2 Conservation

The importance of environmental conservation within the Tahoe Region is emphasized by the guiding principles of the Tahoe Regional Planning Agency (TRPA). *"The Tahoe Region exhibits unique and irreplaceable environmental and ecological values of national significance which are threatened with deterioration or degeneration."* TRPA shall *"maintain the significant scenic, recreational, education, scientific, natural, and public health values provided by the Region;* and *"ensure equilibrium between the Region's natural endowment and its manmade environment."*

The challenges TRPA faces at Lake Tahoe today are centered on maintaining a sustainable balance of environmental protection, economic health, and vital communities. To address these issues, the regulatory focus in the Region has shifted to strengthen the focus on restoration of sensitive lands and environmental improvement projects that repair damage of the past, while also promoting redevelopment of Tahoe's community centers to accelerate attainment of threshold standards with more environmentally appropriate and attractive structures.

This chapter discusses environmental resources and hazards found in the Plan Area, such as biological resources and fire hazards; hydrology, water quality and flooding; soils, land capability and coverage; scenic resources; historic and cultural resources; air quality; greenhouse gases; and noise. Following, it summarizes existing Regional Plan, general plan and community plan policies and makes recommendations for revising, retaining or eliminating conservation policies. For discussion of the federal, state and local regulatory environment see Appendix A: Conservation Regulatory Environment.

2.1 Environmental Management Framework

ENVIRONMENTAL THRESHOLD CARRYING CAPACITIES

In 1980 when the 1969 Bi-State Compact directives were found to be insufficient in protecting Lake Tahoe's ecosystem, the Compact was revised and TRPA was charged with leading a cooperative effort to preserve, restore, and enhance the unique natural and human environment of the Lake Tahoe Region. The amended 1980 Compact directed TRPA to adopt environmental quality standards known as Environmental Threshold Carrying Capacities to better focus environmental quality objectives and to address the impacts resulting from urban development and different land uses through the implementation of a regional land use plan.

In 1982, TRPA, in cooperation with the State of California and Nevada, federal government representatives, the scientific community and local stakeholders, established threshold stand-

ards for nine categories of values identified for the Lake Tahoe Region considered unique to this resource and desirable to sustain. These environmental threshold carrying capacities are defined as environmental standards necessary to maintain significant scenic, recreational, educational, scientific, or natural values of the Region or to maintain public health and safety within the Region. The threshold categories include: (1) water quality, (2) soil conservation, (3) air quality, (4) vegetation, (5) fisheries, (6) wildlife, (7) scenic resources/community design, (8) recreation, and (9) noise.

The 2011 Threshold Evaluation Report presents the results of TRPAs fifth Regional Plan and Threshold Review. The 2011 Report addressed 151 environmental standards and made a status determination on 92 of these standards. Overall, 62 percent were attained or implemented and 38 percent have not yet been attained. For further information see the 2011 Threshold Evaluation Report available for download at: http://www.trpa.org/default.aspx?tabid=174

ENVIRONMENTAL IMPROVEMENT PROGRAM

Because the urban development that existed prior to the 1987 Regional Plan continued to affect the environmental conditions of the Region, it became clear that regulation alone would not achieve and maintain adopted Environmental Threshold Standards. To address these legacy impacts, TRPA launched the Environmental Improvement Program (EIP) in 1997. The EIP is a strategy designed to accelerate the attainment of environmental thresholds through the investment of public and private funds into physical projects including erosion control measures, riparian area restoration, transportation, forest health, and other environmentally beneficial programs and projects.

Between 1997 and 2006 Phase I of the EIP called for an investment of $908 million in capital projects and $58 million in research and monitoring. The EIP also identified hundreds of specific projects and programs to be undertaken by more than 50 funding partners, including federal, state, and local agencies and the private sector with the prime directive of moving the Tahoe Region closer to environmental threshold attainment.

The Lake Tahoe Restoration Act (LTRA) of 2000 authorized the federal share of the EIP funding, which allowed the US Forest Service to invest $300 million in EIP projects and programs. The states of California and Nevada also played a key role in developing and implementing the EIP. Voters in Nevada approved a bond measure to provide $82 million, and the state of California fulfilled its funding commitment through projects funded primarily by the California Tahoe Conservancy, State Parks, and Caltrans. In total, the state of California committed more than $446 million to EIP projects.

Major EIP partners in local government included the counties of Washoe, Douglas, El Dorado, and Placer, the City of South Lake Tahoe, and local utility and fire protection districts. Because stormwater runoff from local roads and private residential and commercial development conveys sediment and other pollutants that degrade lake clarity, erosion control measures known as best management practices (BMPs) are an important component of the Regional Plan and the EIP. Through investments in BMPs and other projects, local and private sources contributed nearly $270 million during the first decade of the EIP. For further

discussion of BMP compliance within the Plan Area see Section 2.3, Hydrology, Water Quality and Flooding.

As of 2007, approximately 270 EIP capital projects have been completed with hundreds more in the planning and implementation stages. Phase II of the EIP (2008-2018) builds upon accomplishments to date, with an increased emphasis on monitoring and focused research, adaptive management, and performance benchmarks. Specifically, the current phase focuses on the following six areas: (1) watersheds, habitat and water quality, (2) forest management, (3) air quality and transportation, (4) recreation and scenic resources, (5) applied science, and (5) program support.

TRPA maintains a priority list of projects, studies, and programs that are anticipated or need to be completed for progressive threshold attainment. This list is updated annually. Figure 2-1 maps the location of completed and proposed EIP projects within the Plan Area. For further discussion of completed Water Quality Improvement Program (WQIP) projects within the Plan Area see Section 2.3, Hydrology, Water Quality and Flooding.

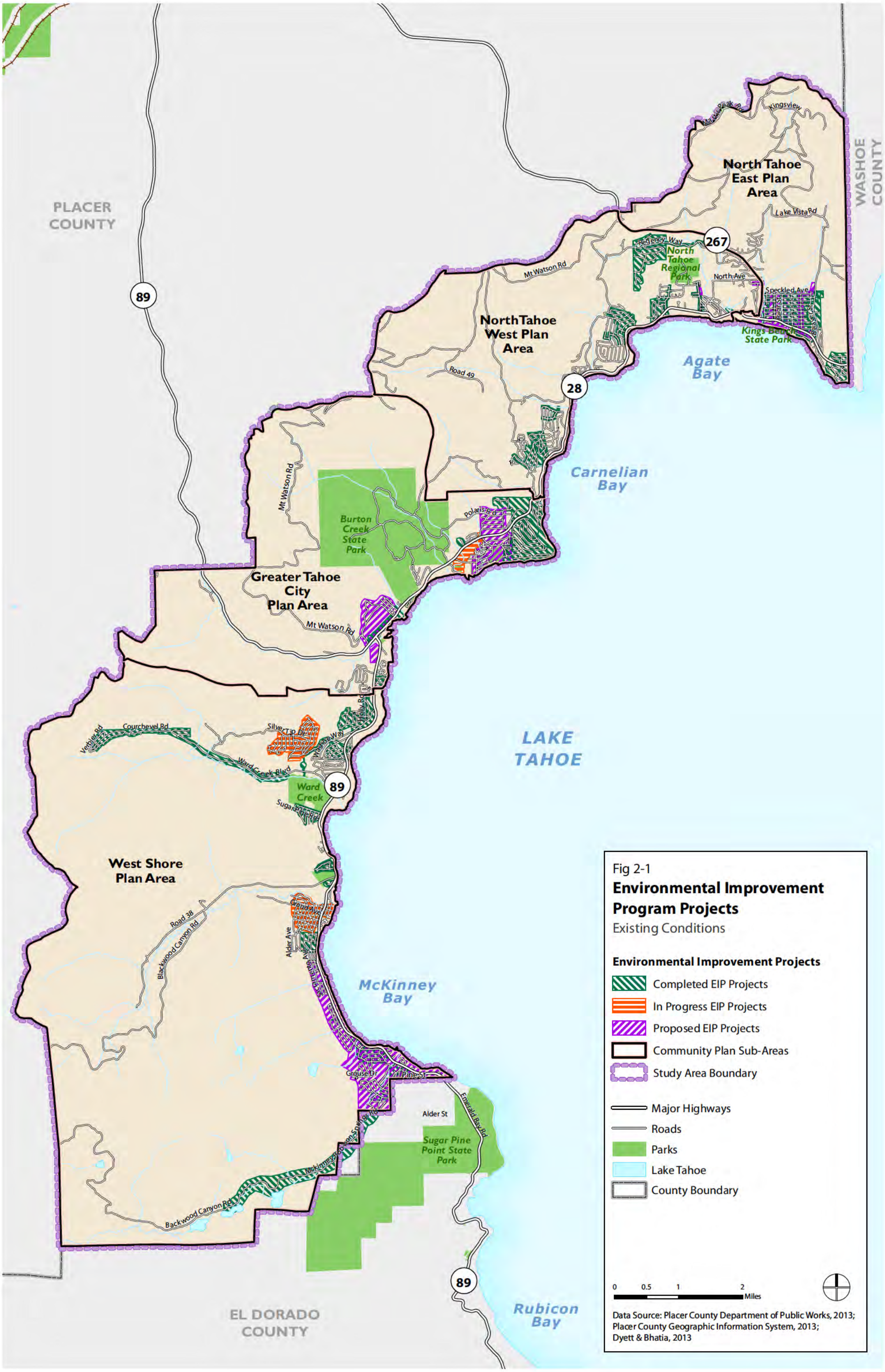

Fig 2-1
Environmental Improvement Program Projects
Existing Conditions

Environmental Improvement Projects
- Completed EIP Projects
- In Progress EIP Projects
- Proposed EIP Projects
- Community Plan Sub-Areas
- Study Area Boundary
- Major Highways
- Roads
- Parks
- Lake Tahoe
- County Boundary

2.2 Biological Resources and Fire Hazards

This section describes common and sensitive vegetation, terrestrial wildlife, and aquatic biological resources that are known to occur in the Plan Area. Biological resources include common vegetation and animal species, sensitive plant communities, and special-status plant and animal species.

ENVIRONMENTAL SETTING

The Plan Area is located within the USFS Sierra Nevada Ecological Section, referred to as the Sierra Nevada ecoregion. The Sierra Nevada ecoregion is the temperate to very cold parts of the Sierra Nevada. The entire Sierra Nevada ecoregion is divided into 21 ecological subsections that are distinguished primarily by their geologic and geomorphic properties and history, and by variation in climate and vegetation patterns. The Plan Area is almost entirely located within the Tahoe-Truckee Subsection, which occurs in the northwest portion of the Tahoe Basin extending from Kings Beach south to Homewood. A small portion of the Plan Area—primarily Tahoma—is located in the Upper Batholith and Volcanic Flows Subsection, which extends to the west of the Plan Area.

The predominant natural plant communities in the Tahoe-Truckee Subsection are jeffrey pine, mixed conifer, white fir series, red fir series, and big sagebrush. Jeffrey pine is common in drier areas on shallow and rocky soils. Patches of mountain hemlock series occur at the highest elevations. Lodgepole pine series prevails on many wet soils and on drier soils where cold air drainage and frost limit the regeneration of other trees. Western white pine and whitebark pine occur at upper elevations. Sedge meadow communities are common but not extensive. Willow, mountain alder, and black cottonwood are common in riparian areas, and aspen is present. Shrub-dominated vegetation includes big sagebrush, bitterbrush, and rabbitbrush. Alpine grassland and montane meadow are also present.[1]

Vegetation Communities

The Lake Tahoe Region occurs within a unique Sierra Nevada geologic basin. The types, distribution, and functions of vegetation and wildlife resources in Tahoe are strongly influenced by the geology, climate, topography, and hydrology of the region, as well as development and land use patterns. The Lake elevation averages 6,225 feet, and surrounding peaks reach elevations of up to 10,880 feet. This elevation gradient results in three general vegetation zones that are recognized in the Basin: montane, upper montane, and subalpine. Numerous vegetation types are present within each vegetation zone. The hydrologic, topographic, and elevation gradients present in the Basin support a diverse mix of vegetation communities and wildlife habitats. For example, more than 50 vegetation types and 22 California Wildlife Habitat Relationships System (CWHR) habitat types are recognized in the Tahoe Basin.[2]

[1] Chapter 3.10: Biological Resources, TRPA Regional Plan Update Draft EIS. Ascent Environmental (2011).

[2] ibid

Table 2.2-1 summarizes the CWHR vegetation communities within the Plan Area and Figure 2-2 maps their location. The majority—58 percent—of the Plan Area consists of white fir vegetation. White fir vegetation is primarily located along the west shore of the Plan Area, extending from just north of Dollar Point to Tahoma. The north shore of the Plan Area is primarily dominated by jeffrey pine (areas closest to the shoreline) and red fir (the northernmost part of the Plan Area).

Table 2.2-1: Vegetation Communities

Vegetation	*Acres*	*Percent of Land Area*
White Fir	27,026	58.2%
Montane Chaparral	4,656	10.0%
Jeffrey Pine	3,513	7.6%
Red Fir	3,106	6.7%
Sagebrush	2,100	4.5%
Subalpine Conifer	1,767	3.8%
Montane Riparian	917	2.0%
Sierran Mixed Conifer	686	1.5%
Perennial Grass	440	0.9%
Aspen	337	0.7%
Barren	229	0.5%
Lodgepole Pine	206	0.4%
Lacustrine	60	0.1%
Wet Meadow	29	0.1%
Unclassified	1,360	2.9%
Total	**46,433**	**100.0%**

Source: USFS, TRPA, 2007.

There are a total of 1,077 vascular plants that have been confirmed in the Tahoe Basin, with another 360 possibly occurring. The Basin is also home to 115 species of non-vascular plants. Vascular plants are defined as those with vascular tissues that distribute resources throughout the plant allowing for vascular plants to evolve to larger sizes.

Existing vegetation patterns in the Tahoe Region are strongly influenced by past and current human activities. Between 1859 and 1900, nearly 60 percent of the Tahoe watershed was clear-cut due to logging activities. As a result, most forestlands are less than 150 years old.

Housing and commercial development have also influenced the vegetation pattern present today in the Plan Area. As discussed in Section 2.4, Soils, Land Capability and Coverage, approximately 4 percent of land coverage in the Plan Area consists of soft and hard coverage. The impacts due to removal of vegetation, but also changes to composition of remaining vegetation has resulted in increased erosion and nutrient runoff from developed lots and introduced non-native species into the Basin.

After most of the logging was complete, federal and state governments began acquiring land in the Tahoe Basin, intensifying in the 1930s. Today more than 85 percent of the land in the Basin is managed by the US Forest Service, Nevada Division of State Lands, California Department of Parks and Recreation, and the California Tahoe Conservancy. Due to the high

proportion of land held in public ownership, potential threats to most vegetation and wildlife resources in the Tahoe Region are reduced relative to many other regions.

Fisheries and Aquatic Resources

There are two key aquatic environments that support fish in the Tahoe Basin—lakes and streams. Both environments play a key role in sustaining fish populations as some fish species use both lake and stream environments to fulfill their life cycles. Lakes within the Region range from small glacial tarns and snowmelt ponds to very large lakes such as Lake Tahoe. Streams range from small ephemeral drainages and intermittent streams to large perennial rivers such as the Truckee River.

The diversity and abundance of Lake Tahoe's fish community has changed considerably since arrival of Euro-American settlers in the Tahoe Basin. Several factors have contributed to the decline or extirpation of native fish and degradation of native aquatic habitats in the Region. These include increased sedimentation as a byproduct of logging, livestock grazing, commercial fish harvests, interruption of natural hydrologic regimes due to past logging practices, urban development, and introduction of non-native fish and other aquatic organisms.[3]

Lake Habitat

TRPA has designated different types and qualities of fish habitat. "Prime" fish habitat includes spawning habitat, and feed and cover habitat. Spawning habitats are composed of relatively small diameter gravel substrates used by native minnows for spawning and rearing fry. Feed and cover habitats are composed of larger diameter cobbles, rocks and boulders used by fish as foraging habitat, and to provide refuge from predators. "Marginal" habitats are dominated by sand and silt substrates interspersed with occasional willow thickets that establish during low lake levels. Figure 2-3 maps the location of spawning, feed and cover, and marginal fish habitats.

Native Fish Species

Of the native fish species, Lahontan cutthroat trout and mountain whitefish were once the most abundant. Overfishing in the late 1800s and early 1900s, habitat degradation, and the introduction of non-native aquatic species have contributed to the extirpation of the Lahontan cutthroat trout in the Tahoe Region. In 1970 the species was federally listed as endangered, however reclassified as threatened in 1975. Today, stream restoration and efforts to reintroduce Lahontan cutthroat trout are underway.

The Lake Tahoe Basin Management Unit Fisheries Department conducted non-game native fish surveys in streams of the California side of Lake Tahoe in 2007 and 2008. Creeks surveyed within the Plan Area included Griff Creek, Watson Creek, Burton Creek, Homewood Canyon Creek, Madden Creek, Quail Creek, McKinney Creek, Ward Creek, and Blackwood Creek. According to the assessment, seven species of fish were sampled, five of which were native to the Tahoe Basin.[4] These include the Lahontan redsider, paiute sculpin, speckled

[3] Chapter 3.10: Biological Resources, TRPA Regional Plan Update Draft EIS. Ascent Environmental (2011).

[4] The Lahontan cutthroat trout and mountain whitefish were not sampled as part of this study.

dace, Tahoe sucker, and tui chub. Three non-native species were also sampled including brook trout, brown trout and rainbow trout. The once abundant Lahontan cutthroat trout is the only trout native to the lakes and streams in Lake Tahoe. Table 2.2-2 shows the distribution of fish species in Plan Area creeks surveyed in 2008.

Table 2.2-2: Fish Species Sampled in Plan Area

Fish Species	*Native/ Non-Native*	*Location*
Lahontan Redsider	Native	Quail Creek, Ward Creek
Paiute Sculpin	Native	Ward Creek
Speckled Dace	Native	Ward Creek, Griff Creek
Tahoe Sucker	Native	Griff Creek
Tui Chub	Native	Griff Creek
Brook Trout	Non-native	Mckinney Creek, Quail Creek, Madden Creek, Blackwood Creek, Ward Creek, Burton Creek, Watson Creek, Griff Creek
Brown Trout	Non-native	Quail Creek, Blackwood Creek, Ward Creek, Griff Creek
Rainbow Trout	Non-native	Mckinney Creek, Quail Creek, Homewood Creek, Madden Creek, Blackwood Creek, Ward Creek, Griff Creek

Source: Lake Tahoe Basin Management Unit Fisheries Department, 2008.

Non-native and Aquatic Invasive Species

As shown above in Table 2.2-2 above, non-native fish species introduced to the Lake Tahoe Region include brook trout, brown trout and rainbow trout, as well as lake trout. Several warm-water fish species have also been introduced to Lake Tahoe and some tributary streams including bluegill, largemouth bass, smallmouth bass, and brown bullhead catfish.

Two invasive non-native aquatic mussels—quagga mussel and zebra mussel—are not present in the Tahoe Region, however are of particular concern due to their expanding range, highly invasive nature, and potential to disrupt ecosystem functions. Aquatic invasive species of serious concern that are present in Lake Tahoe include Asian clam, Eurasian watermilfoil and curlylead pondweed.[5]

[5] Chapter 3.10: Biological Resources, TRPA Regional Plan Update Draft EIS. Ascent Environmental (2011).

Special-status Species

Special-status species are plants and animals that are legally protected under state and federal Endangered Species Acts or other regulations, and species that are considered sufficiently rare by the scientific community to qualify for such listing. Special-status plants and animals are species in the following categories:

- Species listed or proposed for listing as threatened or endangered under the federal Endangered Species Act, and various notices in the Federal Register [proposed species];
- Species that are candidates for possible future listing as threatened or endangered under the federal Endangered Species Act;
- Species listed or proposed for listing by the State of California as threatened or endangered under the California Endangered species Act;
- Species that meet the definitions of rare or endangered under CEQA;
- Plants listed as rare under the California Native Plant Protection Act;
- Plants considered by the California Native Plant Society (CNPS) to be "rare, threatened, or endangered in California";
- Plants listed by CNPS as plants about which more information is needed to determine their status and plants of limited distribution, which may be included as special-status species on the basis of local significance or recent biological information;
- Animal species of special concern to the California Department of Fish and Game; and
- Animals fully protected in California (California Fish and Game Code, Section 3511 [birds], 4700 [mammals], and 5050 [amphibians and reptiles]).

Special-status Plant Species

Ascent Environmental identified 41 special-status plant species know or with potential to occur in the Tahoe Basin. Table 3.10-4 of the Regional Plan Update Draft EIS summarizes the status, habitat association, and occurrence information for each identified special-status plant species.

TRPA staff currently monitors 21 special-status plant species know to occur in the Tahoe Basin. Eight species are known only from text or herbarium records, and 14 special-status species potentially occur based on habitat preference or other environment criteria, however have not been documented in the Basin. Tahoe yellow cress is the only plant listed as endangered by California State.

The vegetation threshold standards apply only to five species including galena creek rockcress, tahoe draba, cup lake draba, long-petaled lewisia, and tahoe yellow cress. According to the 2011 Threshold Evaluation Report, the status of all sensitive plants was “considerably better than target” with the exception of the galena creek rockcress, which lacked insufficient information to make a determination on its attainment status.

Special-status Fish and Wildlife Species

Ascent Environmental identified 40 special-status wildlife species know or with potential to occur in the Tahoe Basin. Table 3.10-5 of the Regional Plan Update Draft EIS summarizes the status, habitat association, and occurrence information of each special-status wildlife species identified.

Fish and Amphibians

The Lahontan cutthroat trout is currently listed as a 'threatened species' under the Federal Endangered Species Act. TRPA has adopted a policy statement, which is to aid in state and federal efforts to reintroduce the Lahontan cutthroat trout to Lake Tahoe. Since 2002, the US Fish and Wildlife Service (USFWS) has introduced Lahontan cutthroat trout to Fallen Leaf Lake to learn what conditions are necessary for successful restoration of the species in a lake environment. Findings suggest that restoration of a viable Lahontan cutthroat trout population may be possible if it can establish a niche apart from other trout species.

Two amphibious species are listed as federal candidates for listing under the Federal Endangered Species Act. These include the Yosemite toad, found in wet meadows between 4,000 and 12,000 feet in the Sierra Nevada and the Sierra Nevada yellow-legged frog, found in upper elevation lakes, ponds, bogs, and slow-moving alpine streams between 6,000 and 12,000 feet.

Birds and Mammals

Three species are listed by the California Department of Fish and Game as 'endangered'. These include the willow flycatcher, bald eagle and the great grey owl. An additional two species are listed as 'threatened' including the bank swallow and California wolverine.

TRPA identifies numerical and management standards related to six special-interest species—bald eagle, osprey, golden eagle, peregrine falcon, northern goshawk, and deer, and one group of species—waterfowl. The numerical standards establish a minimum number of population sites that must be maintained, while the management standard establishes disturbance free buffer zones for each species or species group. According to the 2011 Threshold Evaluation Report, the status of all special-interest species is "at or somewhat better than target."

Fire Hazards

The threat of catastrophic fires has been identified as the number one public concern in the Tahoe Region. The forests in the Tahoe Basin are significant different than found prior to logging during the Comstock era. Prior to Comstock logging during the late 1800s, forest stands were much less dense consisting of larger trees and open understories. The current forest stand characteristics have created excess fuel hazards capable of supporting stand-destroying fires that threaten communities and ecosystem health along the north and west shores of Lake Tahoe.[6]

[6] Lake Tahoe Basin California Portion, Community Wildfire Protection Plan. C.G Celio & Sons Co, Steve Holl Consulting, and Wildland Rx (2004).

Prior to European settlement, large, widely spaced trees with little understory characterized lower elevation montane forests. Between 1875 and 1895, large-scale timber harvesting clear-cut most of the old growth forests on the west shore. By 1900, forests in the Basin consisted of individual stands of seedlings, saplings and poles, which are smaller classes of trees and support more intense fires than old growth stands. Following, in 1918 the change in the forest stands resulted in the largest fire recorded in the Basin, and the largest number of acres burned during a decade—2,593 acres between 1916 and 1925.[7]

Since 1975, periods of drought have contributed to increased mortality in forest and riparian vegetation. Limbs from dying trees and small trees of shade-tolerant species create ladder fuels in forest stands resulting in "fuel hazards that may be the highest they have been in over 100 years."[8]

Ignition Risk

The Tahoe Basin has one of the highest fire ignition rates in the Sierra Nevada. According to data from the US Forest Service's Lake Tahoe Basin Management Unit (LTBMU), between 1973 and 1996 the highest occurrence of ignitions in the Plan Area occurred at Brockway, from Kings Beach to Tahoe Vista, and Dollar Point. The lowest occurrence of ignitions occurred at Homewood.[9]

Values at Risk

In 2004, communities in the California portion of the Tahoe Basin were assessed and ranked based on fire susceptibility, value of the community (based on percentage of each watershed covered by development), impacts to lake clarity (soil erosion hazards), and percentage of old growth forests within each watershed. Based on this assessment, values at risk within the Plan Area include: Brockway and portions of Kings Beach; Dollar Point; Cedar Flat and the Highlands; and portions of Tahoe City, the Truckee River corridor, and Talmont.[10]

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[7] Lake Tahoe Basin California Portion, Community Wildfire Protection Plan. C.G Celio & Sons Co, Steve Holl Consulting, and Wildland Rx (2004).

[8] ibid

[9] ibid

[10] ibid

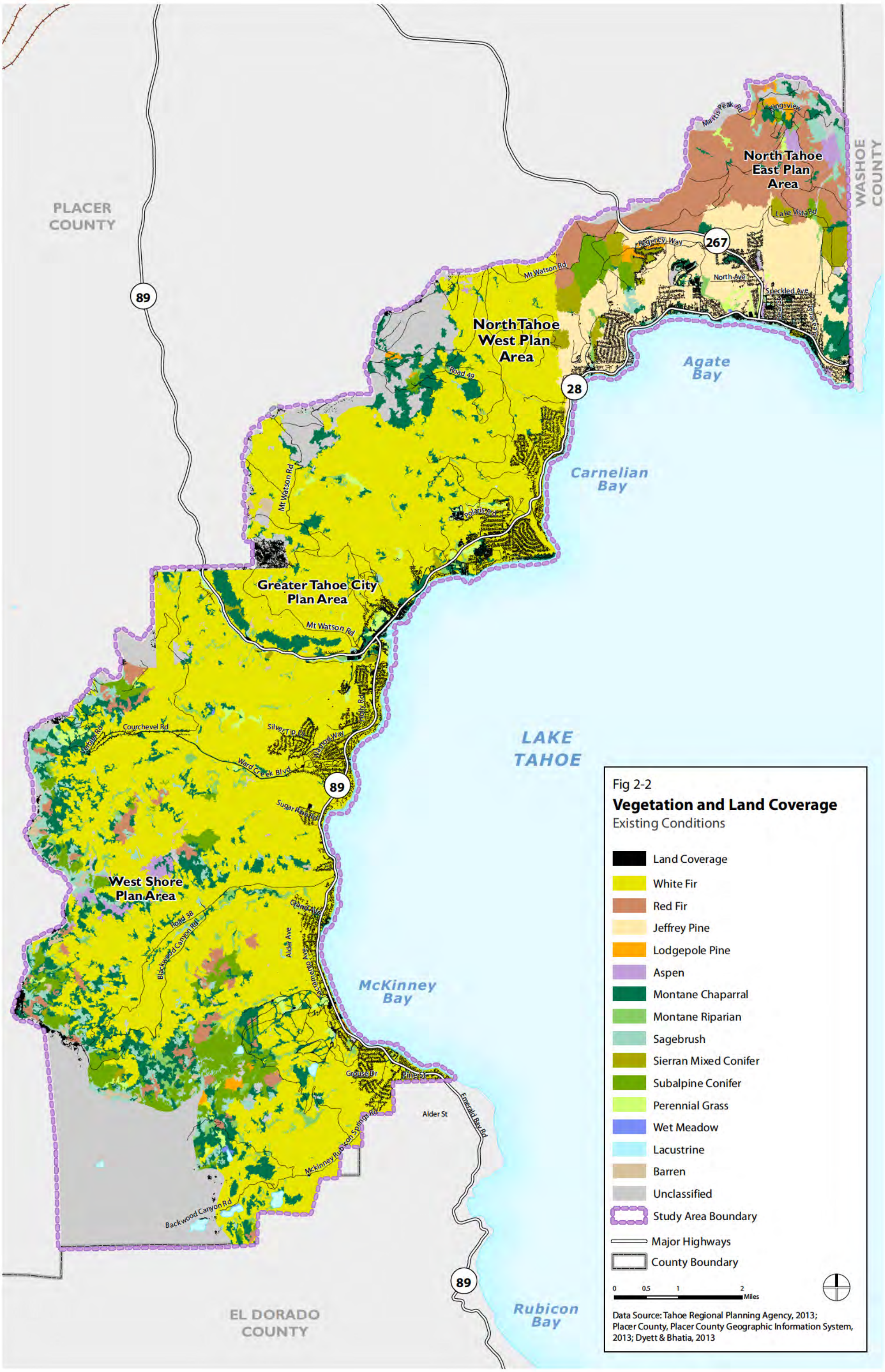

Fig 2-2

Vegetation and Land Coverage

Existing Conditions

- Land Coverage
- White Fir
- Red Fir
- Jeffrey Pine
- Lodgepole Pine
- Aspen
- Montane Chaparral
- Montane Riparian
- Sagebrush
- Sierran Mixed Conifer
- Subalpine Conifer
- Perennial Grass
- Wet Meadow
- Lacustrine
- Barren
- Unclassified
- Study Area Boundary
- Major Highways
- County Boundary

Data Source: Tahoe Regional Planning Agency, 2013; Placer County, Placer County Geographic Information System, 2013; Dyett & Bhatia, 2013

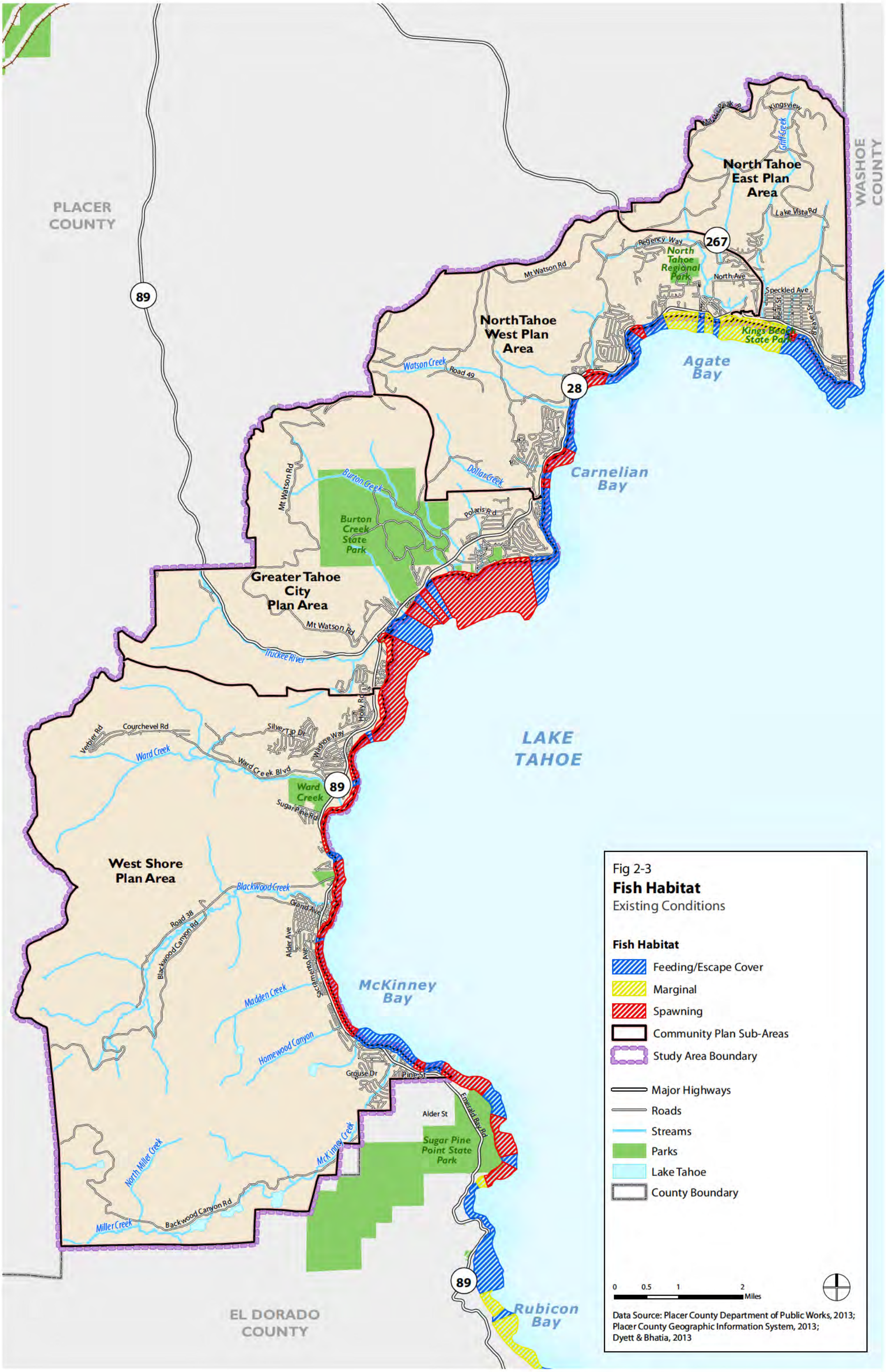

Fig 2-3
Fish Habitat
Existing Conditions

Fish Habitat
- Feeding/Escape Cover
- Marginal
- Spawning
- Community Plan Sub-Areas
- Study Area Boundary
- Major Highways
- Roads
- Streams
- Parks
- Lake Tahoe
- County Boundary

Data Source: Placer County Department of Public Works, 2013; Placer County Geographic Information System, 2013; Dyett & Bhatia, 2013

2.3 Hydrology, Water Quality and Flooding

This section discusses surface water hydrology, water quality and flooding in and around the Plan Area. For further discussion of drinking water and water supply in the Plan Area see Section 4.1, Utilities.

ENVIRONMENTAL SETTING

Climate

The climate is marked by cold winters and cool summers. Most of the Region's precipitation falls as snow from November to April, although a significant portion also falls as rain during summer thunderstorms. Mean annual precipitation ranges from over 55 inches for watersheds on the west side of the Basin to about 26 inches on the east side of the Basin. The peak in stream runoff caused by snowmelt in higher elevations typically occurs in May or June. August is typically the warmest month, with an average temperature of 78.7 degrees Fahrenheit. In the winter months, the temperature drops considerably, and January is usually the coldest month of the year, with temperatures ranging from a low of 15.1 degrees Fahrenheit to a maximum high of 41.0 degrees Fahrenheit.

Global Climate Change

An overall warmer climate will have serious implications for environmental quality in the Lake Tahoe Basin. The most pressing issue is the fact that the amount of precipitation is not expected to change, but the amount that falls as snow is expected to decrease. A recent study conducted by the Shibanti Group, a company specializing in assessing climatic variability, predicts that air temperature is expected to increase steadily in the 21st century, and they anticipate a more than 50 percent reduction in the Sierra Nevada snowpack's April 1 stormwater equivalent (SWE) by the early 2020s. This reduction in April 1 SWE is expected to decrease to 76 percent by 2050. Snowpack will therefore cover less terrain and the timing of peak Sierra Nevada runoff will be earlier and of shorter duration.

Surface Water Resources

The Plan Area lies within two watersheds—the Truckee River Watershed and the Lake Tahoe Watershed. The Lake Tahoe Watershed is made of a network of tributaries and streams surrounding the Lake Tahoe Basin that eventually flow into Lake Tahoe. Only one point of exit—the Truckee River—allows water to leave the Lake Tahoe Watershed and ultimately flow to its terminus at Pyramid Lake in western Nevada.

Lake Tahoe

The Lake Tahoe Basin was formed by the rise and fall of the landscape due to geologic faulting and volcanic activity. Geologic faults running in the north-south direction allowed the formation of a valley between the uplifting of the Carson Range and the Sierra Nevada. Lava flowing from Mount Pluto on the north shore blocked and dammed the Basin's ancestral outlet, forming the 506 square mile basin. Glaciers during the Ice Age left behind bays, jagged peaks, glacial polished ridges, and crystal clear lakes. Precipitation and runoff contributed to

the filling of Lake Tahoe, which has a surface water area that covers approximately two-fifths of the total basin area. The lake is 12 miles wide and 22 miles long and is 1,645 feet deep.

Upper Truckee River

The Upper Truckee River is Lake Tahoe's largest tributary, accounting for 25 percent of the annual inflow into Lake Tahoe. The Upper Truckee River is 23 miles long and originates in the mountains south of Lake Tahoe, flowing into Lake Tahoe at its southern end near South Lake Tahoe. The Upper Truckee River watershed is almost entirely within El Dorado County and is the largest within the Tahoe Basin.

Truckee River

The Truckee River flows 121 miles northeast to Pyramid Lake and is Lake Tahoe's only outlet. A dam constructed in Tahoe City in the early 1900s regulates water flow to the Truckee River maintaining a maximum legal lake level of 6,229 feet. The Truckee River Watershed encompasses Martis Valley and the surrounding mountains that feed the Truckee River between Lake Tahoe and Floriston, California. Primary water bodies within the Truckee River Watershed include the Truckee River, Prosser Creek, Martis Creek, Donner Lake, Donner Creek, Prosser Creek Reservoir, Boca Reservoir, and Martis Creek Reservoir.

Other Tributaries

The Tahoe Basin contains 63 streams that flow into Lake Tahoe. Griff Creek, Snow Creek, McKinney Creek, Homewood Creek, Madden Creek, Blackwood Creek, and Ward Creek are some of the streams that are located in the Plan Area. Total tributary inflow to Lake Tahoe in an average water year (October 1 to September 30) is approximately 430 million cubic meters.[11]

Ground Water Resources

The US Army Corps of Engineers (USACE) delineates five aquifer areas surrounding Lake Tahoe including the Tahoe City/West Shore Aquifer and Tahoe Vista/Kings Beach Aquifer. The Tahoe City/West Shore Aquifer extends from Dollar Point on the north to Rubicon Bay on the south. The estimated depth of the basin is about 590 feet. The Tahoe Vista/Kings Beach Aquifer extends from Dollar Point on the west to Stateline Point on the east.

Snowmelt is the primary source of recharge to the groundwater basin. Other sources of groundwater recharge include stream-flow seepage and groundwater inflow from the surrounding bedrock.

[11] An Integrated Plan for the Tahoe Basin: Conceptual Framework and Research Strategies. USDA (2009).

Water Quality

Surface Water

Several external and internal factors are known to affect water quality of the Basin's aquatic system including precipitation, air quality, atmospheric deposition, land use intensity, impervious cover, urban stormwater runoff, and soil disturbance.

Until recently, Lake Tahoe's clarity was being lost at a rate of one foot per year. Federal, state, and local governments have been concerned with water quality in Lake Tahoe for several decades. As a result of this growing concern for lake clarity and water quality, in 1997 Executive Order 13057 was signed by President Clinton, directing federal agencies and departments to improve, among other environmental components, water quality.

According to the US Environmental Protection Agency (EPA), Lake Tahoe can be differentiated into two zones: deep-water (pelagic) and near-shore (littoral). Monitoring data indicate a decline in the water quality of both zones. Since 1968, deep-water clarity has been reduced by approximately 30 percent, from 100 to 66 feet. Similarly, the near-shore environment has experienced degraded conditions due to proliferation of algae and other aquatic invasive plants and animals, particularly in urbanized areas.

The ongoing decline in Lake Tahoe's water clarity is a result of fine sediment particles, nutrients and phytoplankton (algae). Fine sediment particles are the most dominant pollutant contributing to the impairment of the lake's deep water transparency, accounting for roughly two-thirds of the lake's impairment. Inorganic fine sediment particles less than 16 micrometers (about 1/3 the diameter of a human hair) are the main pollutant of concern that is degrading deep-water clarity. However, nutrients also play an important role, particularly with respect to the near-shore condition.

Status of Water Quality Threshold Standards

Three standards are monitored to document long-term status and trends of Lake Tahoe's pelagic waters: (1) phytoplankton primary productivity, (2) winter (December to March) average lake transparency, and (3) annual average lake transparency. According to the 2011 Threshold Evaluation, trends between the three indicators varied between "moderate improvement" for winter average lake transparency to "rapid decline" for phytoplankton primary productivity. The average annual lake transparency also experienced a "moderate decline."

Indicators associated with two standards are monitored to document the long-term status and trend of Tahoe Basin tributary waters: (1) attainment of applicable state water quality standards, and (2) total annual loads of nutrients (nitrogen and phosphorus) and suspended sediment. Overall, the status for tributary water quality was "considerably worse than the target" with an overall trend of "little or no change."

Groundwater

According to the 2010 TCPUD Urban Water Management Plan, the quality of groundwater within the district is very good and within quality standards and regulations established by the EPA. Water quality data for the various private water companies was not available, however numerous private water companies have experienced difficulty in maintaining water quality standards. Most recently, TCPUD acquired the Lake Forest Water Company through eminent domain proceedings. Since 2002, the Lake Forest Water Company had purchased drinking water from TCPUD when it could no longer meet state and federal water quality standards. In the future, the various private water companies located throughout the Plan Area may have difficulty in adapting to new water quality standards, at which time they could potentially be purchased by one of the two public utility districts located in the Plan Area.

Lake Tahoe Water Quality Management Program

Total Maximum Daily Load (TMDL)

Three pollutants—fine sediment particles (FSP), phosphorus and nitrogen—are responsible for Lake Tahoe's deep water transparency loss. Stormwater runoff from urbanized uses was identified as the largest source of FSP and phosphorous.[12] Loss of Lake Tahoe's clarity and deep water transparency resulted in its listing as a 303(d) impaired water body. Impaired waters listed on the EPA National Summary of Impaired Waters are required to establish TMDLs, or Total Maximum Daily Loads. TMDL is a calculation of the maximum amount of a pollutant that a waterbody can receive and still safely meet water quality standards.

California adopted TMDL for Lake Tahoe in November 2010, which the EPA approved in August 2011. The TMDL guides restoration efforts for a number of sources and pollutants responsible for the decline in water clarity. The TMDL plan calls for state departments of transportation, local municipalities, land and stream resource agencies, and air quality regulators to implement water quality restoration projects and reduce loads from identified pollutants.

The Lahontan Regional Water Quality Control Board (LRWQCB) and the Nevada Division of Environmental Protection (NDEP) are the two state and regulatory agencies that oversee implementation of the TMDL. The goal of these efforts is to meet a transparency water quality objective of 97.4 feet annual average Secchi depth, and aims to meet the interim Clarity Challenge to achieve 80 feet of clarity within 20 years. Deep water transparency and Secchi depth refer to how scientists measure lake water clarity. Water clarity depth is determined based on the lowering of a round disk into the water until it is no longer visible. At the point it is no longer visible, the length of the rope/cable used to lower the disk is the transparency recorded.

[12] Lake Tahoe TMDL Technical Report. Lahontan regional Water Quality Control Board and Nevada Division of Environmental Protection (2009).

Lake Tahoe Pollutant Reduction Plan

LRWQCB incorporated TMDL pollutant load reduction requirements into the updated Lake Tahoe Municipal National Pollutant Discharge Elimination System (NPDES) permit. The municipal separate storm sewer system (MS4) regulates stormwater discharges from Placer County. As a requirement of the MS4 permit, LRWQCB requires Placer County to prepare a Pollutant Load Reduction Plan detailing the County's approach for meeting pollutant load reduction requirements promulgated by the TMDL.

Load reduction targets for FSP, phosphorous and nitrogen have been established based on attainment of California's Lake Tahoe transparency standard—roughly a clarity depth of 97 feet—over an estimated 65-year implementation period. The MS4 permit requires a 10 percent reduction in FSP, 7 percent reduction in phosphorous and 8 percent reduction in nitrogen by September 30, 2016. Table 2.3-1 identifies the pollutant load reduction requirements for Placer County.

Table 2.3-1: 2016 Pollutant Load Reduction Requirements

Parameter	*Base Load (kg/year)*	*Required Percent Reduction*	*Required Load Reduction (kg/year)*	*Allowable Load (kg/year)*
Fine Sediment Particles (mass)	234,053	10%	23,405	210,648
Phosphorus	1,111	7%	78	1,033
Nitrogen	4,635	8%	371	4,264

Source: County of Placer Lake Tahoe Pollutant Reduction Plan, March 2013.

Placer County intends to meet the TDML requirements during this five-year permit term through the registration of Water Quality Improvement Program (WQIP) catchments, implementation of pollutant control management measures in road maintenance operations, and private parcel Best Management Practices (BMP) clarity credits for larger commercial or mixed-use developments, or redevelopment projects.

Water Quality Improvement Projects

Since the Lake Tahoe TMDL 2004 baseline period, Placer County has completed fifteen WQIP projects. Table 2.3-2 below identifies WQIP projects, year completed and estimated catchment credits and Figure 2-4 maps their location.

Table 2.3-2: Completed WQIP Projects

Water Quality Improvement Project	*Year Completed*	*Load Reduction Estimate (FSP)*	*Lake Clarity Credit*
Dollar Point	2008	3,241	16.2
Lake Forest Meadow	2009-2010	2,184	11.0
Timberland	2004	551	3.0
Upper Cutthroat	2005	398	2.0
Lake Tahoe Park	2004	804	4.0
Tahoe Pines - Area A	2007	1,195	6.0
Tahoe Pines - Area B	2009	43	0.3
Tahoe Pines - Area C	2011	1,704	9.0
Tahoe Estates	2009	3,112	16.0
West Sunnyside Phase I	2008	1,305	7.0
Fox Clean Water Pipe	2010	400	2.0
Tahoe City Residential	2011	969	5.0
Brockway	2012	2,022	10.0
Homewood Phase I & IA	2012	3,800	19.0
Beaver Street Retrofit	2007	928	5.0
Lake Forest Highlands	2012	1,000	5.0
Total		**23,656**	**120.5**

Note: One lake clarity credit = 200.42 pounds of FSP.

Source: County of Placer Lake Tahoe Pollutant Reduction Plan, March 2013.

Placer County also anticipates completion of six additional WQIP projects by September 2016. The proposed WQIP projects are listed in Table 2.3-3.

Table 2.3-3: Proposed WQIP Projects

Water Quality Improvement Project	*Year Completed*	*Load Reduction Estimate (FSP)*	*Lake Clarity Credit*
Lake Forest Panorama	2014-2015	6,040	30.1
West Sunnyside Phase II	2015	1,414	7.1
Snow Creek Restoration	2013	1,800	9.0
Kings Beach CCIP	2013-2016	10,508	52.4
Griff Creek	2014	900	4.5
Kings Beach WIP	2014-2016	3,000	15.0
		23,662	118.1

Note: One lake clarity credit = 200.42 pounds of FSP.

1. Kings Beach WIP includes two subwatershed projects within the Kings Beach Planning Area.

Source: County of Placer Lake Tahoe Pollutant Reduction Plan, March 2013.

Best Management Practices

The Best Management Practices (BMP) Stormwater Management Program, also known as EIP project #16, is one of the largest EIP programs both in scope and cost. Stormwater pollution affecting Lake Tahoe is directly correlated with the extent of urban development within the Tahoe Region.[13] Stormwater BMPs are control measures taken to mitigate the quantity and quality of runoff caused by increased impervious surfaces from urban development. In general, BMPs are designed to reduce stormwater volume, peak flows, and/or nonpoint source pollution through evapotranspiration, infiltration, detention, and filtration.[14]

In 1992, TRPA codified the BMP retrofit program, which requires that all property owners in the Tahoe Region install erosion control and stormwater infiltration measures on developed parcels. BMPs must be designed to stabilize soil and infiltrate the volume of a 20-year, 1-hour storm onsite. As of December 2011, 14,714 of 43,470 parcels in the Tahoe Region had received a BMP certificate, a compliance rate of 34 percent.

TRPA provided data on parcels that have received BMP certificates since 1992 within the Plan Area. As shown in Table 2.3-4 below, BMP compliance for all developed parcels in the Plan Area is 29 percent, which is slightly lower than BMP compliance overall within the Region. Approximately 31 percent of single-family parcels, 39 percent of multi-family parcels and 20 percent of commercial parcels have received BMP certificates. Figure 2-4 maps the location of developed parcels with BMP certificates.

Table 2.3-4: BMP Compliance in the Plan Area

Land Use	*Total Estimated Parcels*	*BMP Certificates*	*BMP Compliance*
Single Family Residential	9,983	3,078	31%
Multifamily Residential	635	247	39%
Commercial	266	52	20%
Tourist Accommodations	73	14	19%
Industrial	217	10	5%
Public Services	129	29	22%
Recreation	439	20	5%
Total Parcels[1]	**11,742**	**3,450**	**29%**

1. Does not include conservation/backcountry or vacant parcels.

Source: TRPA, 2013.

[13] Appendix IE-3, Stormwater Management/BMP Retrofit Program Overview. TRPA (2012).

[14] Municipal Stormwater Management. Thomas Debo (2003).