it is often necessary to provide subsurface drainage to avoid moisture saturation and subsequent slope failure.
BMP 2-7: Control of Road Drainage	Used alone or in combination, methods such as the construction of properly spaced cross drains, water bars, or rolling dips; installation of energy dissipaters, aprons, downspouts, gabions, or flumes; armoring of ditches and drain inlets and outlets; and removing or adding berms can be used to control unacceptable effects of drainage.
BMP 2-9: Timely Erosion Control Measures on Incomplete Roads and Stream Crossing Projects	Apply protective measures to all areas of disturbed, erosion-prone, unprotected ground that is not to be further disturbed in the present year. Affected areas can include roads, road fills, skid trails, landings, stream crossings, bridge excavations, and firelines. Preventative measures include removal of temporary culverts, culvert plugs, diversion dams, or elevated stream crossings; installation of temporary culverts, side drains, cross drains, diversion ditches, sediment basins, berms, or other facilities needed to control erosion; removal of debris, obstructions and spoil material from channels and floodplains; and planting vegetation, mulching, and/or covering exposed surfaces with jute mats or other protective material.
BMP 2-10: Construction of Stable Embankments	Construct embankments with materials and methods that minimize the possibility of failure and subsequent water quality degradation. Design and construct the roadway with a proper slope ratio and with adequate strength to support the treadway, shoulders, subgrade, and traffic loads. Construct embankments using one of the following methods: side casting and end-dumping, layer placement, controlled compaction, and/or using retaining walls, confinements systems, plantings, or a combination of these methods.
BMP 2-11: Control of sidecast material during construction and maintenance	To minimize sediment production originating from side cast material during road construction or maintenance, loose, unconsolidated material must not be permitted to enter SMZs. Side casting is an unacceptable construction alternative in areas where it can adversely impact water quality. Prior to the start of construction or maintenance activities, waste areas must be located where excess material can be deposited and stabilized.
BMP 2-12: Servicing and refueling equipment	If the volume of fuel exceeds 660 gallons in a single container, or if total storage at a site exceeds 1,320 gallons, project Spill Prevention, Containment, and Counter Measures (SPCC) plans are required. Operators are required to remove service residues, waste oil, and other materials from National Forest land and be prepared to take responsive actions in case of a hazardous substance spill, according to the SPCC plan.

PSW Region BMPs	Best Management Practice Description
BMP 2-13: Control of construction and maintenance activities adjacent to SMZs	Construction and maintenance fills, sidecast, and end-hauled materials are kept out of SMZs except at designated sites to minimize effects on the aquatic environment. It is also necessary to stabilize fill slopes to prevent sediment accumulations in the streamside zone.
BMP 2-14: Controlling in-channel excavation	When necessary in the construction or removal of culverts, bridges, and other facilities, heavy equipment is permitted to cross or work in or near streams or lakes during construction under specific protection requirements. Excavation during the installation of instream structures must follow all of the following minimum water quality protection requirements: 1) Unless otherwise approved, no excavation will be made outside of caissons, cribs, cofferdams, or sheet piling; 2) the natural streambed or lake bottom adjacent to the structure will not be disturbed without prior approval of the ER or COR; 3) If any excavation or dredging is made at the site of the structure before it is sunk in place, all excavations will be restored to the original surface and the streambed or lake bottom must be protected with suitable material; 4) material deposited within the stream or lake area from foundation or other excavation will not be discharged into live streams or lakes, but will be put into settling areas as shown in plans or approved by the ER or COR; 5) If the channel or lake bottom is disturbed during construction, it must be restored to its original configuration while minimizing any additional disturbance; and, 6) disturbance of stream or lake banks are kept to a minimum. Disturbed banks are stabilized.
BMP 2-15: Diversion of flows around construction sites	Stream flow must be diverted around construction sites such as bridges, culverts, and dams for all live streams. The diverted flows are returned to their natural streamcourse as soon as possible after construction or prior to the rainy season.All disturbed areas are stabilized prior to the rainy season or as needed.
BMP 2-16: Stream crossings on temporary roads	Stream crossing structures are required on all temporary roads where it is necessary to cross designated channels. Such crossings are designed to provide for unobstructed flows and the passage of fish, and to minimize damages to stream channels and water quality. The number of crossings will be kept to the minimum needed for access and will be as perpendicular to stream courses as possible. Temporary crossing facilities will be removed and the site stabilized prior to the rainy season each year or when the facility is no longer needed.
BMP 2-17: Bridge and culvert installation	Spoil material from excavation during construction of in-channel structures should neither obstruct the stream course or natural floodplain nor impair the efficiency of the installed structure. Excavated material should be kept out of stream channels, stockpiled material on floodplains should be removed prior to a storm event, and flowing water should be diverted around work sites.
BMP 2-19: Disposal of right-of-way and roadside debris	Ensure that organic debris generated during road construction is kept out of streams so that channels and downstream facilities are not obstructed and ensure that debris jams are not formed that obstruct fish passage or could result in downstream damage from high water flow surges after dam failure. Construction debris and other generated roadside slash developed along roads in SMZs shall be disposed of by: 1) onsite piling and burning, burying, chipping, scattering, disposal in cutting units, windrowing at the base of slopes, or incorporation (only in temporary roads); 2) removal to agreed locations; 3) A combination of the above 4 large limbs and logs removal to designated sites outside the SMZ or relocation within the SMZ to meet aquatic resource management.

PSW Region BMPs	Best Management Practice Description
BMP 2-21: Water source development consistent with water quality protection	Water source development to supply water for road construction and maintenance, dust control, and fire control shall avoid use of earth fill and dam construction. Cofferdams and water holes will be built out of sandbags filled with clean sand or gravel. Downstream water flow will not be reduced to a level that will be detrimental to established uses.
BMP 2-22: Maintenance of roads	Provide the basic maintenance required to protect the road and to ensure that damage to adjacent land and resources is prevented. This is the normal prescription for roads closed to traffic and often requires an annual inspection to determine what work is needed. At a minimum, maintenance must protect drainage facilities and runoff patterns. Additional maintenance includes surfacing and resurfacing, outsloping, clearing debris, etc.
BMP 2-23: Road surface treatment to prevent loss of materials	When necessary, contractors, purchasers, special users, and Forest Service project leaders will undertake road surface treatment measures such as watering, sealing, aggregate surfacing, or paving to minimize loss of road materials.
BMP 2-24: Traffic control during wet periods	Roads that must be used during wet periods should have a stable surface and sufficient drainage to allow use while also maintaining water quality. Rocking, paving, and armoring are measures that protect the road surface and reduce soil loss. Where wet season field operations are planned, roads may need to be upgraded, use restricted to low ground pressure vehicles or frozen ground conditions, or maintenance intensified to handle the traffic without creating excessive erosion and damaging the road surface.
BMP 2-25: Snow removal controls to avoid resource damage	Where Forest Roads are used throughout the winter, the contractor will be responsible for snow removal that will protect roads and adjacent resources. Rocking or other special surfacing will be necessary before the operator is allowed to use the roads. Snow berms will be removed where they result in accumulation or concentration of snowmelt runoff on the road and erosive fill slopes. Snow berms will be installed in places that will preclude concentration of snowmelt runoff and that will serve to rapidly dissipate melt water.
BMP 2-26: Decommission of roads	Temporary roads will be obliterated or decommissioned following their intended use. Obliteration/decommissioning may include re-contouring or outsloping to return the road prism to near natural hydrologic function, blocking the road to vehicle access, removing crossings and restoring natural drainage, and stabilizing road surfaces with ripping and/or revegetation.
BMP 5-2: Slope limitations for mechanical equipment operations	Ground based equipment operation will be limited to slopes where corrective measures such as water bars can be effectively installed to reduce gully and sheet erosion and associated sediment production.
BMP 5-3: Tractor operation limitation in wetlands and meadows	Mechanical equipment will be excluded from wetlands and meadows except for the purpose of restoring wetland and meadow function. The target areas will be protected from mechanical operations except when they are identified for treatment by trained and qualified personnel on the IDT. Specific protection measures will be established for each area that could incur adverse water quality impacts.

PSW Region BMPs	Best Management Practice Description
BMP 5-4: Revegetation of surface disturbed areas	On unstable soil surfaces resulting from project activities, revegetation with native seed and/or application of mulch may be required to protect water quality and minimize soil erosion. The onsite factors evaluated will include soil productivity, topography, EHR, and soil water holding capacity.
BMP 5-5: Disposal of organic debris	The project IDT will determine the methods of debris disposal and/or placement of debris after treatment. Methods of disposal include: prescribed burning, chipping, mastication, lop and scatter, and mechanical harvesting/collection.
BMP 5-6: Soil moisture limitations for mechanical equipment operations	To prevent compaction, gullying and rutting, mechanical equipment operations will be limited or excluded during wet soil conditions.
BMP 6-2: Consideration of water quality in formulating fire prescriptions	To ensure water quality protection while achieving management objectives through the use prescribed fires, prescription elements will include, but not be limited to, factors such as fire weather, slope, aspect, soil moisture, and fuel moisture. The prescription will include at the watershed and subwatershed level the optimum and maximum burn block size, aggregated burned area, acceptable disturbance for contiguous and aggregate length for the riparian/SMZ, and maximum expected area covered by water repellent soils.
BMP 6-3: Protection of water quality from prescribed burning effects	Implementation of techniques to prevent water quality degradation, maintain soil productivity, and minimize erosion from prescribed burning. These techniques include: constructing water bars in fire lines, reducing fuel loading in drainage channels, and retaining or re-establishing ground cover as needed to keep erosion of the burned site within the limits of the burn plan.
BMP 7-1: Watershed restoration	To repair degraded watershed conditions and improve water quality and soil stability, utilize the following watershed restoration techniques: improve ground cover density, improve infiltration, and improve overall watershed function.
BMP 7-3: Protection of wetlands	Activities and new construction in wetlands will not be permitted whenever there is a practical alternative. Factors relevant to the survival and quality of the wetlands, such as water supply, water quality, recharge areas, habitat diversity and stability, and hydrologic function of riparian areas will be considered when evaluating proposed actions in wetlands. Replacement in kind of lost wetlands should be evaluated to apply a “no net loss” perspective to wetland preservation.
BMP 7-4: Forest and hazardous substance spill prevention control and counter-measure (SPCC) plan	To prevent contamination of waters from accidental spills, a SPCC plan must be prepared if the total oil products on site in aboveground storage exceed 1,320 gallons, or if a single container exceeds 660 gallons.
BMP 7-7: Management by closure to use	If the Forest Supervisor determines that a particular resource or improvement needs protection from use to preclude adverse water quality effects, activities that could result in damages to those resources or improvements may be excluded.
BMP 7-8: Cumulative off-site watershed effects	Cumulative Watershed Effects (CWE) analyses are used to protect identified beneficial uses of water from the combined effects of multiple management activities.

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Appendix B
Streamside Environment Zone Risk Assessment Rating

Appendix B

Streamside Environment Zone Risk Assessment Rating for the Angora Fire Restoration Project

In December 2004, the Tahoe Regional Planning Agency (TRPA) revised their Code of Ordinances (and Lahontan updated their Basin Plan) to allow for the use of "innovative technology equipment" for vegetation management treatments in Streamside Environment Zones (SEZs). This has been interpreted to include low ground pressure mechanical equipment, among other methods. One of the first projects to apply this new guidance was the LTBMUs Heavenly Valley Creek SEZ Demonstration (HSEZ) Project. After extensive monitoring of soil and water quality conditions in the HSEZ site, it was determined that other fuel reduction stands containing SEZs could be treated with similar mechanical equipment without impacts to soil and water quality if they are equally or less sensitive than the HSEZ site.

During project planning for the South Shore Hazardous Fuels Reduction Project a sensitivity rating system was developed by Lake Tahoe Basin Management Unit (LTBMU) staff to evaluate SEZ sensitivities to ground based equipment operations (term "SEZ risk assessment rating"). The rating system was designed to evaluate whether or not ground based mechanical equipment could perform the fuel reduction work needed in stands containing SEZs without the risk of adverse effects to soil or water quality in or near the SEZ. However, after evaluating the post-Angora Fire existing condition, LTBMU watershed specialists have determined that there is variability in SEZ type and extent, primarily due to increases in surface water availability in areas where large scale conifer mortality occurred and lack of ground cover as a result of surface fuel consumption. The following additional criteria, shown as bullets below, are included as project design features in chapter 2 (#12 d, e, and f) for use when applying the SEZ risk assessment rating in the Angora Fire. These design features reflect the updated version of the SEZ risk assessment for use in this project.

- Use the Region 5 Erosion Hazard Rating to determine adequate ground cover at completion of treatment. Adequate ground cover would produce an Erosion Hazard Rating of "low" within SEZs. If adequate ground cover cannot be provided, the SEZ would be considered unsuitable for mechanical treatment. Application of chipped or masticated material would stop at the stream buffer (i.e., chip within the SEZ only up to the no-cut buffer). (Erosion Hazard Ratings are based on soil type, slope, slope length, climate, and ground cover.)

- The risk assessment rating works best for treatment units of 50 acres or less. Divide larger units and rate them individually. Units would be divided based on relevant stream channel and/or terrestrial geomorphic features.

- Rating criteria for stream channel type would be dropped. This has not proved as relevant as expected, and stream channel typing requires skill and experience that few of our staff possess. Most other entities doing fuels work would not possess this skill either, so it would make it more difficult to apply the risk assessment outside of our agency.

Appendix C
Riparian Conservation Objective Analysis

Appendix C

Riparian Conservation Objective Analysis for the Angora Fire Restoration Project

Goals for Aquatic, Riparian, and Meadow Ecosystems and Associated Species

Aquatic Management Strategy (AMS) goals for the Angora Restoration Project follow the direction provided in the Sierra Nevada Forest Plan Amendment (SNFPA). Goals commensurate with the SNFPA are as follows:

- Watershed Condition: Maintain and restore soils with favorable infiltration characteristics and diverse vegetative cover to absorb and filter precipitation and to sustain favorable conditions of stream flows.
- Watershed Connectivity: Maintain and restore spatial and temporal connectivity for aquatic and riparian species within and between watersheds to provide physically, chemically, and biologically unobstructed movement for their survival, migration, and reproduction.
- Water Quality: Maintain and restore water quality to meet goals of the Clean Water Act and Safe Drinking Water Act, providing water that is fishable, swimmable, and suitable for drinking after normal treatment.
- Special Habitats: Maintain and restore the distribution and health of biotic communities in special aquatic habitats (such as springs, seeps, vernal pools, fens, bogs, and marshes) to perpetuate their unique functions and biological diversity.

The Angora Fire Restoration Project addresses key elements of the AMS strategy through the establishment of major restoration categories and the purpose and need for the proposed action and its associated project design features as follows:

- Restoration Categories: the proposed action established five major categories of restoration. Two of these (Aquatic Habitat and Stream Channel Restoration, and Road and Trail Delineation) focus on achieving the goals of the AMS by responding to the detrimental effects of the Angora Fire as well as pre-existing conditions in the fire area that compromise the AMS goals.
- Purpose and Need: The purpose and need statements (see Chapter 2 of the EA) address specific needs for action to protect aquatic habitat, water quality, and soil productivity.
- A proposed action that reflects and incorporates the AMS goals and objectives, riparian conservation areas (RCAs), and riparian conservation objectives (RCOs) analysis standards and guidelines. The proposed action includes stream channel and meadow restoration, restoration of user-created roads and trails, and road and trail improvements to reduce current impacts to the aquatic environment.

Pertinent to the Angora Fire Restoration Project, three management elements in the 2004 Sierra Nevada Forest Plan Amendment apply: aquatic management strategy, RCAs, and RCOs with associated standards and guidelines.

Applicable RCOs

X 1. *Ensure that identified beneficial uses for the water body are adequately protected. Identify the specific beneficial uses for the project area, water quality goals from the Regional Basin Plan, and the manner in which the standards and guidelines will protect the beneficial uses.*

X 2. *Maintain or restore: (1) the geomorphic and biological characteristics of special aquatic feature, including lakes, meadows, bogs, fens, wetlands, vernal pools, springs; (2) streams, including in stream flows; (3) hydrologic connectivity both within and between watersheds to provide for the habitat needs of aquatic-dependent species.*

X 3. *Ensure a renewable supply of large down logs that: (1) can reach the stream channel and (2) provide suitable habitat within and adjacent to the RCA.*

X 4. *Ensure that management activities, including fuels reduction actions, within RCAs and CARs enhance or maintain physical and biological characteristics associated with aquatic- and riparian-dependent species.*

X 5. *Preserve, restore, or enhance special aquatic features, such as meadows, lakes, ponds, bogs, fens, and wetlands, to provide the ecological conditions and processes needed to recover or enhance the viability of species that rely on these areas.*

X 6. *Identify and implement restoration actions to maintain, restore or enhance water quality and maintain, restore, or enhance habitat for riparian and aquatic species.*

RCO Standard and Guideline Discussion:

The RCOs listed in the 2004 SNFPA Record of Decision were reviewed for applicability to the project. RCOs 1 through 6 apply to the project and are further reviewed below. RCO 5 partially applies because the project does not include grazing treatments; it could however include bogs and fens.

RCOs 1 through 6 were reviewed for consistency with the associated standards and guidelines. None of the project activities were found to be inconsistent with the standards and guidelines.

Standards and Guidelines for Riparian Conservation Areas and Critical Aquatic Refuges

91. Designate riparian conservation area (RCA) widths as described in Part B of the SNFPA ROD Appendix A. The RCA widths displayed in Part B may be adjusted at the project level if a landscape analysis has been completed and a site-specific RCO analysis demonstrates a need for different widths.

The widths for the RCAs are consistent with the 2004 Sierra Nevada Forest Plan Amendment: 300 feet on either side of perennial streams and 150 feet on either side of intermittent or ephemeral streams. The project proposes a variety of activities within these RCAs and the associated design features ensure that these are consistent with RCOs 3 and 4.

92. Evaluate new proposed management activities within CARs and RCAs during environmental analysis to determine consistency with the riparian conservation objectives at the project level and the AMS goals for the landscape. Ensure that appropriate mitigation measures are enacted to (1) minimize the risk of activity-related sediment entering aquatic systems and (2) minimize impacts to habitat for aquatic- or riparian-dependent plant and animal species.

RCAs are a buffer for streams, special aquatic features, and other hydrological depressions defined by the SNFPA1. Buffer width is dependent on stream or feature type (perennial, intermittent, ephemeral). Stream environment zones (SEZs) are nested within RCAs and are defined by Lahontan Regional Water Quality Control Board (RWQCB) and Tahoe Regional Planning Agency (TRPA) as biological communities that owe their characteristics to the presence of surface water or a seasonally high groundwater table. SEZ areas in the Angora analysis area have been estimated from 1B soils from soil surveys2 and riparian vegetation layer mapped by the USFS on 1987 infrared, low-altitude aerial photographs. Site-specific SEZ designation would be made in the field during project implementation.

Lake Tahoe Basin has two Critical Aquatic Refuges (CARs) for the management of Lahontan cutthroat trout (LCT) and mountain yellow legged frog (MYLF). Hell Hole CAR provides habitat for MYLF, and Upper Truckee CAR is managed for the recovery of LCT. The Upper Truckee River LCT and Hell Hole Sierra Nevada yellow legged frog (SNYLF) CARs do not overlap nor are they adjacent to the Angora project boundary.3 The South Shore DEIS/EIR identifies the location of known populations of LCT to be outside of the Angora project area.

93. Identify existing uses and activities in CARs and RCAs during landscape analysis. At the time of permit re-issuance, evaluate and consider actions needed for consistency with RCOs.

The project does not include a landscape analysis. However, the proposed actions are consistent with the RCOs as discussed in this document.

94. As part of project-level analysis, conduct peer reviews for projects that propose ground-disturbing activities in more than 25 percent of the RCA or more than 15 percent of a CAR.

The fisheries BE/BA would include pertinent reviews of literature for ground disturbing activities. Appropriate LTBMU resource staff would review the fisheries BE/BA.

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[1] USDA Forest Service, 2004, Sierra Nevada Forest Plan Amendment (SNFPA): Record of Decision and Final EIS, Pacific Southwest Region, Vallejo, CA

[2] USDA NRCS, 2007, Soil survey of the Tahoe Basin Area, California and Nevada, Accessible online at: http://soils.usda.gov/survey/printed_surveys/

[3] Oral communication Richard Vacirca, 2009, Forest Aquatics Program Manager, Lake Tahoe Basin Management Unit

Riparian Conservation Objective 1

Ensure that identified beneficial uses for the water body are adequately protected. Identify the specific beneficial uses for the project area, water quality goals from the Regional Basin Plan, and the manner in which the standards and guidelines will protect the beneficial uses.

Beneficial Uses
Several beneficial uses have been identified in the Lahontan Basin Plan4 for the South Lake Tahoe Hydrologic Area. Uses specific for Angora the project area include:

- Municipal and domestic supply
- Agricultural supply
- Ground water recharge
- Freshwater replenishment
- Navigation
- Water contact recreation
- Non-contact water recreation
- Commercial and sport fishing
- Cold freshwater habitat
- Wildlife habitat
- Preservation of biological habitats of special significance (Osgood Swamp)
- Rare, threatened, or endangered species (Taylor Creek Meadow Marsh)
- Migration of aquatic organisms
- Spawning, reproduction, and development[5]
- Water quality enhancement
- Flood peak attenuation/flood water storage.

Standards and Guidelines Associated with RCO 1

95. For waters designated as "Water Quality Limited" (Clean Water Act Section 303(d)), implement appropriate State mandates for the water body, such as Total Maximum Daily Load (TMDL) protocols.

Water Quality Limitations
Lahontan RWQCB and TRPA have identified stringent water quality limitations for the Lake Tahoe Basin as a result of continued reduction in lake clarity. Discharge limitations to surface waters presented below are identified in either one or both of the Lahontan Basin Plan and the

[4] State of CA 1995 Lahontan Basin Plan
[5] Applies to waters that support high quality aquatic habitat necessary for reproduction and early development of fish and wildlife.

TRPA Code of Ordinances. These discharge limitations apply to water discharges entering any surface water feature in the Lake Tahoe Basin, and therefore apply to the project.

Surface Water Discharge Limitations	
Constituent Maximum	**Concentration**
Total nitrogen as N	0.5 mg/L
Total phosphate as P	0.1 mg/L
Total iron	0.5 mg/L
Turbidity	20 NTU[6]
Grease and oil	2.0 mg/L
Suspended sediment	250 mg/L[7]

2006 Clean Water Act Section 303(d) - Impaired Waterbodies
Lake Tahoe's water clarity has declined as a result of nutrient and sediment transport to the lake from tributary streams and adjacent urban areas. A total maximum daily load (TMDL) is currently under development for Lake Tahoe, which has identified various pollutant sources and their contribution to lake clarity. Sources identified include urban development, dirt roads, particulates in the air from road sanding, and stream bank erosion. NFS lands are not identified as a large contributor per acre thus far in the TMDL development process. This is important since approximately 80% of Lake Tahoe Basin is forested upland. Most forest soils are in a state of relatively high hydrologic function.8

The Angora project has the potential to affect Lake Tahoe and thereby would be considered a contributor to the sediment/phosphorus TMDL. Sediment/phosphorus concentrations in surface waters could easily result from this project. Phosphorus binds to sediment particles and could be transported to the lake along project water bodies.

Lake Tahoe and other water bodies are also listed for nutrients (nitrogen), metals (iron), chloride, and/or pathogens. It is not expected that the Angora project would affect nitrogen, metals, chloride, or pathogen concentrations.

96. Ensure that management activities do not adversely affect water temperatures necessary for local aquatic and riparian-dependent species assemblages.

The Angora Fire affected riparian areas sensitive to increases in water temperatures. This project proposes restoration in riparian areas through planting vegetation to enhance riparian dependent species. Stand treatment to reduce fuels loading and ladder fuels in or adjacent to riparian areas decreases the potential for additional catastrophic wildfires that would create long term increases in water temperatures. The proposed rehabilitation of the Seneca Pond area and the Angora Creek channel reconstruction and large wood placement projects also would result in raising water tables and maintaining and/or improving stream temperatures.

[6] State of CA 1995 Lahontan Basin Plan
[7] TRPA December 2004, Tahoe Regional Planning Agency Code of Ordinances
[8] CA Water Boards and Nevada Division of Environmental Protection, September 2007, Lake Tahoe TMDL Pollutant Reduction Opportunity Report

97. Limit pesticide applications to cases where project level analysis indicates that pesticide applications are consistent with riparian conservation objectives. Prohibit application of pesticides to livestock in RCAs and CARs.

This standard and guideline does not apply because the project does not include pesticide application.

98. Avoid pesticide applications within 500 feet of known occupied sites for the California red-legged frog, Cascade frog, Yosemite toad, foothill yellow-legged frog, mountain yellow-legged frog, and northern leopard frog unless environmental analysis documents that pesticides are needed to restore or enhance habitat for these amphibian species.

This standard and guideline does not apply because the project does not include pesticide application.

99. Prohibit storage of fuels and other toxic materials within RCAs and CARs except at designated administrative sites. Prohibit refueling within RCAs and CARs unless there are no other alternatives. Ensure that spill plans are reviewed and up-to-date.

No fuel storage would take place within RCAs or CARs, and no refueling would take place in CARs. Refueling would take place in RCAs where there is no other alternative (e.g., certain landings within RCAs), but refueling would not take place in SEZs. Spill prevention and cleanup of hazardous materials would be implemented in accordance with FS timber sale type B contract clauses and in accordance with the LTBMU Hazardous Spill Notification and Response Plan (PSW Region Best Management Practice [BMP] 1-12 and 2-12).

Riparian Conservation Objective 2

Maintain or restore: (1) The geomorphic and biological characteristics of special aquatic features, including lakes, meadows, bogs, fens, wetlands, vernal pools, springs; (2) streams, including in stream flows; and (3) hydrologic connectivity both within and between watersheds to provide for the habitat needs of aquatic-dependent species.

Standards and Guidelines Associated with RCO 2

100. Maintain and restore the hydrologic connectivity of streams, meadows, wetlands, and other special aquatic features by identifying roads and trails that intercept, divert, or disrupt natural surface and subsurface water flow paths. Implement corrective actions where necessary to restore connectivity.

The project proposes to employ a combination of constructing, rerouting, upgrading, and decommissioning roads and trails in order to conserve other resources (i.e., soils and SEZs) while still providing public and administrative access to the area. Activities would restore road crossings by ensuring floodplain connectivity, bedload movement, and aquatic organism passage.

101. Ensure that culverts or other stream crossings do not create barriers to upstream or downstream passage for aquatic-dependent species. Locate water-drafting sites to avoid adverse effects to in stream flows and depletion of pool habitat. Where possible, maintain and

restore the timing, variability, and duration of floodplain inundation and water table elevation in meadows, wetlands, and other special aquatic features.

The proposed project would implement road BMP upgrades at road crossings to allow for fish passage.

102. Prior to activities that could adversely affect streams, determine if relevant stream characteristics are within the range of natural variability. If characteristics are outside the range of natural variability, implement mitigation measures and short-term restoration actions needed to prevent further declines or cause an upward trend in conditions. Evaluate required long-term restoration actions and implement them according to their status among other restoration needs.

The proposed project would implement large wood placement methods and increase the amount of wood and aquatic habitat structure in Angora Creek. The proposed action would also implement channel reconstruction on a degraded reach of Angora Creek.

103. Prevent disturbance to streambanks and natural lake and pond shorelines caused by resource activities (for example, livestock, off-highway vehicles, and dispersed recreation) from exceeding 20 percent of stream reach or 20 percent of natural lake and pond shorelines. Disturbance includes bank sloughing, chiseling, trampling, and other means of exposing bare soil or cutting plant roots. This standard does not apply to developed recreation sites; sites authorized under Special Use Permits and designated off-highway vehicle routes.

Channel reconstruction would be designed to reclaim stream bank vegetation by restoring water table depth. Large wood placement activities would utilize equipment that would not disturb stream banks. Other project activities would implement design criteria to avoid or minimize stream bank disturbance.

104. In stream reaches occupied by, or identified as "essential habitat" in the conservation assessment for, the Lahontan and Paiute cutthroat trout and the Little Kern golden trout, limit streambank disturbance from livestock to 10 percent of the occupied or "essential habitat" stream reach. (Conservation assessments are described in the record of decision.) Cooperate with State and Federal agencies to develop streambank disturbance standards for threatened, endangered, and sensitive species. Use the regional streambank assessment protocol. Implement corrective action where disturbance limits have been exceeded.

Lahontan cutthroat trout are not present within the project area. Grazing does not exist as a disturbance activity to streams in the project area.

Aquatic habitat has been assessed using stream condition inventory (SCI)9 data collected since 1994 and habitat status information from the Sierra Nevada Ecosystem Project.10 Index of

[9] Frazier J.W., K.B. Roby, J.A. Boberg, K. Kenfield, J.B. Reiner, D.L. Azuma, J.L. Furnish, B.P. Staab, S.L. Grant. 9/2005. Stream Condition Inventory Technical Guide, USDA Forest Service, Pacific Southwest Region - Ecosystem Conservation Staff, Vallejo, CA. 111 pg

[10] Moyle, P. B., and P.J. Randall, 1996, Biotic integrity of watersheds. Pages 975-985, *In* Sierra Nevada Ecosystem Project: Final report to Congress, Vol. II, assessments, commissioned reports, and background information, Davis: University of California, Centers for Water and Wildland Resources

biological integrity is assessed using the river invertebrate prediction and classification system (RIVPACS) and macroinvertebrate data collected since 2000.11 These data indicate that the status and trend in the RIVPACS scores are stable.

105. At either the landscape or project-scale, determine if the age class, structural diversity, composition, and cover of riparian vegetation are within the range of natural variability for the vegetative community. If conditions are outside the range of natural variability, consider implementing mitigation and/or restoration actions that will result in an upward trend. Actions could include restoration of aspen or other riparian vegetation where conifer encroachment is identified as a problem.

The project would enhance aspen and associated riparian species through planting and stream restoration.

106. Cooperate with Federal, Tribal, State and local governments to secure in stream flows needed to maintain, recover, and restore riparian resources, channel conditions, and aquatic habitat. Maintain in stream flows to protect aquatic systems to which species are uniquely adapted. Minimize the effects of stream diversions or other flow modifications from hydroelectric projects on threatened, endangered, and sensitive species.

The proposed project does not include manipulating stream flows as part of its activities. Stream diversions would be needed to completed channel reconstruction activities. There would be no stream diversions as part of other activities that would affect stream flow. Federal, tribal, state, and local governments would be involved in the proposed project.

107. For exempt hydroelectric facilities on national forest lands, ensure that special use permit language provides adequate in stream flow requirements to maintain, restore, or recover favorable ecological conditions for local riparian- and aquatic-dependent species.

The proposed project does not include activities involving hydroelectric facilities.

Riparian Conservation Objective 3

Ensure a renewable supply of large down logs that: (1) Can reach the stream channel and (2) provide suitable habitat within and adjacent to the RCA.

Standards and Guidelines Associated with RCO 3

108. Determine if the level of coarse large woody debris (CWD) is within the range of natural conditions in terms of frequency and distribution and is sufficient to sustain stream channel physical complexity and stability. If CWD levels are deficient, ensure proposed management activities, when appropriate; contribute to the recruitment of CWD. Burning prescriptions should be designed to retain CWD; however short-term reductions below either the soil quality standards or standards in species management plans may result from prescribed burning within strategically placed treatment areas or the urban wildland intermix zone.

[11] USDA Forest Service, 2008, Sierra Nevada Forests Bioregional Management Indicator Species (MIS) Report: Life history and analysis of Management Indicator Species of the 10 Sierra Nevada National Forests: Eldorado, Inyo, Lassen, Modoc, Plumas, Sequoia, Sierra, Stanislaus, and Tahoe National Forests and the Lake Tahoe Basin Management Unit, Pacific Southwest Region, Vallejo, CA., January 2008

The project area is located in the 2007 Angora Fire area and as a result contains areas of limited to no coarse large woody debris. The Angora Restoration project is an effort to restore the fire area. Treatment includes recruitment of coarse large woody debris and placement of logs in riparian areas. Existing downed trees and large woody debris that are in perennial or intermittent stream channels would be maintained unless channel stability needs dictate otherwise, as determined by an LTBMU hydrologist.

Riparian Conservation Objective 4

Ensure that management activities, including fuels reduction actions, within RCAs and CARs enhance or maintain physical and biological characteristics associated with aquatic- and riparian-dependent species.

Standards and Guidelines Associated with RCO 4

109. Within CARs, in occupied habitat or "essential habitat" as identified in conservation assessments for threatened, endangered, or sensitive species, evaluate the appropriate role, timing, and extent of prescribed fire. Avoid direct lighting within riparian vegetation; prescribed fires may back into riparian vegetation areas. Develop mitigation measures to avoid impacts to these species whenever ground-disturbing equipment is used.

LCT are not present within the project area. Grazing does not exist as a disturbance activity to streams in the project area.

Lake Tahoe Basin has two CARs for the management of LCT and MYLF. Hell Hole CAR provides habitat for MYLF and is outside of the project area. Upper Truckee CAR is managed for the recovery of LCT. The Upper Truckee River LCT and Hell Hole SNYLF CARs do not overlap nor are they adjacent to the Angora project boundary.12 The South Shore DEIS/EIR identifies location of known populations of LCT to be outside of the Angora project area.

Management constraints relative to treatment in the Upper Truckee CAR are displayed in the BMP section. Treatments proposed under the Angora Fire Restoration Project is to reduce long-term fuel loading to reduce future fire severity, increase resiliency of remaining trees from insects and disease, and expedite stand conditions—all with the long term goal to maintain healthy forest conditions supportive of riparian area and stable conditions for riparian dependent species.

110. Use screening devices for water drafting pumps. (Fire suppression activities are exempt). Use pumps with low entry velocity to minimize removal of aquatic species, including juvenile fish, amphibian egg masses and tadpoles, from aquatic habitats.

This requirement is not applicable. No water drafting is proposed in the Angora Fire Restoration Project.

111. Design prescribed fire treatments to minimize disturbance of ground cover and riparian vegetation in RCAs. In burn plans for project areas that include, or are adjacent to RCAs, identify mitigation measures to minimize the spread of fire into riparian vegetation. In

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[12] Written communication Richard Vacirca, 2009, Forest Aquatics Program Manager, Lake Tahoe Basin Management Unit

determining which mitigation measures to adopt, weigh the potential harm of mitigation measures, for example fire lines, against the risks and benefits of prescribed fire entering riparian vegetation. Strategies should recognize the role of fire in ecosystem function and identify those instances where fire suppression or fuel management actions could be damaging to habitat or long-term function of the riparian community.

This requirement is not applicable. The proposed action does not include the use of prescribed fire treatments. Burning would be limited to hand piles created by removal of excessive (greater than 15 tons per acre) activity-generated fuel from within sensitive areas adjacent to streams and other aquatic features. Even though burning is very limited in this proposed action, in order to ensure that burning of piles does not negatively impact RCA values, the following mitigation measures should be implemented:

- For burned SEZs, use the Region 5 Erosion Hazard Rating to prescribe adequate ground cover at completion of treatment. Adequate ground cover produces an Erosion Hazard Rating of low within SEZs. If adequate ground cover cannot be provided, the SEZ must be treated by hand.
- To achieve desired fuel loading in SEZs within units, trees may be end-lined out of the SEZ after consultation with a watershed specialist. Slash in excess of 15 tons per acre will be removed by hand from the 50-foot buffer from stream channels and lakes, piled and burned.
- Locate and burn slash piles 50 feet from any perennial or intermittent stream channel or standing water, and 10 feet from any ephemeral channel.
- Fens will be flagged and avoided, and will include a buffer, determined by LTBMU botanists, that will extend either to the edge of the wet soils and riparian areas that support the hydrology of the fen or 100 feet from fen. An additional 25-foot buffer prohibiting mechanical equipment will be placed around the edge of wet soils to prevent impacts on fen hydrology. No prescribed fire will occur within 100 feet from any fen.
- The sphagnum moss site will be flagged and avoided and will include a buffer, determined by LTBMU botanists, that will extend either to the edge of the wet soils and riparian areas that support the hydrology to the site or 100 feet from site. An additional 25-foot buffer prohibiting mechanical equipment will be placed around the edge of wet soils to prevent impacts on hydrology. LTBMU botanists and hydrologists will flag the area and determine boundaries for mechanical or hand thinning. Trees will be directionally felled away from the site and all wet soils. No prescribed fire will occur within 100 feet from this site.

112. Post-wildfire management activities in RCAs and CARs should emphasize enhancing native vegetation cover, stabilizing channels by non-structural means, minimizing adverse effects from the existing road network, and carrying out activities identified in landscape analyses. Post-wildfire operations shall minimize the exposure of bare soil.

Treatments emphasize enhancing native vegetation cover, stabilization of channels through treatment of fuel loading, increasing resiliency of remaining vegetation, expediting stand conditions for defense zones, and providing for revegetation of riparian vegetation in disturbed sites. Road decommissioning and restoration to minimize adverse effects is proposed in addition to road construction to provide administrative road access to areas in need of treatment. All temporary roads would be restored following treatment.

113. Allow hazard tree removal within RCAs or CARs. Allow mechanical ground disturbing fuels treatments, salvage harvest, or commercial fuelwood cutting within RCAs or CARs when the activity is consistent with RCOs. Utilize low ground pressure equipment, helicopters, over the snow logging, or other non-ground disturbing actions to operate off of existing roads when needed to achieve RCOs. Ensure that existing roads, landings, and skid trails meet Best Management Practices. Minimize the construction of new skid trails or roads for access into RCAs for fuel treatments, salvage harvest, commercial fuelwood cutting, or hazard tree removal

The project would remove fuels associated with post-fire mortality. The Angora Hazard Tree Removal project targeted trees that were identified as hazards. Mechanical equipment would be excluded from wetlands and meadows except for the purpose of restoring wetland and meadow function. Target areas would be protected from mechanical operations except when trained and qualified personnel on the IDT identify them for treatment. Specific protection measures would be established for each area that could incur adverse water quality impacts.

- Ground-based equipment will not operate within 25 feet of the high water line of lakes and ponds, but may reach in to remove material.
- Ground-based equipment will not operate within a minimum 25 feet of perennial or intermittent stream channels except at temporary or permanent stream crossings, but may reach in to remove material.
- To avoid removing or altering bank-stabilizing vegetation, trees may be marked for removal (live or dead) within 5 feet of the bank edge of perennial or intermittent streams and lakes only where fuel loads or stand densities exceed prescription and where large woody debris is at or above desired levels.
- Use directional falling to keep felled trees out of intermittent and perennial streams unless the channel reach is identified as deficient in large woody debris, in which case a FS fisheries biologist will select trees greater than 12 inches diameter at breast height (dbh) to be felled directionally into the channel.
- Where it is necessary to cross an area with inoperable soil moisture conditions in SEZs, equipment will operate over a slash mat, landing mat, or other protective material to minimize soil compaction.
- Areas with wet soils or other sensitive features will be flagged for hand treatment prior to commencement of mechanical operations.
- To achieve desired fuel loading in SEZs within units, trees may be end-lined out of the SEZ after consultation with a watershed specialist. Slash in excess of 15 tons per acre will be removed by hand from the 50-foot buffer from stream channels and lakes, piled and burned.
- Limit mechanical equipment operation in SEZs to cut to length operations or operations using equipment that has been demonstrated to adequately protect soil and water resources (i.e., equipment that is lighter on the land, rubber-tired equipment, equipment that operates

on a bed of slash, or other innovative technologies that reduce impacts to soils).

- For over-the-snow and frozen soil operations in SEZs, exclude ground-based equipment from the 25-foot buffer around perennial and intermittent channels.
- SEZ stands that rate more sensitive than the HSEZ project site will be treated by hand crews, endlining, or mechanical over-snow operations.
- Flag and avoid equipment use in and adjacent to special aquatic features (springs, seeps, vernal pools, fens, and marshes); use hand treatments in these areas.
- Fens will be flagged, avoided, and include a buffer, determined by LTBMU botanists, that will extend either to the edge of the wet soils and riparian areas that support the hydrology of the fen or 100 feet from fen. An additional 25-foot buffer prohibiting mechanical equipment will be placed around the edge of wet soils to prevent impacts on fen hydrology.
- The sphagnum moss site will be flagged and avoided and will include a buffer, determined by LTBMU botanists, that will extend either to the edge of the wet soils and riparian areas that support the hydrology to the site or 100 feet from site. An additional 25-foot buffer prohibiting mechanical equipment will be placed around the edge of wet soils to prevent impacts on hydrology. LTBMU botanists and hydrologists will flag the area and determine boundaries for mechanical or hand thinning. Trees will be directionally felled away from the site and all wet soils.

114. As appropriate, assess and document aquatic conditions following the Regional Stream Condition Inventory protocol prior to implementing ground disturbing activities within suitable habitat for California red-legged frog, Cascades frog, Yosemite toad, foothill and mountain yellow-legged frogs, and northern leopard frog.

The only known amphibian of special status on the LTBMU is mountain yellow-legged frog. Mountain yellow-legged frogs do not occur in the project area.

115. During fire suppression activities, consider impacts to aquatic- and riparian-dependent resources. Where possible, locate incident bases, camps, helibases, staging areas, helispots, and other centers for incident activities outside of RCAs or CARs. During pre-suppression planning, determine guidelines for suppression activities, including avoidance of potential adverse effects to aquatic- and riparian-dependent species as a goal.

This requirement is not applicable; no fire suppression activities are proposed.

116. Identify roads, trails, OHV trails and staging areas, developed recreation sites, dispersed campgrounds, special use permits, grazing permits, and day use sites during landscape analysis. Identify conditions that degrade water quality or habitat for aquatic- and riparian-dependent species. At the project level, determine if use is consistent with other standards and guidelines or desired conditions. If inconsistent, modify the use through redesign, rehabilitation, relocation, closure, or re-directing the use to a more suitable location.

The proposed project would assess the road and trail network, as well as staging areas that are to be used during project activities. The project would identify any BMPs specific to activities in these areas.

Roads and trails in the project area were assessed with the objectives of (1) maintain, upgrade, and develop administrative access; (2) address unclassified roads and trails; and (3) upgrade recreation trails. A proposed action includes construction of roads and trails (on new and existing prisms), decommissioning of classified roads and trails, and restoration of unclassified roads and trails.

Riparian Conservation Objective 5

Preserve, restore, or enhance special aquatic features, such as meadows, lakes, ponds, bogs, fens, and wetlands to provide the ecological conditions and processes needed to recover or enhance the viability of species that rely on these areas.

Standards and Guidelines Associated with RCO 5

117. Assess the hydrologic function of meadow habitats and other special aquatic features during range management analysis. Ensure that characteristics of special features are, at a minimum, at Proper Functioning Condition, as defined in the appropriate Technical Reports (or their successor publications): (1) "Process for Assessing PFC" TR 1737-9 (1993), "PFC for Lotic Areas" USDI TR 1737-15 (1998) or (2) "PFC for Lentic Riparian-Wetland Areas" USDI TR 1737-11 (1994).

The proposed action would implement meadow restoration by cutting encroaching conifers and filling a reach of channel that was an old trail. Livestock grazing is not allowed in the project area.

118. Prohibit or mitigate ground-disturbing activities that adversely affect hydrologic processes that maintain water flow, water quality, or water temperature critical to sustaining bog and fen ecosystems and plant species that depend on these ecosystems. During project analysis, survey, map, and develop measures to protect bogs and fens from such activities as trampling by livestock, pack stock, humans, and wheeled vehicles. Criteria for defining bogs and fens include, but are not limited to, presence of: (1) sphagnum moss (Spagnum spp.), (2) mosses belonging to the genus Meessia, and (3) sundew (Drosera spp.) Complete initial plant inventories of bogs and fens within active grazing allotments prior to re-issuing permits

The project includes design features for protecting sensitive wet areas. Stream restoration is designed to restore floodplain connectivity and retain water moisture gradients over a longer period of time in a yearly hydrologic cycle.

119. Locate new facilities for gathering livestock and pack stock outside of meadows and riparian conservation areas. During project-level planning, evaluate and consider relocating existing livestock facilities outside of meadows and riparian areas. Prior to re-issuing grazing permits, assess the compatibility of livestock management facilities located in riparian conservation areas with riparian conservation objectives.

The proposed project does not include use or management of livestock or pack stock as an activity.

120. Under season-long grazing: For meadows in early seral status: limit livestock utilization of grass and grass-like plants to 30 percent (or minimum 6-inch stubble height). For meadows

in late seral status: limit livestock utilization of grass and grass-like plants to a maximum of 40 percent (or minimum 4-inch stubble height; Determine ecological status on all key areas monitored for grazing utilization prior to establishing utilization levels. Use Regional ecological scorecards and range plant list in regional range handbooks to determine ecological status. Analyze meadow ecological status every 3 to 5 years. If meadow ecological status is determined to be moving in a downward trend, modify or suspend grazing. Include ecological status data in a spatially explicit Geographical Information System database; intensive grazing systems (such as rest-rotation and deferred rotation) where meadows are receiving a period of rest, utilization levels can be higher than the levels described above if the meadow is maintained in late seral status and meadow-associated species are not being impacted. Degraded meadows (such as those in early seral status with greater than 10 percent of the meadow area in bare soil and active erosion) require total rest from grazing until they have recovered and have moved to mid- or late seral status.

The proposed project does not include use or management of livestock or pack stock as an activity.

121. Limit browsing to no more than 20 percent of the annual leader growth of mature riparian shrubs and no more than 20 percent of individual seedlings. Remove livestock from any area of an allotment when browsing indicates a change in livestock preference from grazing herbaceous vegetation to browsing woody riparian vegetation.

The proposed project does not include use or management of livestock or pack stock as an activity.

Riparian Conservation Objective 6

Identify and implement restoration actions to maintain, restore, or enhance water quality and maintain, restore, or enhance habitat for riparian and aquatic species.

Standards and Guidelines Associated with RCO 6

122. Recommend restoration practices in: (1) areas with compaction in excess of soil quality standards, (2) areas with lowered water tables, or (3) areas that are either actively down cutting or that have historic gullies. Identify other management practices, for example, road building, recreational use, grazing, and timber harvests, which may be contributing to the observed degradation

The project incorporates stream and meadow restoration proposals, decommissioning roads to reduce compaction, and re-routing trails outside of the SEZs. Stream and meadow restoration activities are also proposed with objectives for raising water tables, restoring floodplain connectivity, in-channel roughness, and riparian/wetland vegetation.

Standards and Guidelines Associated with Critical Aquatic Refuges

123. Determine which critical aquatic refuges or areas within critical aquatic refuges are suitable for mineral withdrawal. Propose these areas for withdrawal from location and entry under U.S. mining laws, subject to valid existing rights, for a term of 20 years.

The project does not include mineral extraction activity.

124. Approve mining-related plans of operation if measures are implemented that contribute toward the attainment or maintenance of aquatic management strategy goals.

The project does not include mineral extraction activity.