Chapter 10 – VEGETATION

Figure 10-1. Pathway Recommendations for Vegetation

Vegetation Vision

Vegetation in the Lake Tahoe Basin is healthy and dynamic with the full compliment of native plant communities, wildlife habitats and ecological processes.

Proposed Desired Conditions

1: Healthy Vegetation	2: Plant Communities of Concern	3: Special Status Species	4: Hazardous Fuels	5: Urban Vegetation
A full range of native species, development stages, habitats and ecological processes occur.	The natural conditions and functions of plant communities of concern are sustained.	Populations of native, threatened, endangered, rare, special interest or sensitive species found in the Lake Tahoe Basin are maintained at or above sustainable levels.	Fuel conditions pose low wildfire risk to communities.	Vegetation in the urban zones is predominantly native, water-efficient and non-invasive. Urban vegetation contributes to defensible space, water quality protection, and scenic and local community values.

Proposed Indicators

1: Healthy Vegetation	2: Plant Communities of Concern	3: Special Status Species	4: Hazardous Fuels	5: Urban Vegetation
Departure from historic vegetation structure. (Type I)	Ecological status index. (Type I)	Conservation status (high, medium, low priority) (Type I)	Predicted fire behavior. (Type I)	Proportion of parcels that meet approved vegetation criteria. (Type III)

Proposed Standards

1. Healthy Vegetation	2. Plant Communities of Concern	3. Special Status Species	4. Hazardous Fuels	5. Urban Vegetation
Achieve 3% reduction in departure from historic* for each vegetation/ forest type over 5-year evaluation period.	Maintain or improve the ecological status of all monitored locations in an evaluation period.	Maintain existing occurrences of high and medium priority species.	Predicted fire behavior in treated areas of urban and WUI zones does not exceed surface fire type.	None proposed.

* Historic is based on reconstructive vegetation structure studies that are adjusted for climatic and human caused changes.

10.0 VEGETATION

Vegetation is the primary component of terrestrial ecosystems and fulfills functional roles related to water cleansing, soil stabilization, nutrient cycling, air purification, wildlife resources, noise control, and wood products and is an integral component of scenic and recreational values. Scientific research into the role of vegetation in the ecosystem continues to provide managers with tools for balancing development, management and conservation of vegetation.

Definitions

***Healthy vegetation* -** Healthy vegetation occurs when conditions exist within the range of natural variation and all component elements and processes are present.

Note: Perceptions of health are influenced by individual and cultural viewpoints, management objectives, spatial and temporal scales, and the appearance of the forest at a point in time.

***Dynamic vegetation* -** Vegetation is inherently dynamic as patterns of growth and development change in response to environmental conditions, disturbances, and management.

Note: Many values of individual plant communities cannot be realized without respect to the scale (Lake Tahoe Basin or Sierra Nevada region) at which some changes occur.

Public Input

- Resident and visiting public expressed a strong desire to restore forest conditions using principles of ecosystem-based management, which recognizes that vegetation will have a relationship with each of the other resource areas. Although most people expressed fire suppression and fuels management as their number one concern, they also recognize the need to address this concern within the context of a healthy forest objective.

- There is general public acceptance of the current management strategy of fuel treatment in the Wildland-Urban Interface (WUI).

- There is public concern regarding community coordination and implementation of defensible space fuel treatments.

- Utilizing burning as a fuel treatment has been controversial and not universally accepted in the Lake Tahoe Basin.

Existing Desired Conditions, Standards and Indicators

Existing USFS Lake Tahoe Basin Management Unit (LTBMU) and Tahoe Regional Planning Agency (TRPA) Desired Conditions (DCs) cover a broad spectrum from general ecosystem outcomes to management of specific vegetation and habitat. Lahontan Regional Water Quality Control Board (Lahontan) and Nevada Division of Environmental Protection (NDEP) currently do not have desired condition statements related to vegetation, though Lahontan does have a non-degradation clause related to water quality, which is linked to vegetation management activities. Each of the existing DCs is carried forward in this planning effort within ecosystem and land-use contexts.

The existing indicators and standards are at a basin-wide scale. The goals of the existing indicators are to either maintain a current status or achieve a management outcome to evaluate attainment of a vegetation threshold. Good information about what the target condition should be is needed as a basis of comparison with the current condition. Attributing the condition of forest ecosystem components was done based on broad elevation bands. Plant populations and plant communities were identified by specific location. Predicted fire behavior was determined for specified zones from urban areas of concern.

10.1 VEGETATION VISION

Vegetation Vision

Vegetation in the Lake Tahoe Basin is healthy and dynamic with the full compliment of native plant communities, wildlife habitats and ecological processes.

Healthy vegetation provides a range of cultural, social, economic and ecological benefits for present and future generations. The forest and associated vegetation types are managed in consultation with federal, tribal, state and other governments, and with those who live, work and recreate in and around the Lake Tahoe Basin. Collaborative vegetation management will promote protection of people, investments and resources. An ecosystem-based approach to management recognizes inherent ecological processes, including natural and human-induced disturbance, as important elements. Both collaboration and an ecosystem approach are necessary in efforts to achieve and maintain desired conditions and to restore the ecological role of fire and reduce the threat of catastrophic wildfire.

10.2 NEED FOR CHANGE

Changes in how forest resources are viewed have been profound over the last 20 years. The proposed vision is focused on restoring and maintaining forest ecosystems as opposed to specific components or uses within the ecosystem. Studies of environmental and management

consequences have increased our understanding of site-specific and utility-specific questions, but they did not address the larger landscape- or ecosystem-level questions until more recently. Though our understanding of the ecosystem has grown, it is far from complete and must still link more social and economic aspects in order for us to use and live with what is in and associated with the forest ecosystem.

The principles in the existing TRPA standard Common Vegetation are sound. However, levels specified in the standards will change based on an ongoing analysis of historic and inherent factors. The Late Seral/ Old Growth (LSOG) standard will become part of a vegetation structure attribute. The proportion in each development stage is more appropriate by vegetation type than by elevation band.

With respect to uncommon plant communities, focusing thresholds and standards on plant community types rather than select representative locations is needed to ensure the continued protection of uncommon plant communities and more common communities for which there are management concerns. Similarly, expanding the list of sensitive status plant species in the Lake Tahoe Basin is necessary to ensure their protection and provide consistent regulation across federal and other jurisdictions in the basin. Currently five special status species are protected by TRPA threshold standards. However, there is no technical basis for limiting protection to these five species as other species in the Lake Tahoe Basin may warrant similar conservation priority. The USFS Region 5 list recognizes over 350 plant species as sensitive, 9 of which are known to occur in the Lake Tahoe Basin and 11 that have the potential to occur.

In addition to revising the lists of plant communities and special status plant species protected by TRPA thresholds and Forest Service goals, refinements to the indicators measured are needed to allow for measurement to determine status of communities and populations over time. The current non-degradation standard does not provide a reference condition to measure divergence from the desired condition over time. In addition, because the non-degradation standard is not numeric, measures of attainment are open for interpretation by varied evaluators and thus are not consistent or reliably repeatable. In the case of special status plant species, the indicator does not give any indication of the ability of a species to perpetuate self-sustaining populations or establish any criteria for success in conserving the species.

Public concern over the high concentrations of hazardous fuels in the wildland urban interface (WUI) has spurred the need for a threshold to address this concern by prioritizing removal of hazardous fuels that present a threat to lives and property.

10.3 DESIRED CONDITION 1: HEALTHY VEGETATION

The associated attributes to healthy vegetation include: vegetation structure; fuels as an element in nutrient flow dynamics; and non-native invasive plants, insects, and disease and their ability to inhibit native vegetation and alter wildlife habitat quality.

Vegetation Structure

Vegetation structure is an important element in defining vegetation condition, health and sustainability. The structure of a vegetation community varies according to the dominant plant species, climate, and inherent disturbance regimes. Changes in structure are dynamic, which result in portions of a vegetation community advancing towards later development stages and others moving back to earlier development stages. These changes are detectable and

quantifiable from satellite imagery with accuracies validated by inventory plot data. Disturbances such as crown fire, insects, landslides, avalanche, wind throw, etc. occur in the Lake Tahoe Basin that reinitiate or alter vegetation structure. In these ways, the forest is perpetually dynamic. A classification of vegetation structures includes development stages and canopy closures.

***Development stage* is** a classification of the development stage of a given vegetation types as identified by different plant associations (different species composition or community structure); by different ages of the dominant vegetation -usually related to differences in structure; and by different abiotic conditions such as soil and microclimate. For example development stages of a given forest type have distinct characteristics and will exhibit conditions varying in species composition, canopy closure, percent cover, tree size, density of stems and mortality.

The structure of a vegetation type or community varies according to the dominant plant species, the heights of the various layers of vegetation, the amount of canopy cover, and the relative spacing between plants. Disturbances such as crown fire, insects, landslides, avalanches, or wind throw alter vegetation structure and reset the successional clock sometimes resulting in the replacement of affected vegetation with earlier development stages.

Natural Fire Regime

Fuels include all live and dead vegetation that is available to burn when fire enters into the system. The role of fire historically served to reduce fuel loads on the forest floor and inhibit growth of shade tolerant and fire intolerant species in the understory of the forest and to regenerate plant communities that rely on fire for reproductive success. Fuels are an essential element in nutrient flow dynamics within the system and can reduce the erosive impact of water, wind and snow.

Non-Native Invasive Plants, Animals, Insects and Diseases

Non-native invasive plants have been documented in the Lake Tahoe Basin that could inhibit regeneration of native vegetation and alter habitat quality for wildlife. Non-native insects have not entered the basin though threats of Asian Long-horned beetle could potentially have devastating effects on the conifer forests. Non-native diseases are present in the Lake Tahoe Basin and have had far reaching effects on sugar, Western white, and whitebark pines.

10.3.1 Proposed Indicator for Healthy Vegetation

Proposed Indicator for Healthy Vegetation
Departure from historic vegetation structure (Type I)

Vegetation Structure (Development Stages from Fire Regime Condition Class (FRCC))

Changes in structure in any vegetation type provide a means of tracking progress towards achieving desirable outcomes on the landscape. Vegetation structure is classified in five development stages: early-open; middle-closed; middle-open; late-open; and late-closed. The designation of open or closed refers to canopy closure. Greater than 50% canopy closure is closed and less then 50% canopy closure is open. For example, an early-open stand will be comprised of many small trees, less than 5

inches in diameter, with little canopy development. In contrast, a late-closed stand is comprised primarily of large tress, greater than 25 inches in diameter, with dense canopy closure greater than 50%. These development stages constitute the vegetation structure component of Fire Regime Condition Class (FRCC), a national program that compares current vegetation structure with historic reference structure to infer departure from the historic range of variability.

Recent legislation in the Healthy Forest Restoration Act mandates use of FRCC in reporting vegetation treatments. Standardization is essential among agencies and different units within agencies currently assessing FRCC. In fire-adapted ecosystems, modeling and mapping FRCC provides important information for ecological restoration.

10.3.2 Current Condition and Trend Related to Healthy Vegetation

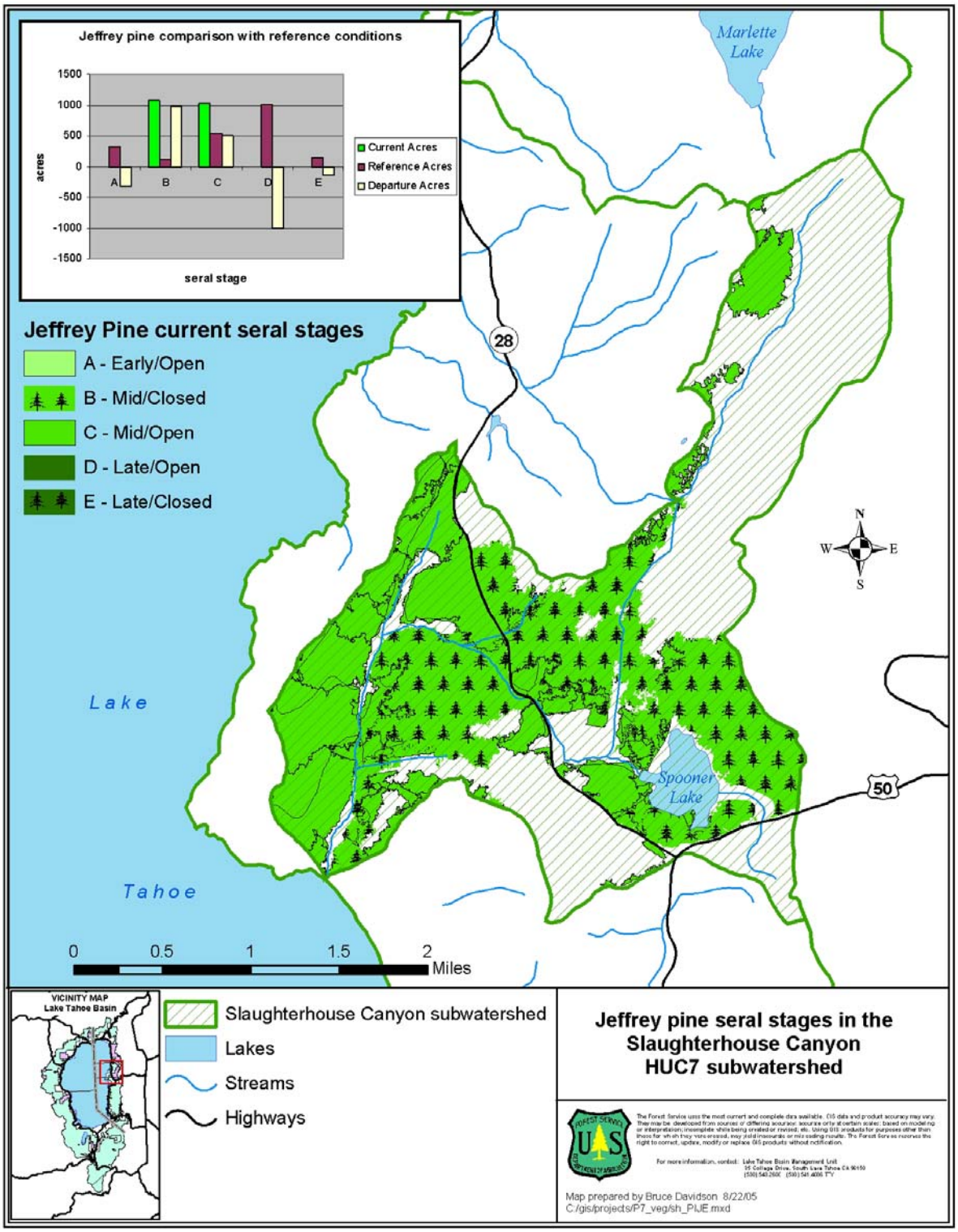
The vegetation structure, using vegetation data and the Biophysical Setting (BPS)/ Vegetation Dynamic Development Tool (VDDT), indicate that forestland within the Lake Tahoe Basin is primarily found within mid-open development stages. Table 10-1 presents the structure for several vegetation types in the Lake Tahoe Basin. Figure 10-2 illustrates the development stages for the Jeffrey pine, as an example. The dominance of these stages on the landscape is indicative of the effects stemming from the Comstock-era logging at the montane and upper montane elevation levels. The largest departures within the Jeffrey pine are found in mid-development/dense canopy and in late development/open canopy. There is much more mid-development/dense canopy in the Lake Tahoe Basin than expected under historic conditions, and there is much less late development/open canopy. The last 100 years have simply not been long enough to grow an abundance of late development stands.

Table 10-1. Averaged percentages of historic* development stage by vegetation type in the Lake Tahoe Basin.

Vegetation Description	Early (Open)	Mid (Closed)	Mid (Open)	Late (Open)	Late (Closed)
White Fir	30	20	5	10	35
Alpine Meadows Barrens	2	98	0	0	0
Aspen with conifer encroachment	15	40	15	25	5
Montane Chaparral, Chaparral, Grassland	20	80	0	0	0
White fir mixed conifer	12 to 18	8 to 12	10 to 15	32 to 37	22 to 28
Lodgepole Pine-Subalpine	50	30	10	5	5
Jeffrey Pine	12 to 17	5 to 7	25 to 30	45 to 50	5 to 7
Red fir – White fir	15	25	10	20	30
Red fir-Western white pine	8 to 14	13 to 17	20 to 24	35 to 40	10 to 15
Herbaceous Wetland	5	90	5	0	0
Montane sagebrush steppe	20	50	15	10	5
Jeffrey Pine-montane chaparral-rocky	30	15	25	25	5
Subalpine Conifer	1	1	1	83	14

Note:
* FRCC reference conditions, based on National LANDFIRE and FRCC workshops and peer review and also on R5 modeling by H. Safford, USFS Regional Ecologist

Figure 10-2. Current and Reference Acres of Jeffrey Pine in the Slaughterhouse Canyon, Lake Tahoe Basin



10.3.3 Range of Feasibility for Health Forest Ecosystem

Using a metric of departure of current vegetation structure from historic (pre-European settlement) vegetation structure is technically feasible. The USDA Forest Service (USFS) currently has data on vegetation structure at the sub-watershed level (using 7th order Hydrologic Unit Code (HUC) watersheds) throughout the basin. The USFS also has historic structure data at the sub-watershed level. These data allow for measuring and monitoring the progress of silvicultural and other vegetation treatments toward meeting the desired conditions presented below.

As climate changes, the inherent condition and fire regimes will also change, and this will need to be considered in adjusting the estimation of percentages of development stages over the long-term.

10.3.4 Proposed Desired Condition and Standards for Healthy Forest Ecosystem

Proposed Desired Condition 1: Healthy Forest Ecosystem
Full range of native species, development stages, habitats and ecological processes occur.

Proposed Standard for a Healthy Forest Ecosystem: Vegetation Structure

Achieve 3% reduction in departure from historic for each vegetation/forest type over 5-year evaluation periods.

Diverse and resilient plant communities include the full range of native species, development stages, habitats and ecological processes, including natural disturbance regimes expected to occur in a high elevation Sierra Nevada ecosystem. Critical to a healthy forest ecosystem are the natural processes that influence the site and vegetation conditions that occur on a site. The resulting vegetation is interdependent with wildlife and soils that together comprise a healthy and sustainable forest ecosystem.

The proposed indicator addresses departure from historic vegetation conditions, thus, the proposed standard quantifies the desired result of management actions intended to manipulate those conditions. The standard of achieving a reduction of 3% departure has been established to as a reasonable rate of restoration.

10.4 Desired Condition 2: Plant Communities of Concern

Most forested landscapes support a number of unique habitats that are critical for the persistence of highly specialized or unique species and communities of organisms. Often restricted in distribution or represented by a small number of examples, these communities are

biological hotspots that significantly contribute to the biological richness and productivity of the entire region. These hotspots may support rare or uncommon assemblages of species, provide critical foraging, roosting, nesting or hibernating places, or perform vital ecosystem functions. These communities have extraordinary value for the conservation of biological integrity and diversity in the landscape.

The special environmental conditions that characterize these communities make them particularly responsive to a variety of naturally occurring stressors like drought, fire, climate change, and human disturbances such as recreation activities, water diversions, soil disturbances, or fire suppression.

10.4.1 Proposed Indicator for Plant Communities of Concern

Proposed Indicator for Plant Communities of Concern
Ecological Status: A composite measure of biotic and abiotic factors that indicates ecological function and sustainability. (Type I and II)

Change from the Current Threshold
The current proposal would protect the community type, and all monitored examples of it, rather than only 7 specific threshold locations. Riparian and aspen communities are proposed for consideration as plant communities of concern that will be covered under thresholds for stream environment zones and wildlife, respectively. These two communities were identified as Ecologically Significant Areas in the *Lake Tahoe Watershed Assessment*.

Ecological Status Index
The U.S. Forest Service Region 5 Range Monitoring Project developed Ecological Status as an indicator to evaluate condition and trend in wetland systems. An ESI (Ecological status index) is an integrated, numeric system for classifying and detecting status and trend for emergent wetlands (wet meadows) that uses measurements of vegetation composition, ground cover, and meadow rooting characteristics to provide an ecological status classification of low, medium, or high. Ecological status is derived from three separate scorecards for 1) vegetation 2) rooting depth and 3) cover of bare soil. The scores are combined into an overall score for the ecological status of a site. Unique scorecards for all three categories have been developed for seven different meadow types. Table 10-2 identifies which plant communities would be measured using Ecological Status and each plant community is discussed below.

Table 10-2: Plant Community of Concern Proposed indicators[1]

Community of Concern	Proposed Indicator
Marsh	Ecological status
Dry/Wet Meadow	Ecological status
Fen	Ecological status
Cushion plant	Response to trampling
	Response to climate change
Deep Water Plants of Lake Tahoe	none

[1] Riparian and Aspen communities are plant communities of concern and are covered under Stream Environment Zones and Wildlife, respectively.

Marshes, Dry Meadows and Wet Meadows
Ecological status is defined for wet meadows and the monitoring program was initiated in 1999. Data collection in the Tahoe Basin began in 2004. The indicator for this community is well developed and peer-reviewed (Type 1 Indicator).

Fens
Ecological status has been utilized in fens but data has shown that fens with a thick organic layer (>16cm) respond to disturbance differently than meadows. Therefore, the early successional indicators used in the rating system needs to be modified and tailored to these unique conditions. The indicator for this community is partially developed and requires further investigation (Type II Indicator).

Cushion plant communities
A modification of the ESI is currently in use on Freel Peak to monitor the response of cushion plants to human disturbance. Monitoring plots were installed on Freel Peak in 2004 to collect data on species composition, plant cover, bare ground, and response to disturbance factors. In addition, response to long-term changes in climate in these communities will be accomplished through participation in the Global Observation Research Initiative in Alpine Environments (GLORIA) program, a world-wide long-term observation network that has been established to discern trends in species diversity and temperature in alpine environments. TRPA and the USDA Forest Service have jointly funded the establishment of long-term monitoring plots in the Lake Tahoe Basin as part of the GLORIA Network. GLORIA plots will be established on three to four peaks in the Lake Tahoe Basin in August of 2005.

Deep Water Plants of Lake Tahoe
The deep water plant bed assemblage of algae, moss, and liverworts was first discovered in Lake Tahoe in 1966. It is thought that deep-water plant beds may provide habitat for several endemic invertebrates including a small wingless stonefly (*Capnia lacustra*) and may be used by non-native fish. However, no data has been collected since 1967 and there is insufficient information on this assemblage of plants to identify an appropriate indicator or standard.

10.4.2 Current Condition and Trend for Plant Communities of Concern

The plant communities of Grass Lake, Osgood Swamp, Hell Hole, Taylor Creek Marsh, Pope Marsh, and Freel Peak were monitored by Forest Service staff in 2002, 2003, and 2004. Upper Truckee Marsh is owned and managed by the California Tahoe Conservancy (CTC) and is therefore monitored by CTC. These monitoring data provide the basis for an assessment of the current conditions of and the impacts to the communities. Table 10-3 presents information regarding the presence, disturbance level and trend for seven special status species in the monitored plant communities.

In 2002 all uncommon plant communities were evaluated with the relevé method to describe plant communities. This method is not appropriate for monitoring change over time. However, observations made regarding the general condition and level of disturbance to communities were noted during these surveys and are relevant to the assessment of trends and current conditions.

In 2003 transects were established in all uncommon plant communities to provide baseline data regarding a variety of parameters including frequency distribution of species, soil characteristics, and ratings of disturbance in 30 categories.

Table 10-3. Assessment of the presence of special status species, disturbance level, and trend of eight plant communities of concern

Plant community	Special status species	Disturbance level	Trend
Deep Water Plants of Lake Tahoe	Unknown	Unknown	Unknown
Freel Peak Cushion Plants	*Draba asterophora var. asterophora*	Moderate (trampling)	Stable (trail improvements)
Grass Lake	*Sphagnum spp*., *Meesia spp.*	None	Stable
Hell Hole	*Sphagnum spp*., Mtn yellow-legged frog (*Rana muscosa)*	Low (past grazing)	Improving (no more grazing)
Osgood Swamp	*Sphagnum spp*.,	High (beaver damage)	Declining (altered hydrology)
Pope Marsh	Waterfowl	Moderate (trampling, non-native plants)	Declining (no restrictions)
Taylor Creek Marsh	Waterfowl, Bald Eagle (*Haliaeetus leucocephalus*), Tahoe yellow cress	Moderate (2002 fire, trampling, grazing, non-native plants)	Improving (TYC restoration and enclosure)
Upper Truckee Marsh	Waterfowl, Tahoe yellow cress (*Rorippa subumbellata)*	Moderate (trampling, past grazing, non-native plants)	Improving (TYC enclosure and restoration)

In 2004 transects were established in all uncommon plant communities (and at least 41 other meadow locations) using the Forest Service Region 5 Range Monitoring Protocol (Weixelman 2006). The range monitoring protocol employs line-intercept transects and nested frequency plot data to classify the ecological status of the community into high, medium, and low condition class. These data were collected to provide a baseline for future monitoring.

The deep-water plants of Lake Tahoe have not been surveyed since the 1960s (Frantz and Cordone 1967). A partial survey of potential habitat for deepwater macrophytes was performed in Lake Tahoe in 1999 (Karlin et al. 2000). However, no assessment of the status of these plant communities has been conducted and therefore it has not been possible to examine trends in the health of these communities over time or to assess the impacts of current allowable activities on deep-water plant communities.

The trends in the condition of uncommon plant communities are shown in Table 10-3. However, the deep-water plant communities have not been assessed. It is likely that the reduction in lake clarity over time has increased light attenuation and therefore reduced the area available as habitat for deep-water plants. More research and information are needed to better understand this community.

10.4.3 Technical Range of Feasibility Regarding Plant Communities of Concern

Use of the measures, analysis, and classification methods in the ESI are both technically feasible and desirable in three of the plant communities of concern; emergent wetlands, fens, and cushion plant. For wetland systems the methods are peer-reviewed and have been in use for 5 years. In fens and cushion plant communities refinement of the methods are in progress to account for the unique conditions present in these systems.

10.4.4 Proposed Desired Conditions and Standards for Plant Communities of Concern

Proposed Desired Condition 2: Plant Communities of Concern
The natural conditions and functions of plant communities of concern are sustained.

The proposed desired condition is integrated with Wildlife and Fisheries and identifies the natural conditions and functions of plant communities of concern as important elements that will be sustained.

Proposed Standards for Plant Communities of Concern:
Maintain or improve the Ecological Status of all monitored locations in an evaluation period.

The proposed standard to maintain or improve the Ecological Status of all monitored locations is similar to the standard of non-degradation required under the current threshold. Most of the plant communities of concern are wetlands or associated with perennial streams and so are already protected by several federal and state laws that prohibit wetland degradation (see Vegetation technical supplement for specific legal sideboards).

The proposed standard will apply to monitored locations only, but adaptive management will allow the addition of new locations as they are discovered. However, new locations should not be considered in threshold attainment until sufficient data is available to meet analysis requirements.

Table 10-4 presents the specific proposed standards for each plant community of concern.

Table 10-4. Proposed standards for communities of concern.

Community of Concern	Proposed Standard
Marsh	A simple numeric majority of monitoring plots will have an ecological status of High every 5 years.
Dry/Wet Meadow	A simple numeric majority of monitoring plots will have an ecological status of High every 5 years.
Fen	A simple numeric majority of monitoring plots will have an ecological status of High every 5 years.
Cushion plant	A simple numeric majority of monitoring plots will improve every 5 years.
	Permanent GLORIA plots will be monitored every 5 years.
Deep Water Plants of Lake Tahoe	none

10.5 SPECIAL STATUS PLANT SPECIES

Over 1,000 vascular plant species have been identified in the Lake Tahoe Basin (USDA 2000). Recognizing that regional assessments cannot address the status of all species, monitoring programs and management activities must focus on a subset of species that may have specific conservation needs. Focal plant species may include those that have regulatory status (i.e., listed under the federal Endangered Species Act of 1973, as amended [ESA; 16 U.S.C. 1531 *et seq*.]), are commercially harvested species or nonnative invasive species. This section focuses exclusively on plants that are considered special status or sensitive species.

Special status plant species include those that are listed as threatened, endangered, proposed or candidate species for listing under the ESA; species that are state listed under the Native Plant Protection Act of 1977 (NPPA; Section 1900 *et seq*. of the California Fish and Game Code), the California Endangered Species Act of 1984 (CESA; Fish and Game Code 2050 *et seq*.) or Nevada Revised Statutes (NRS; 527.260 *et seq*.); species that are included on the Forest Service sensitive species or species of interest lists pursuant to the 2004 Forest planning rule; and species currently included on TRPA's threshold species list.

Special status plant species have been identified as such through an evaluation of multiple parameters that may include any or all of the following criteria: Rarity or limited distribution throughout the species' range or the region; endemism; presence of threats; perceived vulnerability to local extirpation or extinction; and implementation of conservation or management efforts. Special status species are generally thought of as having low abundance, narrow distributions, or small population sizes. Endemic species are those found only in a particular region and nowhere else in the world. Endemics often contribute significantly to the biological diversity of a given area and their typically small population sizes and narrow distribution make them vulnerable to extirpation events and extinction. They may also be considered unique according to both ecological and cultural criteria based on their inherent value and contribution to biological diversity. Some rare plant species occur in equally sensitive ecosystems, such as fens or cushion plant communities, but others may occur in habitats that are not considered uncommon or unique.

The process of assessing rarity, endangerment, and distribution of special status species to determine a given species' conservation status was refined by The Nature Conservancy and NatureServe, which encompasses a series of state natural heritage programs and data conservation centers throughout the United States (National Council for Air and Stream Improvement [NCASI] 2004). Based on a status assessment, the species are assigned a global ranking, which considers the entire range of the species, and a state ranking, which addresses the distribution of the species within the state(s) where it occurs (For more information, see General Methodology section in the Technical Supplement). The Forest Service and other land management and regulatory agencies recognize this process as the accepted standard and generally adopt some version of the lists generated by NatureServe and the various heritage programs (NCASI 2004).

Because of the ecological and biodiversity values inherent in special status plant species, it is important that special management be instituted to ensure the long-term persistence and sustainability of these taxa. The concept of sustainability refers to the dynamic ability of a species to adapt to natural and human disturbances while continuing to survive under a variety of conditions. The special status plant species in the Lake Tahoe Basin are found across the entire ecological and elevation gradient from the shores of the lake itself to the highest peaks.

Conserving and enhancing these species and their habitats is critical to the overall environmental integrity of the Lake Tahoe Basin. The special status species list may change as the taxa are evaluated over time.

Associated Attributes of Special Status Plant Species

The following attributes taken alone do not necessarily meet the definition of a special status species. It is the combination of these attributes together with the life history of the species that constitutes whether or not it warrants particular attention.

Rarity or Endemism
Rarity can be defined in many ways. For instance, species may be naturally rare in terms of a limited distribution or numbers; they may be broadly distributed but occur in low numbers; or they may be rare due to human caused disturbances that result in a loss of habitat and individuals. Generally, rarity speaks to the number of individuals coupled with the overall distribution of a species either globally or within a particular state or region.

Distribution
The spatial distribution of a species may also influence its rarity and susceptibility to threats over time. Many species exhibit a metapopulation dynamic, which means that the species can persist over long periods of time through cycles of site die-offs countered by colonization (Pavlik *et al*. 2002). The dynamic nature of this strategy therefore requires that suitable, unoccupied habitat remain available for colonization. The presence of a species may be correlated with specific soil or hydrologic circumstances that often results in an uncommon assemblage of species. When evaluating the status of a species, decision makers must consider the overall range of the species together with the attributes identified herein.

Endangerment, Threats, and Conservation Efforts
Evaluating real or potential threats to special status plant species and their habitats is integral to identifying conservation needs and appropriate management actions. Threats to a species may affect population numbers, reproductive output, habitat quality, and species sustainability. Human factors such as development and associated infrastructure, extraction of natural resources, and recreational activities cause threats to special status species through the direct loss or degradation of habitat. Natural events such as fire, hurricanes, wind throw, and floods may also threaten species, especially if they are narrowly distributed with low numbers. Threats as they relate to a species' vulnerability to loss is the critical linkage in evaluating the species' status.

Consideration of existing conservation efforts is important in understanding the vulnerability of a species to extirpation or extinction. Some species may be more susceptible to impacts and losses because they do not have protective regulatory status or they occur in areas facing development or other external pressures. Other species may be protected through various regulatory mechanisms, occur on lands that are managed for conservation purposes, or have been addressed through conservation and management strategies designed to reduce and eliminate threats to the species and their habitats.

10.5.1 Proposed Indicator for Special Status Plant Species

Proposed Indicator for Special Status Plant Species
Conservation Status (high, medium, or low) (Type I-III)

The conservation status of a special status species incorporates the parameters presented as attributes regarding rarity or endemism, distribution, and endangerment and threats, as well as habitat integrity and population viability as they relate to recovery. An evaluation of all of these components is performed using the best available scientific and commercial information available. In addition, any ongoing conservation efforts should be considered when the status of a species is determined. The conservation status of each species should be reevaluated each year or as new data are obtained. For a description of rarity or endemism, endangerments or threats, distributions, and conservation efforts, please refer to the associated attributes for this DC.

Population viability is assessed as a probability of persistence for a given occurrence based on its size, condition, and landscape context. The number of reproductive individuals (adult population size) generally is the most meaningful single indicator of a population's probability of long-term persistence. Because adult population size generally reflects site quality and reproductive success over multiple years, it also indicates habitat integrity and facilitates making linkages between direct habitat condition measurements and population success. The scope, severity, and immediacy of threats and the number of protected and managed occurrences are important factors in determining the vulnerability of a species and overall conservation status.

Tracking the conservation status of each special status plant species is an important component in understanding whether the DC is being met. A comprehensive list includes all species that are listed, proposed for listing, or candidate species and species included on the LTBMU subset of the Region 5 Sensitive Plant List. However, the high and medium priority species are the only species that will be tracked and actively managed. The comprehensive list will supersede the existing list of TRPA threshold plant species

10.5.2 Current Condition and Trend for Special Status Plant Species

Table 10-5 presents the LTBMU subset of the Region 5 Sensitive Plant List know to occur in the Lake Tahoe Basin and their global and state ranking, which is a reflection of their conservation status. No special status plant species that occur in the Lake Tahoe Basin are currently listed as threatened or endangered under the ESA.

Table 10-5. Special status plant species known to occur in the Lake Tahoe Basin (Based on USFS Region 5 Sensitive Plant List, June 2006).

Common Name/ Scientific Name	Global / Trinomial Rank	CA State Rank	NV State Rank
Vascular Plant Species (flowering plants)			
Galena Creek rockcress (*Arabis rigidissima* var. *demota)*	G3 T2Q	S1.2	S2
Scalloped moonwort *(Botrychium crenulatum)*	G3	S2.2	S2?
Mingan moonwort *(Botrychium minganense)*	G4	S1.2	NA
Tahoe draba *(Draba asterophora* var. *asterophora)*	G4 T2	S1.3	S1
Cup Lake draba *(Draba asterophora* var. *macrocarpa)*	G4 T1	S1.2	NA
Long-petaled lewisia *(Lewisia longipetala)*	G2	S2.2	NA
Tahoe yellowcress (*Rorippa subumbellata)*	G1	S1.1	S1
Nonvascular Plant Species (moss, lichen)			
Three-ranked hump-moss *(Meesia triquetra)*	G5	S2.2	NA
Broad-nerved hump-moss *(Meesia uliginosa)*	G4	S2.2	NA

10.5.3 Technical Range of Feasibility for Special Status Plant Species

The process of assessing rarity, endangerment, and distribution of special status species to determine a given species' conservation status was refined by The Nature Conservancy and NatureServe, which encompasses a series of state natural heritage programs and data conservation centers throughout the United States. Based on a status assessment, the species are assigned a global ranking, which considers the entire range of the species, and a state ranking, which addresses the distribution of the species within the state(s) where it occurs. The Forest Service and other land management and regulatory agencies recognize this process as the accepted standard and generally adopt some version of the lists generated by NatureServe and the various heritage programs.

10.5.4 Proposed Desired Condition and Standard for Special Status Plant S

Proposed Desired Condition 3: Special Status Plant Species
Populations of native, threatened, endangered, rare, special interest or sensitive species found in the Lake Tahoe Basin are maintained at or above sustainable levels.

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Special status plant species occur across the landscape in persistent, sustainable populations.

Proposed Standard for Special Status Plant Species: Maintain existing occurrences of high and medium priority species.

The goal for special status plant species is to maintain existing occurrences of high and medium priority species (i.e., stable population trend) and continue to gather information on and assess the condition of low priority and special interest species. The priority list of species will be adaptively managed to ensure that species are elevated or downgraded appropriately based on the available information. Currently, there are two high priority species: Tahoe yellowcress and Tahoe draba.

10.6 HAZARDOUS FUELS

Fire is fundamentally essential for healthy, sustainable forest resources and the protection of human communities. Vegetation in the urban setting is, for all practical purposes, no different than the vegetation in the wildlands. The only exception is when conditions exhibit high tree density and heavy fuel loads, the urban vegetation and fuels has the potential to threaten communities with catastrophic consequences. As the human development of the landscape continues to grow, threats to forest ecosystem health and integrity will grow. Reducing fuels and restoring fire's ecological role in this fire-adapted ecosystem can reverse adverse trends. No forest can be made fireproof, however, home owners and communities within the wildland urban intermix can take preventative action to reduce hazardous fuels. Community Fire Protection Plans to put into such action have been completed through public-private collaboration between federal, state, and local agencies and communities in the Lake Tahoe Basin.

Hazardous fuels are a fuel complex defined by kind, arrangement, volume, condition, and location that forms a special threat of ignition and resistance to control (derived from *the Healthy Forest Initiative and Healthy Forest Restoration Act Interim Field Guide*, USFS, 2004).

The two most important events in the history of vegetation in the Lake Tahoe Basin have occurred within and adjacent to what are now the developed and urbanized areas in the basin. The first is the long lasting effect of clear-cut harvesting of trees that were suitable for creating infrastructure necessary for Comstock silver mining (1875-1920). The second is the effect of fire exclusion from the forest ecosystem that depends upon it to regulate species composition, nutrient cycling, regeneration and regulation of watershed functions.

Prior to the settlement era, a mosaic of vegetation structures existed from areas of newly regenerating vegetation to old growth. Although fire is a major disturbance agent shaping the diversity of vegetation structures, its role is more dependent upon the development of live vegetation and other disturbance agents (insects, disease, wind, snow/avalanche) that produce the dead fuels that accumulate on the forest floor. Instead of a continuation of the dynamic changes that were taking place throughout the Lake Tahoe Basin, we are left with a single vegetation structure that continues to grow and increase in density to levels that far exceed the ability of the forest to sustain it. Most of the stands of trees analyzed within the wildland-urban intermix zone would become active crown fire if a fire were to enter it and the effects to local communities would be catastrophic.

The benefits of restoring the diversity of development stages or structure within the forest ecosystem and reducing risk of catastrophic fire to communities are mutual. Achieving these goals will not recreate the pre-settlement forest, but a forest that is healthy and can be sustained using both tree removal treatments and prescribed fire. The following factors are inherent in our forest ecosystem:

- The numerous conversions of forest land use to a developed/urban land use;
- Exotic diseases that kill or reduce reproduction on several tree species; and
- Noxious weeds that reduce reproductive success for native vegetation within the forest.

Public values identified during the Pathway process focused not only on ecosystem based management and fuels reduction, but on scenic and recreation values as well. Therefore, urban vegetation and fuels will need to represent a range of possible conditions that meet the fire suppression capabilities of local resources, long-term sustainability of the forest ecosystem and each of the resource values that are linked to them.

Associated Attributes of Urban Vegetation and Fuels

Predicted Fire Behavior

Analysis of tree cores and stumps indicate that historical fuel loadings were much lower and crown spacing much greater. Fire return intervals averaged 5-18 years near the Lake and 19-32 years at higher elevations. Frequent fires reduced surface and ladder fuels, fire intensities were low and there was little mortality of mature trees. Fire return intervals in intermittent and ephemeral steams were similar to adjacent upland forests. Fire return intervals were longer along larger perennial streams, but the fires that did occur resulted in a mosaic of age classes of riparian shrubs and trees. Frequent fires periodically destroyed shrubs and most lodgepole seedlings that regenerated in meadows.

Community Defensible Space

A multi-tiered approach of direct and indirect protection has been developed to protect communities. The **structure defensible space** includes the structure and the area directly adjacent to structures and residences. Mandated federal, state, and local codes and standards are in place for defensible space and other building construction mitigation measures. For example, up to a 100 foot radius of defensible space is required around home structures according to State of California legislation. The Wildland Urban Interface (WUI) is comprised of defense and threat zones that extend a combined 1.5 miles from community or key infrastructure boundary (see figure 10.3 on the next page). The actual boundaries are determined at the project level following national, regional and forest policy. Local fire management specialists determine the extent, treatment orientation, and prescriptions for the WUI based on historical fire spread and intensity, historical weather patterns, topography, and access (USDA Forest Service, 2004). The **defense zone** or direct protection buffer extend a sufficient distance so that wildland fire spread and intensity are reduced. Vegetation treatments are designed to reduce passive and active crowning to a surface fire that can be directly attacked by hand crews. To ensure that passive or active crown fire is reduced to a surface fire, the defense zone is reinforced by a **threat zone** or indirect protection buffer. This landscape approach to area treatments is designed to offer a full range of suppression tactics. The actual extent of the zone is based on fire regime, condition class, local fire history, problem fire behavior and size, local fuel conditions, weather, topography, existing treatments, and barriers to fire. The individual fuels treatments in this zone are designed to effectively reduce wildfire spread and intensity.

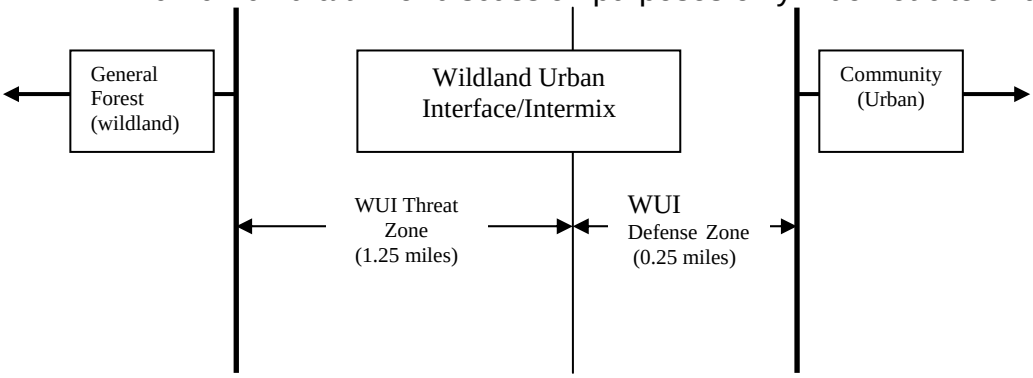


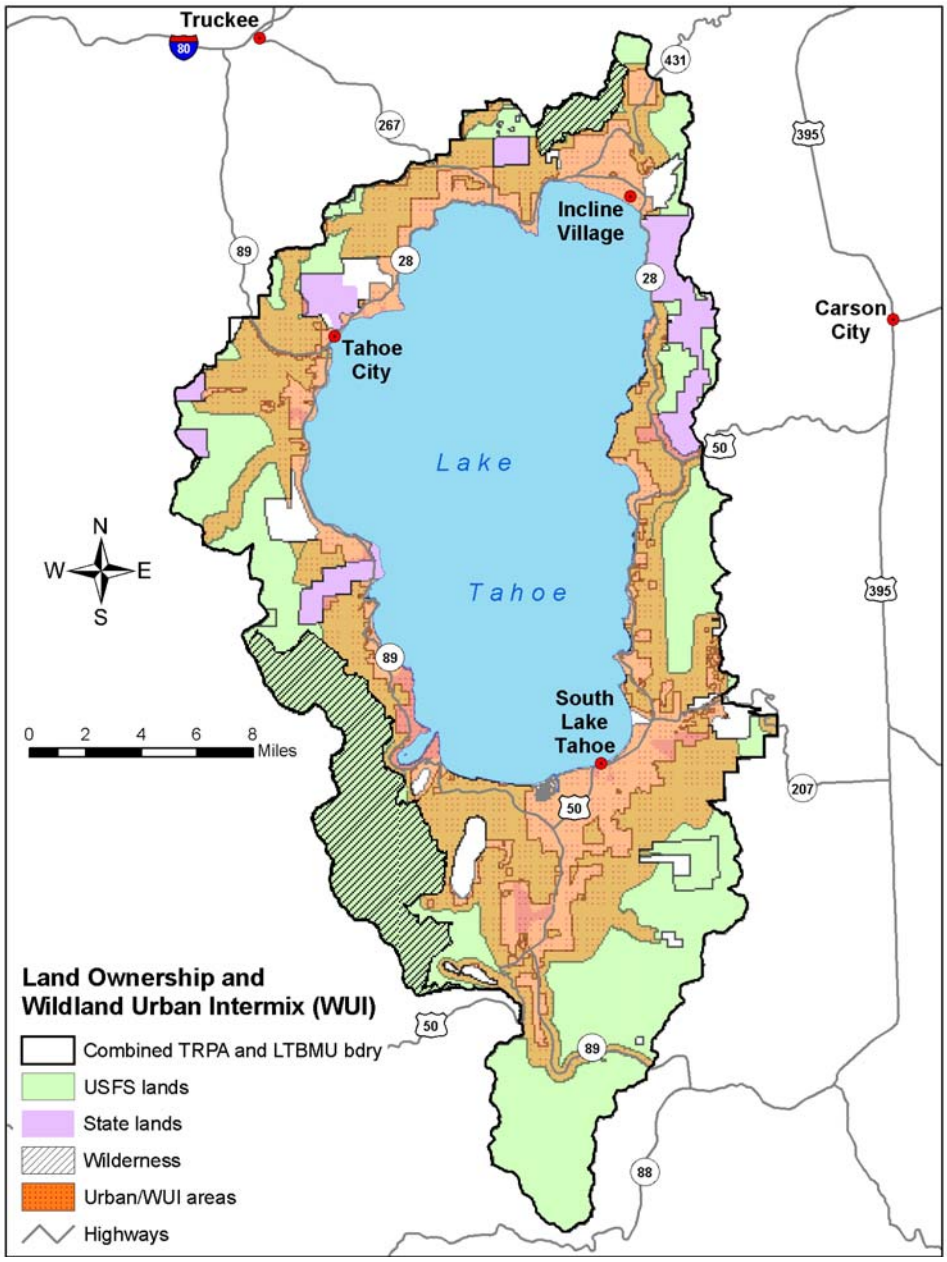
Figure 10-3. Zones of the Wildland-Urban Interface/Intermix

The WUI zones make up nearly half (48.2%) of the forestland in the Lake Tahoe Basin (see Table 10-6 and Figure 10-4 on the next page).

Table 10-6. National Forest System Lands and other ownerships by major land designation category

	National Forest		Other		Totals	
	Acres	Percent	Acres	Percent	Acres	Percent
Urban	64,306	30.7%	36,659	17.5%	100,965	48.2%
Core	784	0.4%	34,951	16.7%	35,735	17.1%
Defense	43,959	21.0%	1,708	0.8%	45,667	21.8%
Threat	19,563	9.3%	0	0.0%	19,563	9.3%
Wildland	63,796	30.5%	19,961	9.5%	83,757	40.0%
Wilderness	24,629	11.8%	0	0.0%	24,629	11.8%
Totals	152,731	73.0%	56,620	27.0%	209,351	100.0%

Figure 10-4. Extent of wildland-urban intermix zone in the Lake Tahoe Basin



10.6.1 Proposed Indicator for Urban Vegetation & Fuels

Proposed Indicator for Urban Vegetation & Fuels
Predicted fire behavior. (Type I)

Predicted fire behavior is the result of modeling fire behavior conditions with an inventory of existing fuel conditions. In the Lake Tahoe Basin, the current structural condition of tree canopies and amount of surface fuels in combination with physical setting provide the conditions required for rapidly moving fires that typically consume the crowns of forested areas in the Wildland–Urban Intermix (WUI). This indicator has been enumerated basin-wide in the Stewardship-Fireshed Assessment conducted by the USFS-R5 Cadre, LTBMU resource specialists, and cooperating federal, state and local agencies.

10.6.2 Current Condition and Trend for Hazardous Fuels

Fire suppression management has occurred in the Lake Tahoe Basin for over 80 years. During that time, normally would have been three to five fire cycles in the mixed-conifer and pine zones of the WUI. Extensive tree harvest in the late 1800s and early 1900s resulted in an overall young forest that is more susceptible to mortality from fires. The bark of younger trees is thinner and their crowns are lower to the ground, making them more susceptible to lethal heating. As such, a larger proportion of it would burn severely, with a high incidence of mortality.

The Lake Tahoe Basin has one of the highest ignition rates in the Sierra Nevada, with the highest levels concentrated around urban areas. Heavier fuels that are likely to burn occur in a narrow band that coincides with lower elevations and areas of heavy human access.

It appears that the climate generally is warming and that past warm periods have been associated with dryness. Therefore the trend appears to be one toward climate conditions with an increasing likelihood of large, severe fires. Within the WUI, weather is always suitably arid by late summer.

Randomly selected watersheds around the basin were modeled for fire behavior using the FARSITE model to evaluate some of the likely effects of unplanned fires on wildlands near urban areas. Fires were simulated on several randomly selected watersheds representing east, south, west, and north shores of the basin where the density of ignitions has been the greatest. Without simulated suppression, flame lengths reached the tree crowns and surface fuels were heavy enough to carry fire into the crowns. Although surface fires dominated the simulation, tree mortality was likely underestimated due to the fact that younger trees have thinner bark and lower crown base heights. Flame lengths and consequent fire effects are likely to be most severe in the mixed conifer and pine zones at lower elevations and on the east shore where pine forest mortality has been prevalent.

Treatment of the urban/developed areas and WUI will require initial treatments aimed at removing and/or reducing understory growth and surface fuel accumulations. More than

40 percent of these areas have received initial treatment. Maintenance treatments will need to continue to serve as surrogates for the role of fire.

10.6.3 Technical Range of Feasibility for Hazardous Fuels

Fire behavior has been accurately predicted over the past two decades using fire behavior models. These models utilize specific local inventory plot information about the type and kind of horizontally and vertically arrayed fuels along with physical setting, expected high fire weather conditions and fuel moistures. These components together are the basis for predicting whether a wildfire would remain on the surface of the forest floor or become an active crown fire.

Hazardous fuels are similar, but different from the healthy vegetation desired condition. In addition to attaining the goals in healthy vegetation, further treatment within the WUI and urban zones must be accomplished to protect communities from wildfire. These zones have been delineated using geographic information systems (GIS), and to some extent they have been adjusted by fire/fuels experts for local conditions on a project-by-project basis. However, locally defined boundaries still need to be determined for the rest of the Lake Tahoe Basin. Reaching the desired condition for hazardous fuels will depend upon a good WUI map.

10.6.4 Proposed Desired Condition and Standard for Hazardous Fuels

Proposed Desired Condition 4: Hazardous Fuels
Fuel conditions pose low wildfire risk to communities.

Within the WUI, US Forest Service wildland protection strategies are established and fire behavior is modified that result in significant reductions in wildland fire intensity and rate of spread, thereby contributing to public and firefighter safety, more effective fire suppression, and fewer acres burned.

Proposed Standards for Hazardous Fuels
Predicted fire behavior in treated areas of urban and WUI zones does not exceed surface fire type.

Forest stand densities, diversity of vegetation structure, appropriate vegetation composition and appropriate surface fuel loads will be within levels that do not support active crown fire. These forest conditions will be similar to those proposed in the Healthy Vegetation Desired Condition, but will differ in order to further reduce wildfire behavior. The predicted crown fire potential will be a surface type of fire for all stands within the WUI.

10.7 Urban Vegetation

Urban Vegetation focuses specifically on the potential benefits of a more thoughtfully designed urban landscape and the avoidance of potential adverse effects that management of Urban Vegetation could have on the area (e.g., fertilizer runoff into Lake Tahoe). This desired condition will require further development and refinements in the upcoming years.

Associated Attributes:

- Landscaping –plants installed for a particular purpose in residential or commercial areas;
- Urban Lots- vegetated, undeveloped parcels;
- Recreation parcels – includes golf courses and parks;
- Water quality protection- fertilizers, pesticides, and erosion inputs to Lake Tahoe;
- Defensible Space- contributions to fire hazard reduction; and
- Contribution to scenic and community values – fulfills functional roles.

10.7.1 Proposed Indicator for Urban Vegetation

Proposed Indicator for Urban Vegetation
Proportion of parcels that meet approved vegetation criteria (Type Ill)

The proposed indicator of the proportion of parcels that meet approved urban vegetation criteria will likely require integration into BMP compliance. Compliance with state laws and local ordinances requiring defensible space may also be utilized as an indicator.

10.7.2 Current Condition and Trend for Urban Vegetation

This information is not currently available and will need further developed.

10.7.3 Technical Feasibility of Urban Vegetation

There is a strong need for spatially explicit data on the relative contributions of landscaping erosion, urban pesticides, and fertilizer run-off to lake clarity declines. Such data would enable the development of place-based indicators that target different land uses. Specific indicators could be developed for each of the five TRPA designated land uses: Conservation, Recreation, Residential, Commercial/Public Service and Tourist.

This would lead to more specific standards and improve management and compliance efforts. Generating this level of data will require a Basin-wide integrated effort among many of the Resource areas.

10.7.4 Proposed Desired Condition and Standard for Urban Vegetation

Proposed Desired Condition 5: Urban Vegetation
Vegetation in the urban zones is predominantly native, water-efficient and non-invasive. Urban vegetation contributes to defensible space, water quality protection, and scenic and local community values.

The desired condition highlights: 1) the concern over negative inputs to Lake Tahoe; and 2) the functional attributes of urban vegetation that can potentially provide benefits to the Lake Tahoe Basin

Proposed Standard for Urban Vegetation:
None proposed

Currently, there are specific TRPA codes, city ordinances, and state laws related to this issue, but there is no mechanism in place to measure all attributes towards a standard. The current relevant TRPA enforceable standard is for Best Management Practices related to water quality discharge. Recreational parcels are required to develop fertilizer and water management plans and are regularly tested for compliance, but these standards do not apply to land uses other than Recreation. There are specific City of South Lake Tahoe and California State Law requirements related to treatment of vegetation and fuels for defensible space around buildings.

Until research and monitoring information are available that adequately quantifies the effectiveness of the urban vegetation and associated attributes, this issue area is proposed as a goal rather than a numeric standard.

10.8 Further Considerations Regarding Vegetation

There are several vegetation-specific needs that must be addressed. These include:

- Federal, state and local collaboration is being planned to refine and delineate the wildland-urban intermix zones;
- Correlation of inventory plot data with spatial vegetation layer that was derived from IKONOS satellite imagery;
- Simulations of potential fire behavior based on current conditions within each watershed;
- Further development of indices for plant communities of concern;
- Review, re-evaluation, and updating of information on existing baselines and species conservation status; and
- Compilation of all vegetation resource data is scattered despite some very good agency-specific data bases. A compilation system that integrates these data would be very useful.

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