

FINAL DRAFT

Tahoe-Sierra Integrated Regional Water Management Plan Update

September 2019

KJ 1870012



**SOUTH TAHOE
Public Utility District**

Photo courtesy of Matthew Grimm

Prepared By

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Tahoe-Sierra
Integrated Regional Water
Management Plan
Update**

September 2019

Prepared for

South Tahoe Public Utility District
1275 Meadow Crest Drive
South Lake Tahoe, California 96150-7401

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of the Tahoe-Sierra Region for their time, guidance, and
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of this truly integrated plan.

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Executive Summary

This Integrated Regional Water Management Plan (IRWM Plan) defines a clear vision for the management of water and associated resources in the Tahoe-Sierra Region (Tahoe-Sierra Region, Region) and highlights important actions needed to accomplish that vision through the year 2035 planning horizon.

This IRWM Plan Update complies with the 2016 *Integrated Regional Water Management Grant Program Guidelines applicable to Proposition 1 IRWM grant funding* published by the California Department of Water Resources (DWR) in July 2016. The information contained within this IRWM Plan was developed through the time and contributions of more than 30 water supply, wastewater treatment, land use management, public interest, and ecosystem-focused organizations with interests in the water resources of the Tahoe-Sierra Region.



Lake Tahoe from the Air
(Photo courtesy of Great Bicycle Rides in El Dorado County)

Introduction (Section 1)

The intent of this IRWM Plan update is to address the many major water-related needs/challenges and conflicts within the Region, including water quality, local water supply reliability, groundwater management, ecosystem restoration and integrated watershed management throughout the Region. The Memorandum of Understanding (MOU) discussed in Section 1.2.2 identifies topics related to collaboration to achieve ecosystem restoration, water supply and water quality improvements, and integrated activities for increased environmental education and stewardship. These MOU topics have resulted in the following Goals, which are organizing principles for the IRWM Plan objectives, described below:

- Protect and Improve Water Quality
- Protect the Community Water Supply and Treatment/Delivery System
- Manage Groundwater Sustainable Yield
- Contribute to Ecosystem Restoration
- Implement Integrated Watershed Management throughout the Region

The Tahoe-Sierra Region is generally based on watershed boundaries within the State of California for the Little Truckee River, Truckee River, Carson River and Lake Tahoe watersheds, all of which drain to Nevada. The Region encompasses approximately 802,600 acres, and includes the eastern parts of Alpine, El Dorado, Placer, and Nevada Counties, and the southeastern corner of Sierra County.

The Tahoe-Sierra IRWM Plan governance is comprised of several elements, the broader Partnership who are the heart of the Tahoe-Sierra IRWM, the Regional Water Management Group, which is a smaller group to meet the requirements of the DWR IRWM Program, and subcommittees which are formed on an as-needed basis. The Partnership consists of

signatories to a MOU that commits members to adopt and implement the Plan, and to revise and update it as needed. Partnership members are listed in Table 1-1.

The IRWM Plan development process was organized around regular subcommittee meetings/conference calls and partnership meetings at key IRWM plan junctures. The topics and plan sections were introduced and discussed during the subcommittee meetings prior to release to the Partnership. Stakeholders were provided the opportunity to review the content and sections prior to the meetings and submit written comments after the meetings. Key topics discussed during Plan development are outlined in Figure ES-1.

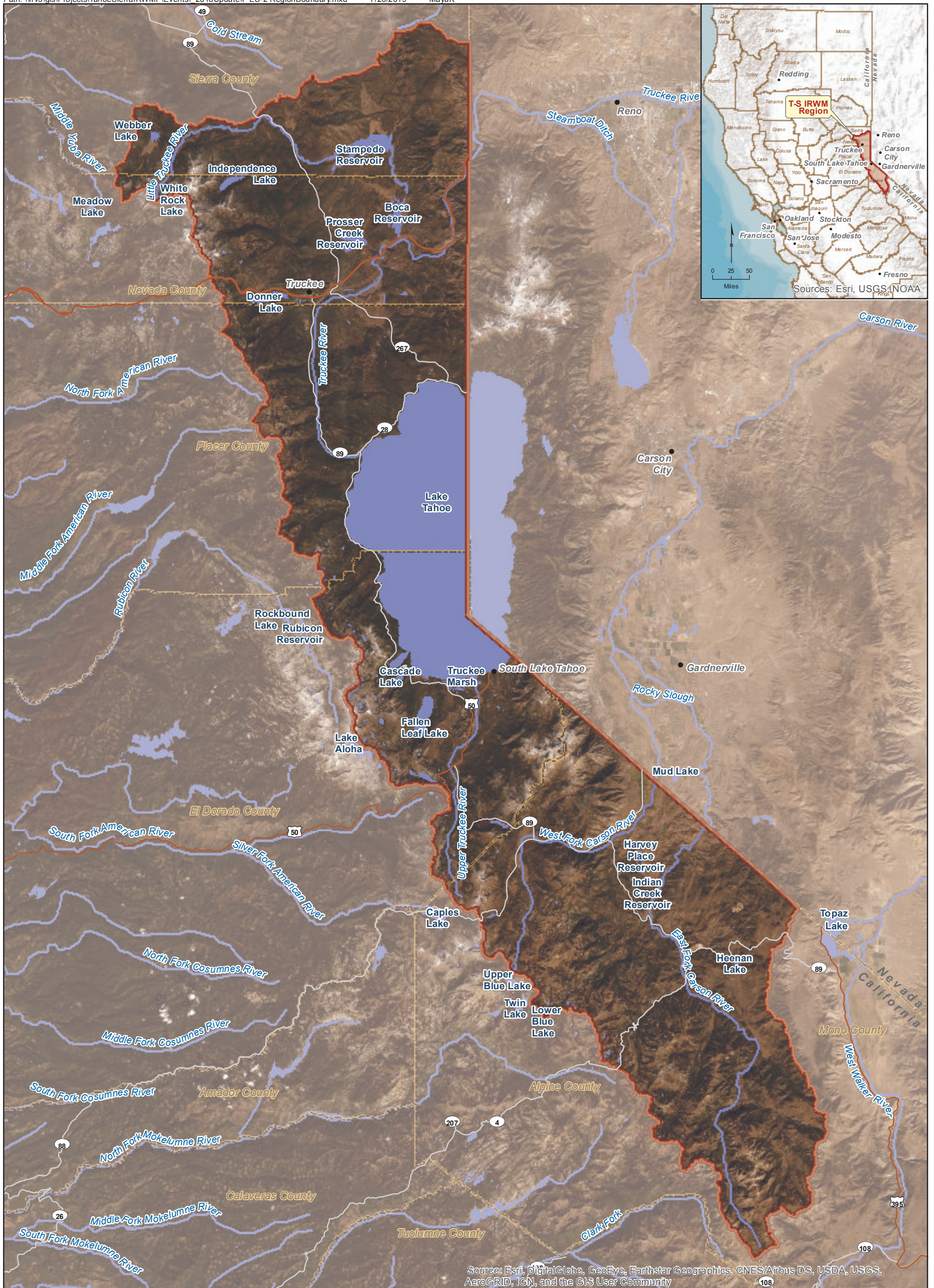


Figure ES-1: IRWM Planning Process Overview

To recognize the diverse Regional and local interests, the planning process incorporated community outreach focused on a wide variety of stakeholders including a focused disadvantaged community (DAC) outreach survey and communication with tribal representatives. The planning process centered around Partnership meetings, which were open to the public. Stakeholders were invited to participate through facilitated discussions and review of draft documents; the meetings were announced to a broad distribution list via e-mailed invitations, as described above. All meeting materials were made available on the website after each meeting.

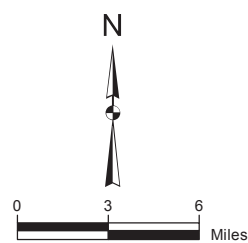
The Tahoe-Sierra Region (Section 2)

Section 2 describes the physical and environmental characteristics of the Region, describes social and demographic characteristics of the Region, and provides an overview of the Region’s water system. The Region is a mountainous area on the east slope of the Sierra Nevada mountain range that ranges from about 5,000 feet to almost 11,000 feet in elevation. It consists of the Truckee River system in California, which includes the Upper Truckee River, the California portion of Lake Tahoe, streams draining to Lake Tahoe within California, the Little Truckee River, and the Truckee River in California; and the East and West Forks of the Upper Carson River in California. Surface water flows in both river systems drain into Nevada, and Lake Tahoe straddles the border between California and Nevada, as shown on Figure ES-2.



Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

- Legend**
- Tahoe-Sierra IRWM Boundary
 - California Counties



Kennedy/Jenks Consultants
Tahoe-Sierra IRWMP

Regional Location

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Figure ES-2

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The majority of the population within the Region lives in the City of South Lake Tahoe, the Town of Truckee, and unincorporated communities on the west and north shore of Lake Tahoe. A number of the Region's communities have been identified as DACs which have median household incomes less than 80% of the statewide median household income (MHI) per DWR criteria. Also within the Region is the Washoe Tribe of Nevada and California's Woodfords Community. The majority of the Region, approximately 80%, is open space including both public and private lands (DWR 2010). Within the Region, approximately 68% of the land area is publicly managed for recreation and/or forest, 10% is the California portion of the surface of Lake Tahoe, and 6% is urban, rural, or planned development. Approximately 1% of the land area of the Region is dedicated to agriculture with the remaining 15% as other open space (BLM 2011). Communities in the Region are economically dependent on tourism and recreation related to the natural resources of the area including mountain terrain, forests, rivers, and lakes. As an east slope area, water users downstream of the Region are in Nevada.

Water supply in the Region includes both surface water and groundwater. Groundwater is the primary source of water for most communities in the Lake Tahoe Basin, Martis Valley, and individual property owners outside of the Region's developed areas. Within the Region there are five major public water districts, over twenty smaller community water suppliers, and over 100 non-community water suppliers, as well as individual property owners with groundwater wells. There are four dams within the Truckee River and Little Truckee River hydrologic units (HUs); the Lake Tahoe Dam, the Prosser Creek Dam, the Stampede Dam, and the Boca Dam. In addition in Alpine County there are two man-made reservoirs: Indian Creek Reservoir and Harvey Place Reservoir.

Water quality is one of the more significant drivers for bringing the various partners together to participate in IRWM Planning in the Tahoe-Sierra Region. Surface water sources in the Region are generally acceptable for municipal use after disinfection. However, several bodies of water are 303(d) listed impaired waterbodies for pathogens, salinity (total dissolved solids and chloride), sedimentation, nutrients (nitrate, nitrogen, phosphorus), metals (aluminum, iron, manganese, silver), sulfates, and other organics. Total Maximum Daily Loads (TMDLs) have been developed for some of the listed waterbodies, including Lake Tahoe, the Truckee River, and Indian Creek Reservoir. Groundwater in the Region is generally of good quality, suitable for municipal water use. Threats to groundwater quality in the Region are both natural and anthropogenic. Naturally occurring uranium, radon, arsenic, iron and manganese affect some wells within the Region, while leaking underground storage tanks and other cleanup sites pose a threat to groundwater in urban areas.

Lake Tahoe is classified by limnologists as an oligotrophic lake, which means the lake has very low concentrations of nutrients that can support algal growth, leading to clear water and high levels of dissolved oxygen. The exceptional transparency of Lake Tahoe results from naturally low inputs of nutrients and sediment from the surrounding watershed. Lake Tahoe's famed transparency has declined by roughly 27 feet from 102.4 feet of visible depth to 75.3 feet, since monitoring began in the 1960s (TERC 2013b). Notwithstanding the decline in clarity, Lake Tahoe is designated an Outstanding National Resource Water by the U.S. Environmental Protection Agency.

Terrestrial vegetation in the Region is dominated by coniferous forest, and the many creeks, rivers, lakes, and wetlands in the Region support many different aquatic ecosystems. Releases from Prosser Creek, Boca, and Stampede dams support fisheries in the Truckee River and Pyramid Lake. The Region is in the historic ranges for the Lahontan cutthroat trout and the Paiute cutthroat trout, both of which are federally listed as threatened species.

There are many major issues and challenges for the Region with respect to water resource management including the following:

- **Climate Change** – Climate change has the potential to have significant impacts on the Region. As an alpine environment, the Region is highly vulnerable to the effects of climate change, especially because of the potential for higher elevation rain/snow line, decreased snow pack, the potential for increased wildfires, and the potential effects on habitats of increasing temperatures. The Region is economically and ecologically dependent on its snow pack.
- **Water Quality** – Water quality is a major concern throughout the Region. Many waterbodies in the Region are considered to be detrimentally impacted by pollutants including sediment, nutrients, and metals. For the protection of these waterbodies, quality of runoff is an issue in both urban and undeveloped areas. In urban areas stormwater transports sediment and other pollutants from impermeable surfaces into receiving waterbodies. In undeveloped areas the wetlands, meadows, and riparian areas that would naturally provide filtration and removal of sediment and nutrients are in some cases impaired and can no longer provide that filtration, and may instead contribute through erosion, to the sediment loading in downstream waterbodies. In addition to surface water quality concerns, groundwater in some areas is impacted with naturally-occurring chemicals like arsenic, or man-made contaminants such as MTBE or chlorinated organic chemicals.
- **Forest Management** – Because most of the land area in the Region consists of steep forested mountainsides, wildfires and the subsequent erosion by wind and water is a major concern. Fire risk is predicted to increase in the future as a result of climate change. Erosion following wildfires could become even more of a problem as wildfire risk is projected to increase.
- **Infrastructure Needs** – Aging and deteriorating infrastructure is a problem in the Region. The dams in the Region were all initially constructed between the 1910s and 1970s, although rehabilitation work has been done on several dams, as needed. Much of the existing water and wastewater infrastructure including treatment facilities and distribution or collection infrastructure was constructed in the 1960s and is nearing or long past the design lifespan. The small customer bases for utility districts in the Region contribute to financing issues, and the problem of financing improvement projects is exacerbated by the fact that there are many small private water providers in the Region that do not qualify for many grant programs.



Relation to Local Water and Land Use Planning (Section 3)

Section 3 describes how land use planning and decision making are coordinated with water management planning and implementation within the Region and highlights opportunities for improved communication and action in the future. Water resources and land use planning in the Region are inherently linked in that activities and processes that occur on the land directly affect the use and movement of water within the Region. These linkages between land use and the

impacts on the hydrologic cycle, and similarly between water management and the ability to support particular land uses, are important to consider when making land or water management decisions. DWR recognizes these linkages and requires that IRWM Plans describe the relationships and interactions between regional planning efforts fostered by the Regional Water Management Group and local water planning and local land use planning.

The Tahoe-Sierra IRWM Plan contains information from local planning efforts that have occurred throughout the Region and has drawn from numerous plans and studies related to water resources and land use management in the Region. The IRWM Plan is consistent with and supports locally-led planning and implementation of integrated water management. Additionally, through the IRWM process, land and water management organizations in the Region have taken steps towards better understanding and collaboration regarding regional water management issues.

Plan Objectives (Section 4)

The goals and objectives presented in Section 4 represent the foundational intent of this IRWM Plan to improve water resources management throughout the Region over the planning horizon of the next 20 years to 2035. The five goals from the 2007 IRWM Plan were maintained; however updating the existing objectives to ensure they were still meaningful and relevant for the Tahoe-Sierra Region required a collaborative and interactive process over a 5-month period. The draft objectives were circulated for review and comment to the stakeholders two times to allow for thorough consideration and refinement for what ultimately sets the direction of the IRWM Plan.

The overarching Plan goals are listed below. Plan objectives were established within each of these Plan goals, with measurable planning targets established for each Plan objective.

1. **Protect and improve water quality.** A number of water quality concerns for surface water and groundwater exist particularly as they relate to Water Quality Control Plan beneficial uses and the water quality impairments to some of the major water bodies such as Lake Tahoe that occur in the Region. The main concerns expressed during the meetings are with water quality and aging wastewater infrastructure that impact water quality in the region. This goal highlights the importance of improving the water quality of water bodies as appropriate to water uses and preserving water quality levels that are now within desirable levels.
2. **Protect the community water supply and treatment/delivery system.** Although water supply within the Region is adequate, local water/wastewater agencies recognize that aging and deteriorating infrastructure is a problem in the Region. This goal acknowledges the importance of sustainability through the implementation of infrastructure improvements as well as cost-effective conservation and efficiency improvements to avoid wasting water and other natural resources.
3. **Manage groundwater for sustainable yield.** Groundwater is the main source of municipal water in the Region. This goal emphasizes the importance of managing groundwater through effective water management strategies that provide multiple benefits.
4. **Contribute to ecosystem restoration.** Improvements to the watershed including the many creeks, rivers, lakes, wetlands and forests can result in long-term benefits to the native habitats and their ecosystems as well as improvements to water quality. This goal

highlights the importance of continuing to monitor, understand, and mitigate the hazards related to watershed management.

5. **Implement integrated watershed management throughout the Region.** This goal recognizes that with improved integration and collaboration more successful watershed management can be achieved when compared to individual efforts.

Resource Management Strategies (Section 5)

The Goals and Objectives presented in Section 4 describe a range of areas in which regional stakeholders intend to improve water-related conditions in the Region over the plan horizon. Achieving these objectives will require that resource managers and other stakeholders implement a variety of water management actions. Those actions could include projects, programs, or policies designed to help agencies and local governments manage water and related resources. A broad list of these actions, referred to as resource management strategies (RMS), were identified in the California Water Plan (CWP) 2013 and were considered for applicability to the Region. Table ES-1 provides a summary of the RMS described in Section 5, divided into six management outcomes.

Table ES-1: Resource Management Strategies

CWP Management Objective	Resource Management Strategies
Reduce Water Demand	Agricultural Water Use Efficiency Urban Water Use Efficiency
Improve Flood Management	Flood Management
Improve Operational Efficiency and Transfers	[<i>Conveyance – Delta</i>] Conveyance – Regional/Local System Reoperation Water Transfers
Increase Water Supply	Conjunctive Management & Groundwater [<i>Desalination (Brackish and Sea Water)</i>] Precipitation Enhancement Municipal Recycled Water [<i>Surface Storage – CALFED/State</i>] Surface Storage – Regional/Local
Improve Water Quality	Drinking Water Treatment and Distribution Groundwater Remediation/Aquifer Remediation Matching Water Quality to Use Pollution Prevention Salt and Salinity Management Urban Stormwater Runoff Management
Practice Resource Stewardship	Agricultural Land Stewardship Ecosystem Restoration Forest Management Land Use Planning and Management Recharge Area Protection Sediment Management Watershed Management
People and Water	Economic Incentives Outreach and Engagement Water and Culture Water-Dependent Recreation

CWP Management Objective	Resource Management Strategies
Other Strategies	Crop Idling for Water Transfers <i>[Dewvaporation or Atmospheric Pressure Desalination]</i> <i>[Fog Collection]</i> Irrigated Land Retirement Rainfed Agriculture Snow Fences <i>[Waterbag Transport/Storage Technology]</i>

[] RMS not applicable to Tahoe-Sierra IRWM Plan

Project Selection and Prioritization (Section 6)

Section 6 describes the project solicitation, development, and review process that was used to select and prioritize projects for inclusion in the Tahoe-Sierra IRWM Plan. The project solicitation process began with a Sub-committee review of previous IRWM Plan project submittals and evaluation followed by a discussion of how potential project submittals would be evaluated and considered for inclusion into the IRWM Plan Update. A draft list of project scoring criteria was discussed and made available for comment to the Partnership at the time the draft Project Information Form was distributed. The potential project scoring criteria were chosen to facilitate project comparison, review, selection, and prioritization. The next step of the process was to receive, evaluate, and score all project submittals, after which a list of projects with recommended scoring for each project was included. The final step of the process was to discuss the recommendations made with project proponents and stakeholders at a Partnership Meeting to formally accept the projects into the Plan.

During the 2018 call for projects, a total of 101 projects were submitted from 19 organizations, with 41 projects categorized as restoration projects, 50 as stormwater/flood control projects, and 25 as water supply/wastewater projects. All of the Plan objectives are addressed at least in part, and almost all RMS are also included. Of these projects, 35 involve multiple agencies or organizations, and 43 are located at least in part in a DAC.

All of the projects submitted during the call for projects are included in the Tahoe-Sierra IRWM Plan, and are summarized in Table ES-2. It should be noted that this represents a “snapshot” for this particular edition of the IRWM Plan as the list is expected to change over time as projects are completed and new project concepts added.

Table ES-2: Project Summary

Project Number	Agency/Organization	Project Title	Type ^(a)
1	Alpine County	Markleeville Creek Floodplain Restoration Project	WRS
2	Town of Truckee	Coldstream Road Open Bottom Culvert and Creek Restoration	R
3	Town of Truckee	Trout Creek Restoration	R
4	Truckee River Watershed Council	Lacey Meadows Restoration	R
5	American Rivers	Priority Meadow Restoration in the Carson Watershed	R
6	El Dorado County	Country Club Stormwater Management and Erosion Control Project – Phase 3	RS
7	El Dorado County	Meyers SEZ and Erosion Control Project – Phase 2	RS
8	Tahoe RCD	AIS Prevention, Control, and Monitoring	R
9	Town of Truckee	Aquatic Invasive Species/Watercraft Inspection Program	R
10	Truckee River Watershed Council	River Revitalization Project	R
11	Alpine Watershed Group	Priority Restoration Project in the USFS West Carson Project Area	R
12	Alpine Watershed Group	West Carson River Restoration in Lower Hope Valley	R
13	Truckee River Watershed Council	Johnson Canyon Westside Restoration	R
14	Tahoe RCD	Upper Truckee River - Johnson Meadow Restoration	RS
15	Truckee River Watershed Council	Donner Creek Confluence Floodplain Restoration Project	R
16	Truckee River Watershed Council	Dry Creek Restoration Project	R
17	Truckee River Watershed Council	Lower Bear Meadow Restoration	R
18	Truckee River Watershed Council	Martis Wildlife Area Restoration	R
19	Tahoe RCD	Groundwater Discharge in Nearshore of Lake Tahoe	R
20	Truckee River Watershed Council	Non-Native Invasive Plant Species	R
21	El Dorado County	Country Club Stormwater Management and Erosion Control Project (Oflying Water Quality Project)	RS
22	Truckee River Watershed Council	Coldstream Canyon Watershed Restoration	R
23	Truckee River Watershed Council	Sardine Meadow Restoration	R
24	El Dorado County	South Upper Truckee Water Quality Project	RS
25	Town of Truckee	West River Street Revitalization	R
26	El Dorado County	Delaware Water Quality Project	RS
27	El Dorado County	Glenridge Water Quality Project	RS
28	El Dorado County	San Bernardino Water Quality Project	RS
29	American Rivers	Faith Valley and Forestdale Meadow Restoration	R
30	American Rivers	Priority Meadow Restoration in the Truckee Watershed	R
31	California Tahoe Conservancy	Tahoe Pines	R
32	California Tahoe Conservancy	Upper Truckee River and Marsh Restoration	R
33	Markleeville PUD	MPUD Sewer Line Relocation	WRS
34	Placer County	Kings Beach Western Approach	RS
35	Placer County DPW	Burton Creek Restoration Improvements	R
36	Placer County DPW	Coon Street SEZ Restoration Improvements	R
37	South Tahoe PUD	District Facilities BMPs (BMP Implementation on STPUD Operating Site SWR/WTR)	R

Project Number	Agency/Organization	Project Title	Type^(a)
38	South Tahoe PUD	Sewer Crossings Condition Assessment, Improvements	R
39	South Tahoe PUD	Iroquois Pond SEZ Restorations	R
40	Truckee Donner PUD	Martis Valley Groundwater Basin Planning and Restoration Study	WRS
41	University of California, Davis-Tahoe Environmental Research Center	LT Nearshore Modeling	R
42	City of South Lake Tahoe	City of South Lake Tahoe Landscape Irrigation Efficiency Upgrades	W
43	Lukins Brothers Water Company, Inc.	Meter Conversion	W
44	Lukins Brothers Water Company, Inc.	Waterline Replacement Project 7a	W
45	Lukins Brothers Water Company, Inc.	Well #4 replacement and treatment project	W
46	Markleeville Water Company	Markleeville Pipeline Replacement, Meter and Hydrant Installation	W
47	South Tahoe PUD	Regional Water Conservation Programs	W
48	South Tahoe PUD	Keller-Heavenly Zone Improvements	W
49	South Tahoe PUD	SCADA Upgrades	W
50	South Tahoe PUD	STPUD Waterline Replacement Projects	W
51	South Tahoe PUD	Upper Montgomery Booster, Zone Improvements	W
52	South Tahoe PUD	H-Street Zone Booster, Fire Pump Improvements	W
53	South Tahoe PUD	Wastewater Force Main Bypass Projects	W
54	Tahoe City PUD	Tahoe City Emergency Water Supply	W
55	Tahoe City PUD	Westshore Regional Water Storage Tanks	W
56	Tahoe City PUD	West Lake Tahoe Regional Water Treatment Plant	W
57	Truckee Donner PUD	Potable Groundwater Well Discharge	W
58	Truckee Donner PUD	Water Pipeline Replacement Project	W
59	Truckee River Watershed Council	Aquatic Invasive Species (AIS) Prevention-Middle Truckee River Watershed	W
60	Truckee River Watershed Council	Truckee River Operating Agreement – Instream flow enhancement	W
61	Washoe Tribe of Nevada and California – Washoe Environmental Protection Department (WEPD)	Woodfords Community Wastewater Infrastructure Upgrades	W
62	Washoe Tribe of Nevada and California – Washoe Environmental Protection Department (WEPD)	Woodfords Community Water Infrastructure Upgrades	W
63	Alpine County	Alpine County Woodfords Complex Stormwater Retrofit	S
64	Alpine Watershed Group	Grover Hot Springs State Park Meadow Restoration	S
65	Alpine Watershed Group	Hope Valley Restoration and Aquatic Habitat Enhancement Project	S
66	Alpine Watershed Group	Markleeville Creek Floodplain Restoration Project	S
67	City of South Lake Tahoe	Bijou Area Water Quality Improvement Project, Phases 2 (Upper Glenwood)	S
68	City of South Lake Tahoe	Bijou Park Creek Watershed and SEZ Restoration Project	S
69	City of South Lake Tahoe	Osgood Basin Expansion	S
70	City of South Lake Tahoe	Ruby Way Overlook Ct.	S
71	City of South Lake Tahoe	Sierra Boulevard Complete Streets Project	S
72	City of South Lake Tahoe	Tahoe Valley Greenbelt	S
73	City of South Lake Tahoe	Upper Keller Canyon Drainage and Erosion Control Project	S

Project Number	Agency/Organization	Project Title	Type ^(a)
74	El Dorado County	Chiapa Water Quality Project	S
75	El Dorado County	Cold Creek Fisheries Enhancement Project	S
76	El Dorado County	CSA #5 Erosion Control Project	S
77	El Dorado County	East San Bernardino Bike Trail	S
78	El Dorado County	El Dorado County Urban Upland TMDL Implementation	S
79	El Dorado County	Hwy 89 Class I Trail	S
80	El Dorado County	Meyers Corridor Operational Improvement Project	S
81	Placer County	Emigrant Trail Extension on Donner Summit	S
82	Placer County	Flick Point Erosion Control Project - Phase II	S
83	Placer County	Kings Beach Commercial Core Improvement Project	S
84	Placer County	Kings Beach Watershed Improvement Project	S
85	Placer County	Legacy Trail - Truckee River Trail	S
86	Placer County	Martis Valley Trail	S
87	Placer County	North Tahoe Regional Trail	S
88	Placer County	Placer County Urban Upland TMDL Implementation	S
89	Placer County	Streets & Roads Operations and Maintenance	S
90	Placer County	Tahoe City Complete Streets Highway Improvements	S
91	Placer County	Tahoe City Downtown Access Improvements	S
92	Placer County	Tahoe Vista Tamarack Erosion Control Project	S
93	Placer County	Tahoma Roads Water Quality Improvement Project	S
94	Placer County	Truckee River Recreational Access Plan	S
95	Tahoe Regional Planning Agency	BMP implementation, inspection and maintenance	S
96	Tahoe Resource Conservation District	Regional Landscape Conservation Measures for Lake Tahoe	S
97	Tahoe Resource Conservation District	Regional Stormwater Monitoring Program	S
98	Town of Truckee	Permenant BMP Implementation, Inspection, and Maintenance	S
99	Town of Truckee	Town of Truckee Stormwater Management and Retrofits	S
100	Town of Truckee	Truckee River Legacy Trail	S
101	Truckee River Watershed Council	donner - lower mobile home/rr culvert	S

(a) R = Restoration, SW = Stormwater/Flood Control, W = Water Supply/Wastewater

Impacts and Benefits (Section 7)

Section 7 provides an overview of the impacts and benefits likely to be realized with implementation of the Tahoe-Sierra Region IRWM Plan. This is a preliminary screening level assessment of potential impacts and benefits, due to the nature of the IRWM planning process, and it is not intended to be a complete list. More extensive and project-specific evaluations of impacts and benefits will occur through the project implementation process. This overview of potential impacts and benefits may be used as a benchmark for future evaluation throughout IRWM Plan implementation to understand if the potential benefits have been realized or if unanticipated impacts have occurred.

The primary benefit of this IRWM Plan is the development of a shared vision and objectives for regional water management and planning among the stakeholders in the Region and a

framework for maintaining that into the future. The process of developing and updating this IRWM Plan has fostered improved coordination, collaboration, and communication among stakeholders, and a greater awareness of concerns throughout the Region. Additional potential benefits from implementation of Plan projects may include improved water quality, improved water treatment and delivery, improved groundwater management, and ecosystem restoration.

Negative impacts that may be associated with the Tahoe-Sierra IRWM Plan projects include short-term, site-specific impacts related to site grading and construction, and long-term impacts associated with project operation. The significance of these impacts will be evaluated in greater detail under project-specific and/or programmatic environmental compliance processes (consistent with California Environmental Quality Act and, if applicable, the National Environmental Policy Act).

Implementation Framework (Section 8)

This section documents the relationships and decision-making structure recommended for use during the continued development and implementation of the Tahoe-Sierra IRWM Plan over the next 20 years. It also sets forward a proposed framework for Plan implementation and guidelines for performance monitoring to track progress, and it offers suggested initial Plan implementation activities. This section is intended to define the entity (or entities) that will implement the Plan, the responsibilities for Plan implementation and therefore serve as the cornerstone of actions the Region must take to continue the IRWM program into the future. The Tahoe-Sierra IRWM operates functionally using the concept of a Partnership. During the update of the Plan, the Regional Water Management Group was refined to be at least 3 entities two of which have statutory authority for water management, and which is included within the Partnership with no additional roles or responsibilities.

Once the Tahoe-Sierra IRWM Plan has been adopted, the focus of the Partnership, who are the signatories to the MOU, and stakeholders will change significantly. Some of the activities conducted during Plan development will continue, but the emphasis will shift from planning toward implementation and tracking of progress. Implementation of the Tahoe-Sierra IRWM Plan will rely on actions taken by existing agencies and organizations within the Region. In order to implement the Plan in an open and definitive way, each Region is required to develop a governance structure consistent with the Propositions 84 and 1E IRWM Guidelines. The proposed governance structure was developed to reflect the discussions of the Partnership and stakeholders to provide a means for the Region to maintain functionality, encourage open participation in the Plan, and help assure Plan longevity and stability.

One of the most important aspects of Plan implementation is processes to ensure that the public and interested stakeholders continue to be involved. This will be accomplished through multiple avenues of communication and engagement among the Partnership and IRWM participants. These will include, at minimum, enlisting the support of a core Leadership Team (LT), with rotating members, to conduct outreach, create content and facilitate annual Partnership meetings, and support any Subcommittees that may be formed on separate topics. The Leadership Team will issue periodic e-mails and will post meeting materials and other relevant information to the project website and invite review and comment from any interested person or organization. During the meetings, all Partnership members are invited to participate as equals in the interaction to reach consensus on the implementation of the Plan. Decisions during implementation will continue to be made using consensus based agreement, with matters first considered by the Leadership Team for consideration and then by the entire Partnership. If for some reason broad agreement cannot be reached related to specific items within a reasonable

amount of time and effort, the Partnership will discuss such items(s) and then decide by majority vote how to proceed.

Financing of this Tahoe-Sierra IRWM Plan involves two distinct tracks: funding of IRWM Plan administration through local in-kind staff time and coordination and funding of project implementation. The Tahoe-Sierra IRWM anticipates continuing as a volunteer-led organization using the Leadership Team as the focus for IRWM Plan implementation. Members of the Partnership may provide in-kind services to fulfill the roles of the LT and administrative support. The current project list includes 101 projects with a total estimated funding need of \$302 million. Of the sixty projects, several are projects currently at the early planning or feasibility study stage, which is an indicator that the overall funding needs will likely increase. The section identifies potential funding sources, and documents some of the activities that the Partnership and others may employ to secure additional project implementation funding.

Another important element of successful Plan implementation is a well-developed approach to performance and monitoring. This section describes such an approach, including monitoring, adjustments, and data sharing in order to meet the 2012 and 2016 IRWM Guidelines. The key elements of plan performance and monitoring involve tracking of project implementation and progress towards achieving objectives and the individual measurable planning targets (MPTs). This tracking will be monitored in a Data Management System (DMS) and will provide key information to inform the Partnership and stakeholders as to whether the Plan is being implemented as intended, or whether updates or other changes are needed to keep the Plan on track.

The tracking and monitoring of plan performance does not replace required regulatory reporting by specific agencies within the Region. Plan performance tracking is being done to monitor progress on Plan implementation and provide information that can be useful for continuing implementation of, updating or amending the Plan. Project implementation will be tracked as part of the IRWM Plan Implementation activities

In order to bring focus to specific implementation actions, and to support early and proactive progress, recommendations are provided in Table ES-3.

Table ES-3: IRWM Plan Near-Term Implementation Activities and Schedule

Activity/Action	Lead Entity	Planned Schedule
1. Convene Plan Implementation Meetings to develop proposed meeting schedules. It is suggested that at minimum one Plan implementation meeting be held per year.	LT/Partnership	Ongoing – annually
2. Continue to update the Data Management Application and budget for continued update and maintenance.	Partnership/Partner	Ongoing – as needed
3. Issue a Call for Projects to add, delete, or integrate new and existing projects and project status updates.	LT	Ongoing – as needed
4. Prepare for applying for Future DWR Implementation Grant funds and other grant funding opportunities.	Subcommittee	Ongoing – as needed
5. Coordinate with neighboring IRWM regions and local, state and federal agencies.	Partnership	Ongoing – annually

Coordination (Section 9)

As described in other sections of this IRWM Plan, management of water and related resources within the Tahoe-Sierra Region is complex and has many interdependencies. Many different agencies, organizations, and other stakeholders have authorities and responsibilities for managing water and related resources within the Region. This complexity and the distributed network of shared responsibilities create the need for robust and effective coordination. Section 9 describes how the Tahoe-Sierra Partnership plans to coordinate with neighboring IRWM regions, local, state, and federal agencies and other stakeholders within the Region to improve integrated water management throughout the Region and neighboring areas.

A collaborative approach to water management is essential to meeting the Region's goals. The majority of the projects included in this Plan involve multiple agencies or organizations, which reinforces the need for collaboration to achieve efficient project execution. Many of the local water management agencies within the Region have developed cooperative relationships and processes for coordination with each other and with other local organizations. Coordination with state and federal agencies has occurred during the initial formation of the Region and during Plan preparation. In the future, coordination with these agencies will occur on an as-needed basis for planning and implementation of specific projects and during future Plan updates.

One of the critical ingredients for improving water resources management is to provide multiple opportunities for water managers, community stakeholders, and other organizations with interests related to water resources to be informed about and participate in the IRWM program. The partnership will provide this through continued stakeholder meetings, dialogue with the Washoe Tribe and representatives of DACs, and use of the Tahoe-Sierra IRWM Plan webpage (<http://tahoesierrairwm.com/>) throughout Plan implementation.

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Section 1: Introduction

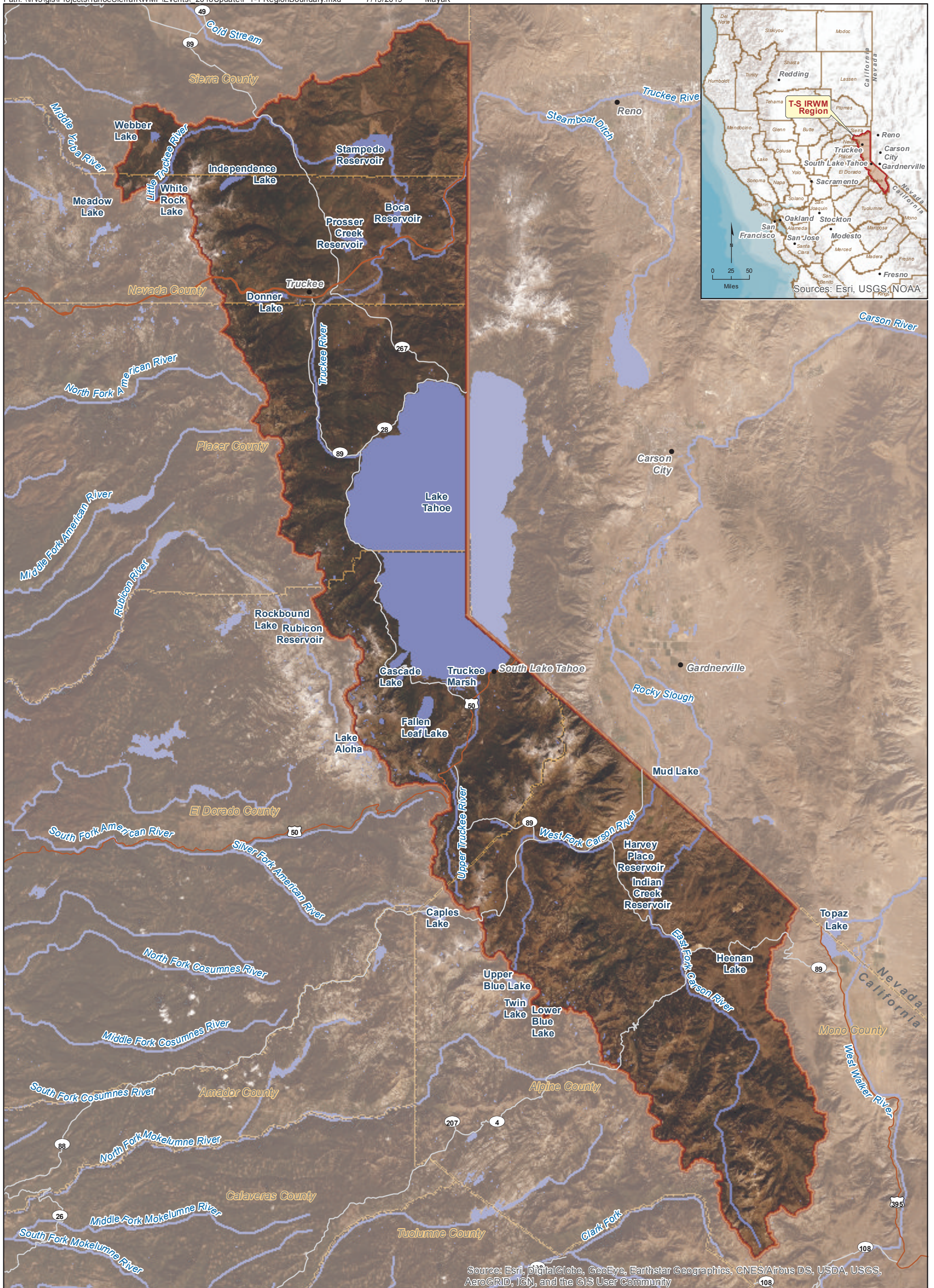
This Integrated Regional Water Management Plan (IRWM Plan) defines a clear vision for the management of water resources in the Tahoe-Sierra Region (Tahoe-Sierra Region, Region) and highlights important actions needed to accomplish that vision through the year 2040 planning horizon. This document is intended to be a useful planning tool. It does not, in itself, provide discretionary approval for any given project or establish any new prescriptive compliance requirements. Rather, it provides a framework for improved understanding and action to address the major water-related challenges/needs and conflicts facing the Region through the planning horizon.

This IRWM Plan Update complies with the *2016 Integrated Regional Water Management Grant Program Guidelines applicable to Proposition 1 IRWM grant funding* published by the California Department of Water Resources (DWR) in July 2016. The information contained within this IRWM Plan was developed through the time and contributions of more than 30 water supply, wastewater treatment, land use management, public interest, and ecosystem-focused organizations with interests in the water resources of the Tahoe-Sierra Region. The focus and direction described within this IRWM Plan provides an opportunity for these organizations to accomplish more to benefit the needs of the Region than they could otherwise accomplish individually. The integrated array of goals and objectives, selected resource management strategies, priority projects, and plan implementation framework demonstrate the successful collaborative working relationships fostered through the 18-month plan development process.

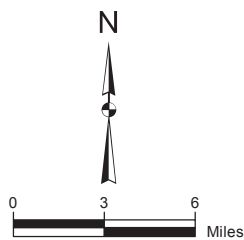
1.1 Background

The Region encompasses approximately 802,600 acres, and is defined by the Little Truckee River, Truckee River, Carson River, and Lake Tahoe (California) hydrologic units (HU) or watersheds in the eastern Sierra Nevada mountain range. It includes the eastern parts of Alpine, El Dorado, Placer, and Nevada Counties, and the southeastern corner of Sierra County as shown on Figure 1-1. The Region has a mountainous topography that ranges from about 5,000 feet to almost 11,000 feet in elevation of which about 2/3 is public lands. It extends from the crest of the Sierra Nevada Mountains east to the Nevada border, and from the border between Alpine and Mono Counties in the south to north of Stampede Reservoir in Sierra County. The majority of the population within the Region is clustered around Lake Tahoe and the Truckee River in the City of South Lake Tahoe, Town of Truckee, Tahoe City and other rural communities. The areas making up the Region share similar geographies and economies, and are hydrologically interconnected. In the northern two-thirds of the Region are the Truckee River and its tributaries in California, including the California portion of Lake Tahoe. In the southern third of the Region are the headwaters to the Carson River. The watersheds of the Tahoe-Sierra Region drain into Nevada where the Truckee River is connected to the Carson River by the Truckee Canal.

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- Legend**
- Tahoe-Sierra IRWM Boundary
 - California Counties



Kennedy/Jenks Consultants
Tahoe-Sierra IRWMP

Regional Location

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Figure 1-1

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1.1.1 Primary Focal Points of the IRWM Plan

The intent of this IRWM Plan update is to address the many major water-related needs/challenges and conflicts within the Region, including water quality, local water supply reliability, groundwater management, ecosystem restoration and integrated watershed management throughout the Region. The Memorandum of Understanding (MOU) discussed in Section 1.2.2 identifies topics related to collaboration to achieve ecosystem restoration, water supply and water quality improvements, and integrated activities for increased environmental education and stewardship. These MOU topics have resulted in the following Goals, which are organizing principles for the IRWM Plan objectives, described below, of:

- Protect and Improve Water Quality
- Protect the Community Water Supply and Treatment/Delivery System
- Manage Groundwater Sustainable Yield
- Contribute to Ecosystem Restoration
- Implement Integrated Watershed Management throughout the Region

The goals and related objectives are further described in detail in Section 4.

1.1.1.1 Protect and Improve Water Quality

The protection and improvement of water quality is essential to both human health and aquatic ecosystem function. Communities in the Region are economically dependent on tourism including snow and water sports, which is related directly or indirectly to the water resources of the Region, which are dominated by Lake Tahoe and its tributary and downstream rivers and creeks. Surface water sources in the Region are high quality and acceptable for municipal use after disinfection. However several bodies of water within the Region are 303(d) listed impaired waterbodies with issues such as pathogens, salinity (total dissolved solids and chloride), sedimentation, nutrients (nitrate, nitrogen, phosphorus), metals (aluminum, iron, manganese, silver), sulfates and other organics. Threats to groundwater quality in the Region are both natural and anthropogenic. Naturally occurring uranium, radon, arsenic, iron and manganese affect some wells within the Region. In urban areas volatile organic compounds and oxygenated ethers such as methyl tert-butyl ether (MTBE) from gasoline, and chlorinated hydrocarbons from dry cleaners or industrial solvent usage have impacted or may threaten groundwater supplies.

1.1.1.2 Protect the Community Water Supply and Treatment/Delivery Systems

The water management system within the Region includes a wide array of infrastructure, such as dams, canals, distribution systems, water and wastewater treatment systems, and groundwater wells and pumps, much of which was built in the 1960s and 1970s. As the infrastructure ages, the potential for disruptions in water supply and wastewater failures increase. Maintaining, modernizing, and improving this extensive infrastructure to continue to provide the expected level of service will require significant investment and effort over the next 20 years. In addition, some areas are facing unreliable groundwater supplies and are turning to surface water sources.

1.1.1.3 Manage Groundwater Sustainable Yield

As the main source of municipal water in the Region, groundwater is vital to the residents and businesses. To date, groundwater supplies have generally been sufficient although occasional

water quality challenges have occurred. However, few groundwater studies have been conducted within the Tahoe-Sierra Region, except for portions of the Martis Valley and Carson Valley basins in order to confirm long-term groundwater yields.

1.1.1.4 Contribute to Ecosystem Restoration

The Region provides hundreds of square miles of habitat for countless species, including a broad range of terrestrial and aquatic, state and federally recognized special-status and threatened or endangered species including the Lahontan cutthroat trout and the Paiute cutthroat trout. Improvement of aquatic and terrestrial habitat to promote the survival, restoration, and growth of these important species and many others is critical. In addition, a number of aquatic/riparian invasive plants and animal species either already occur or pose a significant threat to the Region. Aquatic invasive species occurring in the Region include Asian clam, curly leaf pondweed, and Eurasian watermilfoil. Several invasive plant species have been identified within the Region including Canada thistle, Russian knapweed, diffuse knapweed, sulfur cinquefoil, hoary cress, teasel, rush skeleton weed, and yellow star thistle.

1.1.1.5 Implement Integrated Watershed Management throughout the Region

Many individuals and organizations throughout the Region that are interested in water resource management are already engaged in efforts that support the work of water management entities. However, more can be done to develop and implement broader public education efforts to further improve stewardship of the Region's precious water resources.

1.1.2 Formation of the IRWM Region

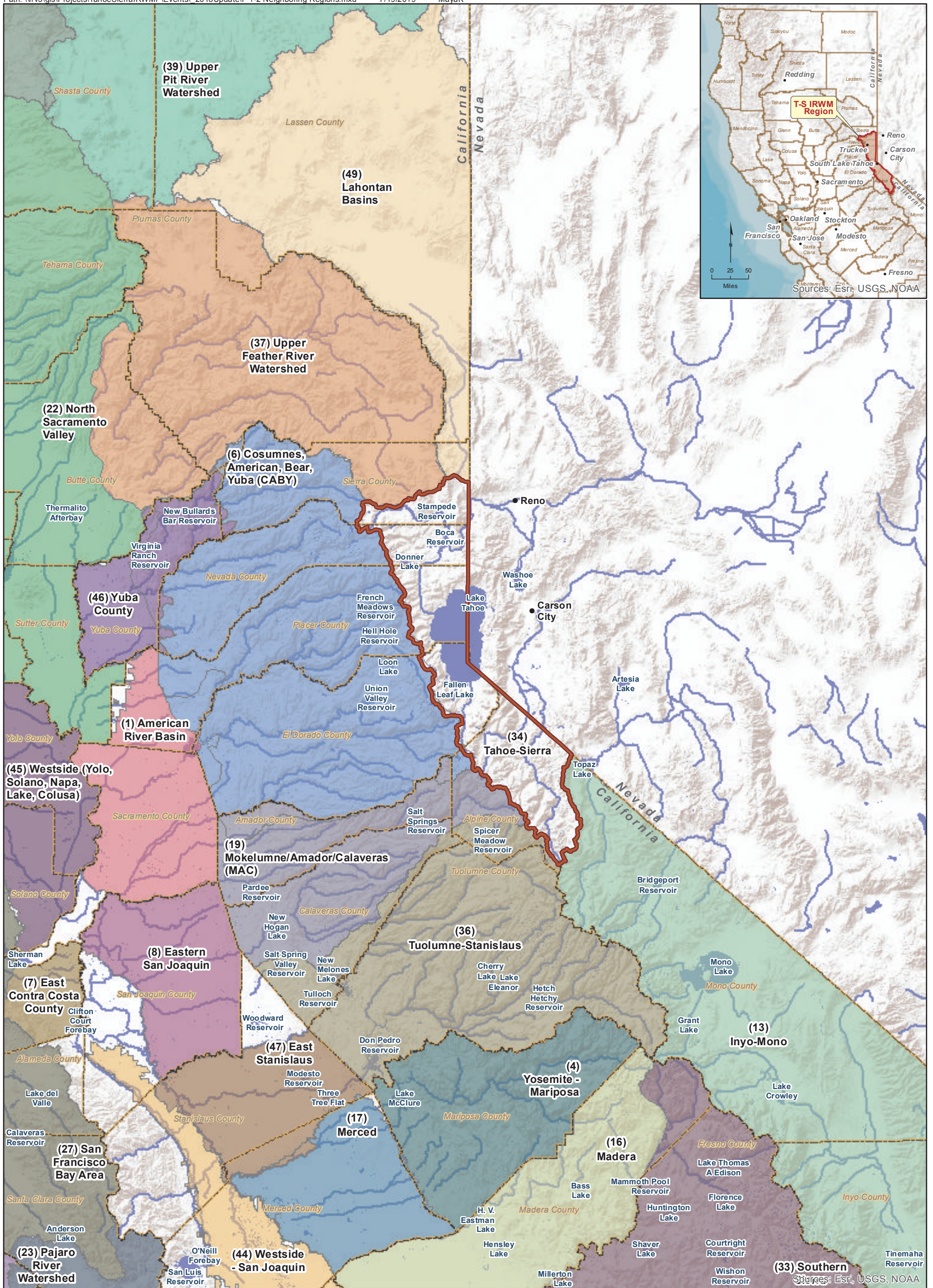
The Tahoe-Sierra IRWM Region is generally based on watershed boundaries which drain to Nevada within the State of California. This allows partners to maximize opportunities for coordination on similar issues, and focus resources and funding on priority projects in targeted areas. The Tahoe-Sierra Region and neighboring regions are further described below and shown on Figure 1-2.

The Tahoe-Sierra IRWM and the adjacent Inyo/Mono IRWM both use watershed boundaries to define their regions. The Inyo/Mono Region includes the Walker River watershed and the Tahoe-Sierra includes the Carson River watershed which abuts the Walker River watershed. Where these boundaries lie adjacent to each other also happens to be the jurisdictional boundary between Alpine County and Mono County. This means there are no overlaps or areas of isolation between boundaries on the southern end of the Tahoe-Sierra IRWM Region.

On the eastern edge of the Tahoe-Sierra boundary, the boundary is the California/Nevada state line, again with no overlaps or areas of isolation.

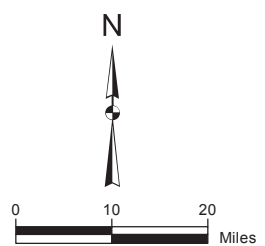
To the north of the Tahoe-Sierra IRWM, the newly formed Lahontan Basins IRWM, which is adjacent to the Tahoe-Sierra Region, is in the early stages of IRWM Plan preparation.

Based on a review of the maps associated with the IRWMs to the west and communications with those IRWM representatives (Cosumnes, American, Bear, and Yuba (CABY), Mokelumne/Amador/Calaveras (MAC), and Tuolumne-Stanislaus), all three IRWMs use the Sierra Nevada Crest as an easterly boundary of the watersheds they address. This means that the boundaries abut at the crest of the Sierra Nevada Mountains, but do not overlap or leave areas of isolation.



Legend

- Tahoe-Sierra IRWM Boundary
- California Counties



Kennedy/Jenks Consultants
Tahoe-Sierra IRWMP

Neighboring Regions

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Figure 1-2

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There was previous concern that there was a slight overlap with the Tahoe-Sierra IRWM boundary and the Upper Feather River IRWM in the area of the Little Truckee River Watershed. This was due to a jurisdictional overlap between the Feather River and the Little Truckee watersheds on the part of both Sierra County and the Tahoe National Forest, and a water supply connection between the two watersheds through water that is diverted from the Little Truckee and imported to Sierra Valley. However, the two watersheds are divided by the regional water board boundaries and the IRWM funding area boundaries. After consultation with the Upper Feather River IRWM, it was agreed that the Little Truckee watershed is appropriate for inclusion in the Tahoe-Sierra IRWM Region. Therefore, the Little Truckee River watershed is now located entirely within the Tahoe-Sierra IRWM.

With focus on the Little Truckee River, Truckee River, Carson River and Lake Tahoe watersheds as the basis for the Region boundaries, the Region also accounts for the following boundaries and includes the following features:

- Political boundaries: portions of Alpine, El Dorado, Placer, Sierra and Nevada Counties.
- Surface water bodies: Lake Tahoe, Upper Truckee River, Fallen Leaf Lake, Truckee River, Donner Lake, Martis Creek Reservoir, Prosser Creek Reservoir, Little Truckee River, Webber Lake, Independence Lake, Boca Reservoir, Stampede Reservoir, West Fork of the Carson River, East Fork of the Carson River, and many other lakes and tributary streams.
- Major water-related infrastructure: Indian Creek Reservoir and Harvey Place Reservoir, Lake Tahoe Dam, the Prosser Creek Dam, the Stampede Dam, and the Boca Dam.
- National forests/parks: Toiyabe National Forest, Tahoe National Forest, and Lake Tahoe Basin Management Unit

The Region encompasses the service area (or partial service area) of multiple local agencies, including more than ten entities with water and related resource management responsibilities.

1.2 Governance

The Tahoe-Sierra IRWM Plan governance is comprised of several elements, the broader Partnership who are the heart of the Tahoe-Sierra IRWM, the Regional Water Management Group, which is a smaller group to meet the requirements of the DWR IRWM Program, and subcommittees which are formed on an as-needed basis.

1.2.1 Partnership

The Partnership consists of signatories to a Memorandum of Understanding (MOU) that commits members to adopt and implement the Plan, and to revise and update it as needed. The 2007 MOU has been updated with this update to the Plan, and additional signatories have joined. Appendix 1-A includes the updated MOU with signatory pages or other proof of adoption. The Partnership along with other participants, their roles and the organizational structure and function is further detailed in Section 8.

Representatives of each member organization are responsible for implementation of the Plan within their organization. The lead agency role is shared and designated by the group when

necessary. For the Proposition 50 IRWM Round 1 Implementation Grant and Supplemental Funding application processes, the Tahoe Resource Conservation District (TRCD) acted as lead agency and designated applicant. For the Proposition 84 IRWMP Planning and Implementation Grant application processes, South Tahoe Public Utility District (South Tahoe PUD) acted as lead agency and designated applicant. A subcommittee comprised of a smaller group of MOU signatories, was created for this IRWM update as described below. The Partnership agreed to a consensus-based decision making process; whereby the subcommittee makes recommendations to the Partnership for consideration.

1.2.2 Regional Water Management Group

The Tahoe-Sierra Regional Water Management Group (RWMG) consists of at least three organizations, two of which have statutory authority for water management as identified in Table 1-1 below. The Tahoe-Sierra RWMG has been defined to consist of these entities only for the purpose of meeting grant application schedule constraints. The RWMG will not have any additional authority as such and is considered part of the Partnership. RWMG members will be selected annually at the Partnership Meeting and/or on an as-needed basis.

Table 1-1: Current^(a) Partnership and MOU Signatories

Organization	Responsibilities	Partnership Member/MOU Signatory	Subcommittee Member	Statutory Authority for Water Management ^(b)
Alpine Watershed Group	Public Interest Group	X	X	
California Tahoe Conservancy	State Government	X	X	
City of South Lake Tahoe	Land Use	X		
El Dorado County	Land Use, Water	X		
Friends of Squaw Creek	Public Interest Group	X		
Lakeside Park Association	Private Water System	X		
Lukins Brothers Water Company	Private Water System	X		
Markleeville Public Utility District	Wastewater	X		X
North Tahoe Public Utility District	Water, Wastewater, Parks	X		X
Placer County	Land Use, Water, Wastewater, Storm Water, Flood Control	X		
Sierra County	Land Use, Water	X		
South Tahoe Public Utility District	Water, Wastewater	X	X	X
Squaw Valley Public Service District	Water, Wastewater, Fire, Solid Waste	X		X
Tahoe City Public Utility District	Water, Wastewater, Parks	X		X
Tahoe Regional Planning Agency (TRPA)	Land Use	X		X
Tahoe Resource Conservation District	Public Interest Group	X	X	
Town of Truckee	Land Use, Storm Water	X	X	
Trout Unlimited, Inc.	Public Interest Group	X		
Truckee River Watershed Council	Public Interest Group	X	X	
Washoe Tribe of Nevada and California	Tribal Government	X	X	

(a) Table last updated August 30, 2019

(b) Potential RWMG Member

1.2.3 Subcommittee

For this particular IRWM Plan update, a subcommittee was formed to oversee the IRWM Plan development and provide leadership to the program. The Subcommittee is composed of seven volunteers from agencies, tribal representatives and NGOs within the Tahoe-Sierra Region. Table 1-1 summarizes the agencies and NGOs, their principle responsibilities, whether they have signed the MOU and are a member of the Partnership, are a member of the Subcommittee, and whether they are a part of the RWMG.

As stated in the MOU, agencies and associations joined together to update the IRWM Plan that will accomplish the following:

- Promote collaboration throughout the project implementation such that quantifiable ecosystem restoration and improved water supply and water quality benefits will occur in an integrated, cost and time efficient manner.
- Integrate activities, which will increase environmental education and stewardship, reduce conflicts and litigation potential, and through interregional stewardship and cooperation, increase understanding and participation in export water proposals as they relate to beneficial uses in the area of origin.
- Design a data management system that can inform the stakeholders of the relative success of various Resource Management Strategies, programs and projects.

A fundamental principle of the Tahoe-Sierra IRWM Program process is working toward consensus and the Region strives for consensus (agreement among all participants) in all of its decision-making. The IRWM Program governance structure is described in detail in Section 8, Implementation Framework. As of April 2014, the subcommittee met nine times during the preparation of the IRWM Plan update.

1.3 Stakeholder Coordination and Outreach

The stakeholder engagement and outreach process was a coordinated effort throughout IRWM Plan update development.

1.3.1 Overview of the Stakeholder Coordination and Outreach Process

Inclusion of stakeholders and a consensus-driven process has been a cornerstone since the inception of the IRWM and throughout the Tahoe-Sierra IRWM Plan Update process. Extensive stakeholder outreach was conducted to help ensure that the Plan reflects the water-related needs of the entire Region, promotes the formation of regional partnerships, and encourages increased coordination with state and federal agencies. The term stakeholders is used to refer to representatives of agencies, NGOs, nonprofit groups, governmental organizations, tribal communities, disadvantaged communities (DACs) and the public who were interested and participated in the development of the IRWM Plan. Stakeholders were invited to participate in the IRWM Update process through the attendance of Partnership meetings.

A benefit of the IRWM process is that it brings together a broad array of groups into a forum to discuss and better understand shared needs and opportunities. Members of the subcommittee participated in regular meetings/conference calls (often monthly), reviewed meeting materials that included handout materials prepared to discuss plan content, draft IRWM Plan sections, lead the project prioritization effort and provided extensive collaborative input to shape this IRWM Plan Update. In addition, through participation in meetings, stakeholders have been exposed to a variety of opportunities for discovering and establishing mutually beneficial partnerships.

A total of four (4) Partnership meetings were held during preparation of the 2014 Plan, as shown in Table 1-2. A list containing over eighty-five names and agencies, developed during the planning grant application process, was used as the basis for invitations to the Partnership meetings. Efforts were made to facilitate participation of a diverse group of stakeholders including tribal representation. Outreach efforts included an IRWM Program website, and invitation to the meetings by e-mail and phone. Regular partnership meetings have been held since adoption of the 2014 Plan. Meeting summaries, agendas, and handouts are available to be viewed on the Tahoe-Sierra’s IRWM website (<http://tahoesierrairwm.com/>). Appendix 1-D includes Partnership and Subcommittee meeting summaries.

Membership in the stakeholder group was broad including representation from agencies, organizations, and individuals with an interest in improving water supply reliability, water quality, water conservation, natural habitat, and land-use planning within the Region; the result was collaboration among a broadly varying stakeholder group that represents the entire Region. Neither a financial contribution nor agency status was required to be part of the collaborative IRWM Plan Update development process. All meetings were open to the public.

Table 1-2: Summary of Partnership Meetings for 2014 Plan Preparation

Stakeholder Meeting No.	Date	Key Topics	No. of Attendees
1	May 23, 2013	IRWM Update Process, MOU and Objectives	20
2	September 24, 2013	Final Draft Objectives and Quantifiable measures, Project Review Template and Call for Projects Process, Website update, DAC and Tribal Outreach and Schedule	14
3	April 30, 2014	SEP Program Update, Sierra Water WorkGroup, Project Scoring, Drought Solicitation and Grant Program, Governance, MOU and Data Management	21
4	July 2014	Planned for Acceptance of Final IRWM Plan	

1.3.2 Stakeholders

A list of all of the agencies and organizations that were involved in the development of the Tahoe-Sierra IRWM Plan is provided in Table 1-3. The broad array of stakeholders includes a mix of regulatory, environmental, tribal and land use planning entities that represent all areas of the Tahoe-Sierra Region including:

- Municipal and County Governments
- Water Purveyors, Wastewater Agencies, and Similar Special Districts

- State and Federal Regulatory and Resource Agencies
- Environmental Community
- Tribal Community
- Disadvantaged Community
- Others

Each of these types of organizations is described further in Table 1-3.

Table 1-3: Participating Stakeholders

Alpine County	Sierra County
Alpine Watershed Group	Sierra Nevada Conservancy
American Rivers	Sierra Watershed Education Partnerships
California Tahoe Conservancy	South Tahoe Public Utility District
Carson Water Subconservancy District	Squaw Valley Public Service District
City of South Lake Tahoe	Tahoe City Public Utility District
El Dorado County	Tahoe Regional Planning Agency
El Dorado County Water Agency	Tahoe Resource Conservation District
Friends of Squaw Creek	Tahoe Truckee Unified School District
Lake Tahoe Unified School District	Town of Truckee
Lakeside Park Association	Trout Unlimited, Inc.
Lukins Brothers Water Company	Truckee River Watershed Council
Markleeville Public Utility District	UC Davis Tahoe Environmental Research Center
Markleeville Water Company	US Environmental Protection Agency
North Tahoe Public Utility District	US Forest Service Lake Tahoe Basin Management Unit
Placer County	Washoe Tribe of Nevada and California

1.3.2.1 Municipal and County Governments

Municipal and county governments participating in the IRWM Plan process included local jurisdictions and land use planning agencies. They were involved in the identification of issues, formation of objectives, and development of projects for the Plan by offering discussion in the meetings. Such participants included Alpine County, City of South Lake Tahoe, El Dorado County, Placer County, Sierra County and Town of Truckee.

1.3.2.2 Water Purveyors, Wastewater Agencies, and Similar Special Districts

The participation of agencies with water management focus was particularly important to the IRWM process. These agencies include water purveyors, wastewater agencies, and other special districts. The active participants were involved in the development and implementation of the objectives and projects for this IRWM Plan. Their participation focused primarily on water supply and resource management concerns of the Region. Active agencies included Markleeville Water Company, South Tahoe Public Utility District, Squaw Valley Public Service District, Tahoe City Public Utility District, North Tahoe Public Utility District, El Dorado County Water Agency, Markleeville Public Utility District, and Lukins Brothers Water Company.

1.3.2.3 Regional, State and Federal Regulatory Resource Agencies

Several regional, state and/or federal regulatory and resource agencies helped describe ongoing activities that require coordination with IRWM, identify issues and objectives, and

develop projects for this IRWM Plan. Their involvement was essential not only because of the need for coordination but also because of the need for regulatory and environmental approval prior to implementation of projects. Regional, state and federal agencies involved in the IRWM Plan Update included California Tahoe Conservancy, Regional Water Quality Control Board – Lahontan Region, DWR, Tahoe Regional Planning Agency, US Forest Service Lake Tahoe Basin Management Unit and the US Environmental Protection Agency.

1.3.2.4 Environmental Community

The role and responsibility of the environmental community in the IRWM Plan process was to help ensure that goals for conservation and protection of the natural resources and habitat within the Region were incorporated. Members of the environmental community involved in the plan included representatives of Alpine Watershed Group, Sierra Watershed Education Partnerships, Tahoe Resource Conservation District, Truckee River Watershed Council, UC Davis Tahoe Environmental Research Center, Friends of Squaw Creek, Sierra Nevada Conservancy, Carson Water Subconservancy District and American Rivers.

1.3.2.5 Tribal Community

The tribal communities involved in planning included the Washoe Tribe of Nevada and California.

1.3.2.6 Disadvantaged Community

Involvement of DACs was an important component throughout the planning process through a focused DAC outreach process described below. A portion of the Region qualifies as a DAC.

1.3.3 Community Outreach Overview

To recognize the diverse Regional and local interests, the planning process incorporated community outreach focused on a wide variety of stakeholders. The planning process centered around Partnership meetings, which were open to the public. Stakeholders were invited to participate through facilitated discussions and review of draft documents; the meetings were announced to a broad distribution list via e-mailed invitations, as described above. All meeting materials were made available on the website after each meeting.



Council Meeting at the Washoe Tribe's Woodfords Community
(Photo courtesy of the Washoe Tribe's Woodfords Community)

Public outreach activities occurring throughout the process included:

- **Review of Plan Sections** – The sections of the IRWM were drafted incrementally and provided to stakeholders for review and input at multiple points during the Plan development process. Materials were accepted and finalized only after the stakeholders reached consensus.
- **Partnership Meetings** – Four (4) Partnership meetings were held throughout the 2014 IRWM process. These meetings provided

background on the planning process, discussed plan goals and objectives, considered opportunities for coordination among local and regional agencies, presented plan sections to provide opportunity for comments on plan sections, identified potential projects, discussed project selection criteria, as well as discussed plan governance. Additional partnership meetings have been held at least annually since adoption of the 2014 Plan, for IRWM planning, implementation, and update purposes.

- **Website** – The Tahoe-Sierra website (<http://tahoesierrairwm.com/>) was published as a standalone site for the IRWM Partnership. As noted previously, handouts distributed at each Partnership and Subcommittee meeting were posted on the website after each meeting. Additional information regarding the IRWM Plan was also posted to this webpage, including draft IRWM Plan sections as they became available.
- **Data Management Website** – The Tahoe-Sierra data management website will be linked to the Tahoe-Sierra IRWM webpage. This site contains pertinent mapping of the IRWM Region for stakeholder use throughout the IRWM Plan and into the future.
- **Electronic and Written Communication** – Email was the main tool used to maintain stakeholder communication and engagement. The email list, which contained approximately 85 entries, was used to invite stakeholders to the meetings.
- **Contact Information** – Consultant contact and South Tahoe PUD staff contact information were made available to any stakeholder or interested party to ask questions about the IRWM Plan and receive feedback.
- **Notices to Prepare and Adopt the IRWM Plan** – Notices to Prepare and Adopt the IRWM Plan were published in accordance with Government Code §6066 in local newspapers including the Tahoe Daily Tribune, Sierra Sun and The Record-Courier. Appendix 1-C includes the proof of publications for the notices of intent to prepare and adopt the IRWM Plan.

1.3.3.1 Disadvantaged Communities

DAC outreach consisted of door-to-door multi-lingual household surveys in the areas of Kings Beach and South Lake Tahoe that are identified DACs. The surveys included collection of demographic information as well as questions formulated to improve understanding of drinking water and sanitation services, perceptions regarding water quality, ecosystems and wildlife, stormwater, drainage and flooding and importance of various water-related factors to the respondent.

1.3.3.2 Tribal Outreach

Consistent with the 2009 Update to the California Water Plan, the Tahoe-Sierra Partnership has used the term “California Native American Tribe” to signify all indigenous communities of California, including those that are non-federally recognized and federally recognized. The Washoe Tribe of Nevada and California was identified within the Region boundaries.

The purpose of tribal outreach as part of the IRWM plan was to engage and identify issues and ultimately projects specific to water supply, resources, and quality that would benefit the tribe. To begin this process, through the Tribal Environmental Protection Department and the

Environmental Specialist, the Washoe Tribe Interim Chairman was invited to attend the initial stakeholder meeting to introduce the IRWM process and request further communication. An initial tribal meeting was held with the Woodfords Washoe Community Council and community members. This meeting was used to introduce the IRWM process and discuss tribal issues and concerns, tribal water-related needs, and identify opportunities to improve conditions for the tribe. Since the initial meeting, the Washoe Tribe has been an active attendee at the stakeholder and subcommittee meetings and submitted two (2) projects for inclusion in the plan.

Coordination and engagement with tribal stakeholders have continued since preparation of the 2014 Plan. However, overly prescriptive tribal policies associated with IRWM implementation grants, requiring to waive sovereignty, has more recently disincentivized this stakeholder group from proposing implementation projects and in turn from continuing active involvement in the IRWM process. The Region will nevertheless continue to provide opportunities for involvement.

1.3.4 Neighboring IRWM Regions

Surrounding IRWM Regions include Inyo-Mono; Tuolumne-Stanislaus; Mokelumne/Amador/Calaveras; Cosumnes, American, Bear, & Yuba; Upper Feather River; and Lahontan Basins as shown on Figure 1-2. There are no areas of overlap with these neighboring IRWM Regions. As the Tahoe-Sierra Region starts at the watershed divide of the Sierra-Nevada range, there are no upstream or downstream neighboring IRWM Regions. Downstream areas are in the state of Nevada, and cooperation and coordination is dictated by the Truckee River Operating Agreement (TROA) and the Federal Alpine Decree on the Carson River. Jurisdictions that overlap with other IRWM Regions include county governments. Alpine County includes parts of the Tahoe-Sierra Region, Mokelumne/Amador/Calaveras, and Tuolumne-Stanislaus. El Dorado, Placer, Nevada, and Sierra Counties include parts of the Tahoe-Sierra and Cosumnes, American, Bear, & Yuba Regions. The Upper Feather River; and Lahontan Basins also include area within Sierra County.

1.4 Plan Development

This subsection gives a brief overview of the process of developing this IRWM Plan which includes an overview of the iterative plan development process that was integrated into the IRWM meetings.

1.4.1 Overview

The IRWM Plan development process was organized around regular subcommittee meetings/conference calls and partnership meetings at key IRWM plan junctures. The topics and plan sections were introduced and discussed during the subcommittee meetings prior to release to the Partnership. Stakeholders were provided the opportunity to review the content and sections prior to the meetings and submit written comments after the meetings. Content was then drafted and finalized by Kennedy/Jenks Consultants, the IRWM Plan consultant.

The key topics discussed during the Plan development process are outlined in Figure 1-3. These topics consist of content items defined in DWR's published standards for IRWM Plans (see Proposition 84 and Proposition 1E Integrated Regional Water Management Grant Program Guidelines; November 2012). Although not specifically highlighted in Figure 1-3, the IRWM Plan

Standards for stakeholder involvement and coordination were a key topic addressed throughout the process, as described in Section 1.3.

Information related to each of the key topics was presented and discussed through an interactive process initiated during stakeholder meetings. The topics include relevant items, such as IRWM Plan objectives, to be covered in one or more stakeholder meetings. Draft IRWM Plan content was prepared based on the discussion of each topic and then was provided for public review and comment. The draft content was discussed initially at the subcommittee meeting and then distributed to the Partnership and revised through an iterative process based on comments received by the stakeholders until consensus was reached. As described below, the subcommittee was convened to assist in refining content and resolving any conflicting comments. At the end of the planning process, the agreed upon content was synthesized into this IRWM Plan for final public review and Partnership member adoption.

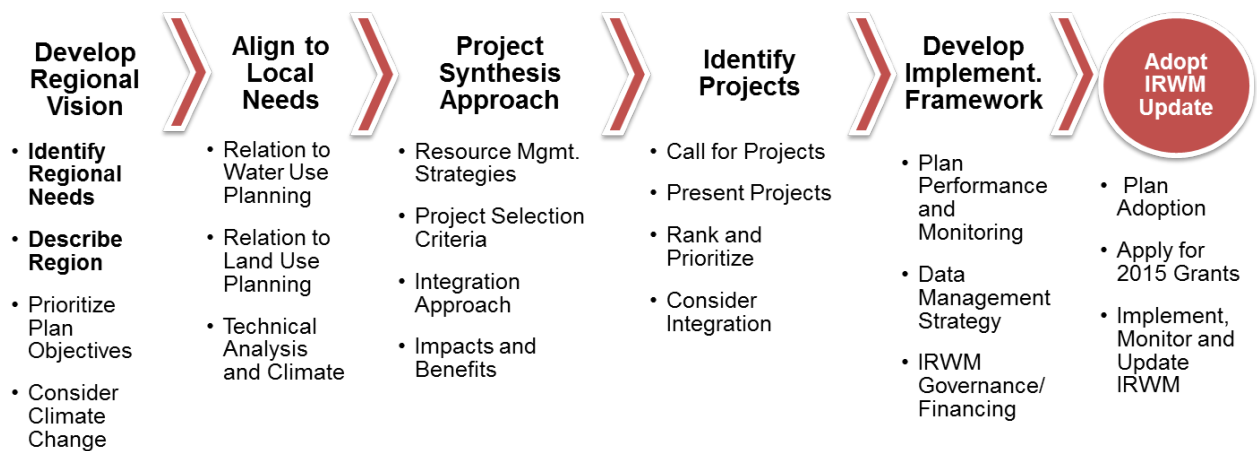


Figure 1-3: IRWM Planning Process Overview

1.4.2 Subcommittee

A subcommittee was formed to allow for a more detailed discussion of specified topics in a focused setting. The subcommittee’s role included the following:

- Data Management – Reviewed and discussed format of and content for the data management system;
- DAC – Discussed DAC outreach goals and methods for outreach throughout the IRWM Planning process;
- Tribal – Discussed tribal outreach goals and methods for outreach throughout the IRWM Planning process. The committee aided in outreach efforts throughout the Plan process;
- Plan Review – Reviewed development of Plan sections and key plan content when requested; and
- Technical Review – Scored submitted projects in accordance with the project selection criteria.

The subcommittee convened to participate with and/or assist the consultants with a variety of matters for which regular input and consultation are needed, but they have no independent decision-making authority. The subcommittee members for this IRWM plan update includes: South Tahoe Public Utility District, Washoe Tribe of Nevada and California, California Tahoe Conservancy, Town of Truckee, Alpine Watershed Group, Truckee River Watershed Council, and Tahoe Resource Conservation District.

1.4.3 Plan Organization

The Tahoe-Sierra Region IRWM Plan Update is organized as a narrative, telling the story of the conflicts/challenges and opportunities and how they inform the objectives for the Region. The Plan is organized to address the standards required by the November 2012 IRWM Guidelines issued by DWR. The key plan standards and sections addressing each standard are summarized in Table 1-4. Appendix 1-B presents a detailed cross-referencing table, which links DWR plan elements with the Tahoe-Sierra IRWM Plan topics.

Table 1-4: Proposition 84 Standards and Plan Cross-Reference

IRWM Standard	IRWM Plan Section
A. Governance	Section 1 & 8
B. Region Description	Section 1 & 2
C. Objectives	Section 4
D. Resource Management Strategies (RMS)	Section 5
E. Integration	Section 1, 8 and 9
F. Project Review Process	Section 6 and Appendix 6
G. Impact and Benefit	Section 7 and 8
H. Plan Performance and Monitoring	Section 8
I. Data Management	Section 8
J. Finance	Section 8
K. Technical Analysis	Section 2 and Appendix 2-F
L. Relation to Local Water Planning	Section 3
M. Relation to Local Land Use Planning	Section 3
N. Stakeholder Involvement	Section 1.3 & 8
O. Coordination	Section 9
P. Climate Change	Section 2, 3 and Appendix 2-D

1.5 Plan Adoption

The IRWM Plan is recommended to be adopted by all participants in the planning process, including the governing boards of the Partnership. The Guidelines require that each agency that is part of the Partnership responsible for the development and implementation of the Plan formally adopt the IRWM Plan. The Guidelines also require that each project proponent named in an IRWM Grant Application adopt the Plan.

Plan adoption by the governing bodies of the various public agencies began once the final IRWM Plan was released in July 2014. The deadline for adopting the Plan for purposes of fulfilling the planning grant requirements and to secure potential implementation grant funding is September 9, 2014. A list of organizations that have adopted or endorsed the Tahoe-Sierra IRWM Plan will be included in Appendix 1-A. Adoption or endorsement of the Tahoe-Sierra IRWM Plan does not imply that the organization necessarily supports every project that is included in the Plan. Rather, the organization is documenting their support for the objectives,

targets, actions, and implementation framework recommended to implement the Plan. Projects will be reviewed for implementation on a case by case basis as the Plan is implemented.

All proponents of projects that are included in an IRWM Implementation proposal must adopt the IRWM Plan. Documentation of adoption will be provided in the applicable grant application.

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Section 2: Region Description

This section provides a detailed description of the Tahoe-Sierra Region, including socio-economic conditions, geography, climate, land use, ecological resources, surface and groundwater resources and infrastructure, water demand and supply, water quality, and climate change vulnerabilities. The description is intended to comply with the Regional Description IRWM Plan standard as detailed in the IRWM Guidelines for Proposition 84 and 1E published by the California Department of Water Resources (DWR) in November 2012.

2.1 Region Overview

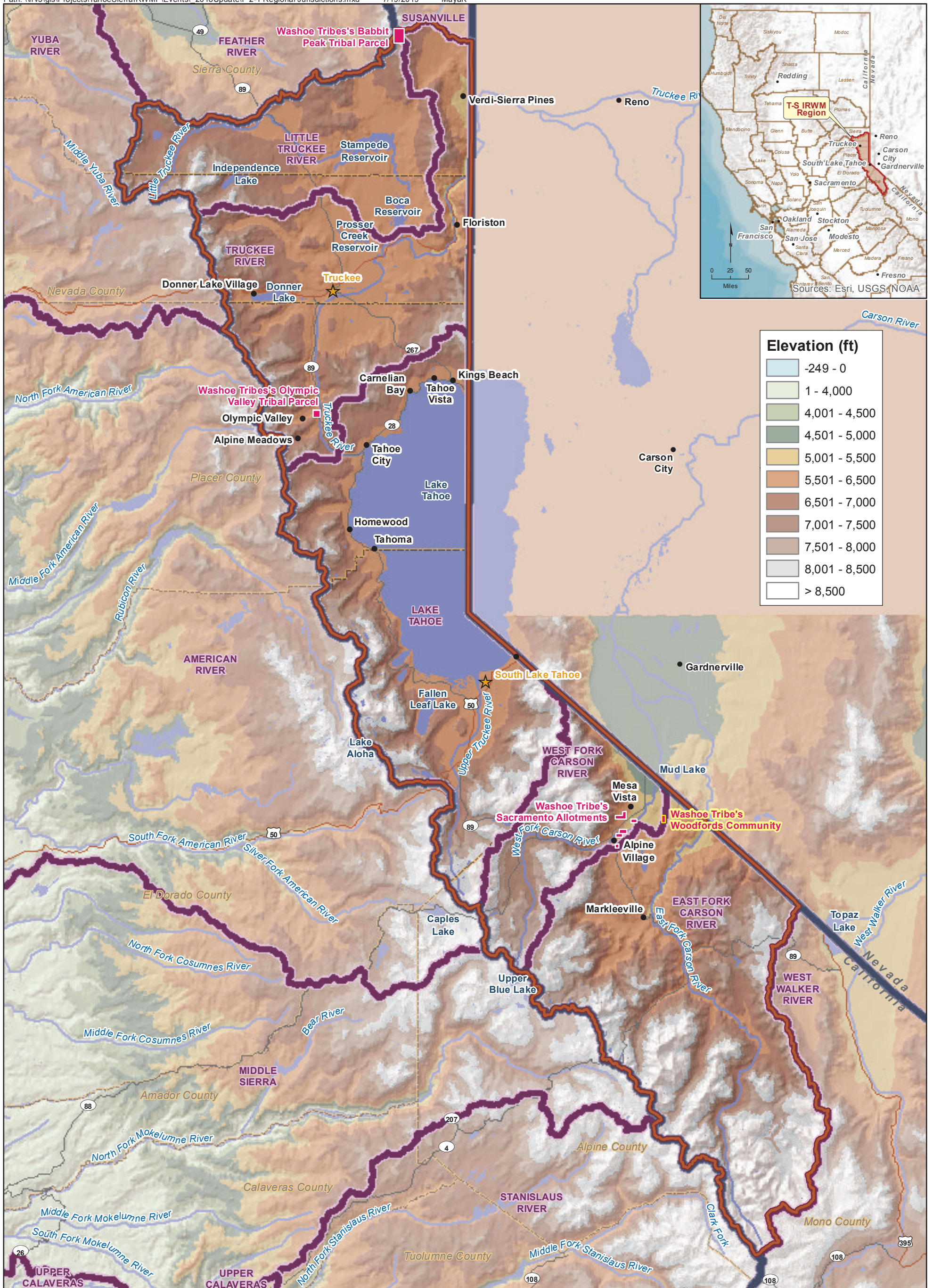
The Region is a mountainous area on the east slope of the Sierra Nevada mountain range that ranges from about 5,000 feet to almost 11,000 feet in elevation and encompasses 802,600 acres. It extends from the crest of the Sierra Nevada east to the Nevada border, and from the border between Alpine and Mono Counties in the south to north of Stampede Reservoir in Sierra County (Figure 2-1). The Region consists of the Truckee River system, which includes the Upper Truckee River, the California portion of Lake Tahoe, streams draining to Lake Tahoe within California, the Little Truckee River, and the Truckee River in California; and the East and West Forks of the Upper Carson River in California. Surface water flows in both river systems drain into Nevada, and Lake Tahoe straddles the border between California and Nevada.

As an east slope area, water users downstream of the Region are in Nevada. The majority of the Region, approximately 80%, is open space including both public and private lands (DWR 2010). Within the Region, approximately 68% of the land area is publicly managed for recreation and/or forest, 10% is the California portion of the surface of Lake Tahoe, and 6% is urban, rural, or planned development. Approximately 1% of the land area of the Region is dedicated to agriculture with the remaining 15% as other open space (BLM 2011). The majority of the population within the Region lives in the City of South Lake Tahoe, the Town of Truckee, and unincorporated communities on the west and north shore of Lake Tahoe. Communities in the Region are economically dependent on tourism and recreation related to the natural resources of the area including mountain terrain, forests, rivers, and lakes. This also means that in many parts of the Region there are significant fluctuations in population seasonally, weekly, and even daily.

2.2 Early Region History

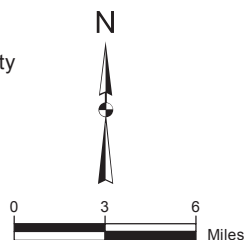
Between 2 million and 500,000 years ago, glacial activity formed Lake Tahoe. Other physical features of the Region, such as the outlet from Lake Tahoe and the present day Truckee River and the Carson River systems, were formed later between 75,000 to 10,000 years ago (State of Nevada 2013). The Region has been inhabited for at least 6,000 years by the Washoe peoples. The center of the Wašiw (Washoe) world is Da.aw (Lake Tahoe) both geographically and spiritually. The Washoe are believed to have generally spent the summer in the Sierra Nevada with the Kings Beach Complex of Washoe emerging around 500 AD in Lake Tahoe and the northern Sierra Nevada (Pritzker 2000). There is evidence of the Martis complex of people (near Martis Valley) who may have overlapped with the Kings Beach people, both of which were Washoe (d'Azevedo 1986).

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- Legend**
- Tahoe-Sierra IRWM Boundary
 - California Counties
 - Lahontan Regional Board boundary
 - Watersheds

- Washoe Tribe's Woodfords Community
- Washoe Tribe - Other Parcels
- City
- Places



Kennedy/Jenks Consultants
Tahoe-Sierra IRWMP

Regional Location

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Figure 2-1

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The Region was first found by non-native explorers associated with the Fremont Expedition in 1844 with initial discovery of Grover Hot Springs and Markleeville in the Carson River drainage. The first viewing of Lake Tahoe by Fremont from Red Lake Peak occurred on 14 February 1844. A separate exploration party found Donner Lake and six members of this party, including Daniel Murphy, first stood on the shores of Lake Tahoe later in 1844 (State of Nevada 2013).

2.3 History of Water Management

The history of water management in the Region is contentious; filled with litigation and fighting over water rights between California and Nevada water users, Pyramid Lake Paiute, conservationists, farmers, and industrialists. Some significant projects such as the construction of dams on Lake Tahoe; at Boca, Prosser, and Stampede on the Truckee River; and decisions that have affected the Region are described briefly below.

1850 California Statehood: Established current state boundaries and adoption of “California Doctrine” with respect to administration of a “common law doctrine of riparian water rights”, which provoked many controversies and legal battles.

1851 Naming of Lake Bigler: Named by State of California organized Indian expedition; confirmed by California legislature in 1870; renamed by Legislature in 1945 to Lake Tahoe.

1859 Discovery of Comstock Lode Silver Deposit: The resulting population influx accelerated the Region’s demand for water and lumber. Diversions of water from Lake Tahoe and the Carson River occurred to build flumes to float logs east to the Washoe Valley for the logging and mining industries in Nevada. Sawdust clogged the Carson and Truckee Rivers and began an era of environmental degradation in Nevada. Negative impacts continue today with mercury discharges from silver ore processing.

Early 1860s Settlement of Truckee Donner area: Settlement in the northern part of the current Region supported logging and railroad construction and operations. Logging impacts included sawdust and milling debris discharge to the Truckee River and silt from clear cutting that impacted both water quality and native wildlife.

1864 Nevada Statehood: A system of water rights administration of “prior appropriation doctrine” was enacted in 1885, and conflicted with the California system.

1865 Water Quality Regulation and Water Rights: Prohibition on sawdust dumping in Nevada state waters and the first Lake Tahoe/Truckee River water rights claim for export to San Francisco; this project encountered insurmountable problems when the Truckee River water rights were granted to another entity.

1869 Nevada Recognizes Interstate Water Pollution: Nevada Legislature resolution recognizes the water pollution and endangerment of native fish and calls upon California Legislature to protect upstream waters from sawdust dumping. The late 1860s was also when the transcontinental railroad was completed, which, when combined with ice harvesting, opened eastern markets for produce from the Central Valley and export of Truckee River/Pyramid Lake fish to both east and west. At that time the native Lahontan Cutthroat Trout was prevalent in the waters of the Region.

1889 California Water Quality Regulation: California Legislature passed an anti-sawdust statute; five years later, logging debris discharges were stopped and fish ladders constructed.

1890s Truckee River Hydropower Development: Started in 1891 in Reno, with other diversion near Farad, these diversions blocked spawning of the booming fisheries industry. When combined with agricultural expansion encouraged by the Homestead Act, and the 1902 National Reclamation Act forming the Truckee-Carson Irrigation Project, these and other legislation were forebears of the water management challenges that continue today.

Collectively, the various settlements and agreements described below, with the other water quality regulatory requirements, govern the use of water throughout the Region.

1903-1915 Truckee-Carson (Newlands) Project: A major US Reclamation Service (predecessor to US Bureau of Reclamation) water resources project that included construction of the Lake Tahoe Dam to provide water for agriculture in Nevada.

1919 Truckee River General Electric Decree: Granted the US Reclamation Service ownership of the Lake Tahoe Dam and established the “Floriston Rates” to provide sufficient flow for downstream hydropower generation.

1935 Truckee River Agreement: Established the official elevation of the rim of Lake Tahoe at 6,223.0 feet above mean sea level (amsl), and allowed for storage in the upper six feet to 6,229.1 feet amsl.

1935-1939 Truckee Storage Project: US Reclamation Service water resources project for construction of Boca Dam for water storage and to provide irrigation water to the Truckee Meadows in Nevada.

1944 Orr Ditch Decree (settlement of a 1913 litigation): Established individual water rights on the Truckee River, including irrigation water rights for the Pyramid Lake Indian Reservation, and affirmed the previous 1919 decision for the Sierra Pacific Power Company (previously the Truckee River General Electric Company).

1959-1987 Washoe Project: US Reclamation Service water resources project, which included the Prosser Creek Dam completed in 1962, the Stampede Dam completed in 1970, and the Stampede Power plant completed in 1987. It was originally intended to provide irrigation water for use in Nevada, but ultimately has been used for maintaining flow for fisheries.

1969 Bi-State Compact (revised 1980): Created the Tahoe Regional Planning Agency (TRPA) to coordinate planning efforts in the entire Lake Tahoe Basin (both California and Nevada sides).

1980 Federal Alpine Decree: Allocated water rights on the Carson River, and recognized riparian water rights under California law. Major water rights holders on the California stretches of the Upper Carson River included Sierra Pacific Power Company and several livestock companies.

1982 decision: granted the Secretary of Interior the authority to direct that the water stored in Stampede Reservoir be used for Pyramid Lake, Nevada fisheries, and preservation of endangered species.

1990 Truckee-Carson-Pyramid Lake Water Rights Settlement Act (Settlement Act): Established interstate allocations of Lake Tahoe water and Truckee River between California and Nevada, confirmed the 1980 Alpine Decree, provided for the Pyramid Lake fishery, and required the negotiation of an operating agreement for the Truckee River. The Settlement Act did not supersede the 1919 and 1944 decrees, but requires the operating agreement to ensure that those water rights are respected.

2008 Truckee River Operating Agreement (TROA): Operating agreement for the Truckee River negotiated between the US government, State of California, State of Nevada, Truckee Meadows Water Authority, Pyramid Lake Paiute Tribe of Indians, Washoe County Water Conservation District, City of Reno, City of Sparks, City of Fernley, Washoe County, Sierra Valley Water Company, Truckee Donner Public Utility District, North Tahoe Public Utility District, Carson-Truckee Water Conservancy District, and Placer County Water Agency.

2.4 Jurisdictional Boundaries

The Region stretches across portions of Sierra, Nevada, Placer, El Dorado, and Alpine Counties in California, as shown on Figure 2-1. The two incorporated cities in the Region are the Town of Truckee in Nevada County and City of South Lake Tahoe in El Dorado County. Other communities within the Region include Donner Lake Village and Floriston in Nevada County; Alpine Meadows, Carnelian Bay, Homewood, Kings Beach, Olympic Valley, Tahoe City, and Tahoe Vista in Placer County; Tahoma in El Dorado County; and Markleeville, Mesa Vista, Alpine Village, and the Washoe Tribe’s Woodfords Community in Alpine County. There are no communities within the part of the Region in Sierra County except for the west outskirts of Verdi, California.

Table 2-1: Land Ownership in the Region

Agency, Area Name	Acreage (in Region)	Percent of Total Area
US Forest Service:	507,530	63%
Toiyabe National Forest (including parts of Mokelumne Wilderness and Carson-Iceberg Wilderness)	254,550	32%
Tahoe National Forest	132,400	17%
Lake Tahoe Basin Management Unit (including part of Desolation Wilderness)	120,580	15%
Bureau of Reclamation:		
Boca Reservoir	(included in Tahoe National Forest)	
Prosser Creek Reservoir		
Stampede Reservoir.		
Bureau of Land Management	18,730	2%
Slinkard Wilderness Study Area	1,875	
Other Public domain lands	16,855	
California State Parks:	7,000	0.9%
Burton Creek State Park		
D.L. Bliss State Park		
Donner Memorial State Park		
Ed Z’berg Sugar Pine Point State Park		
Emerald Bay State Park		
Grover Hot Springs State Park		

Agency, Area Name	Acreage (in Region)	Percent of Total Area
Kings Beach State Recreation Area		
Lake Valley State Recreation Area		
Tahoe State Recreation Area		
Ward Creek		
Washoe Meadows State Park		
California Department of Fish and Game	6,280	0.8%
State Lands Commission	5,400	0.7%
Other (Military, other State, Federal)	4,700	0.6%
TOTAL STATE AND FEDERAL LANDS	549,600	68%
Other (Private)	167,370	21%
Lake Tahoe (within California)	85,300	11%
TOTAL LANDS IN THE REGION	802,390	

(a) Acreage Source: Land Status geodatabase, Bureau of Land Management, 2011

2.4.1 State and Federal Lands

Approximately 68% of the Region is comprised of public land including the jurisdictions listed below and shown on Figure 2-2. Approximately 80% of the total area in the Region is open space, including both public and private lands. Public lands include the US Forest Service (USFS), US Bureau of Land Management, US Bureau of Reclamation, and California State Park lands. More detailed land and water use information is found in Section 3.

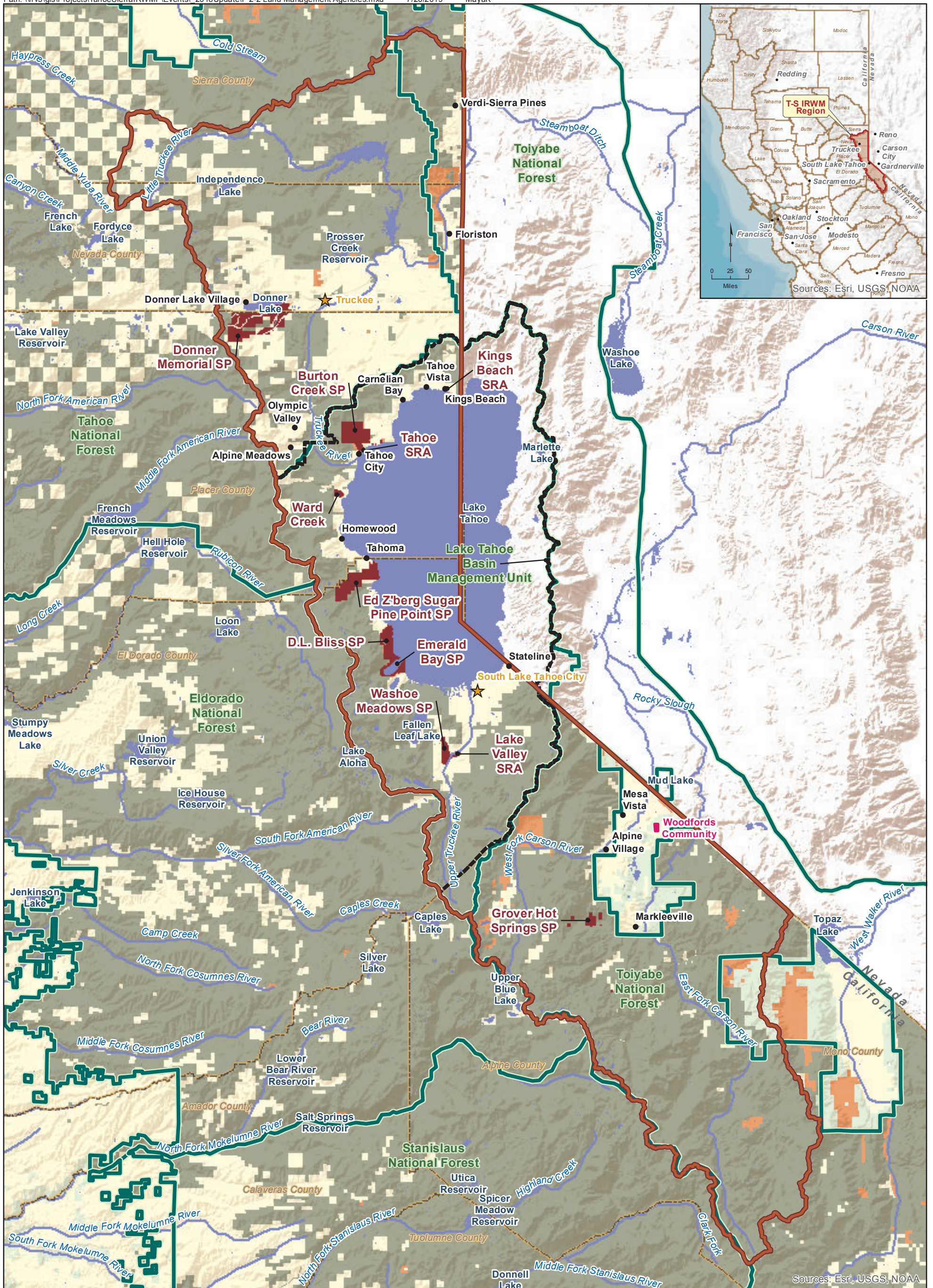
2.4.2 Regional Jurisdictional Agencies

In addition to federal, state, and county governmental organizations and local communities, there are regional government agencies with jurisdiction within the Tahoe-Sierra Region, including the Tahoe Regional Planning Agency, which includes the entire Lake Tahoe Basin in both California and Nevada (Figure 2-1), and the Tahoe Resource Conservation District, which includes the California side of the Lake Tahoe Basin. The entire Region is within the jurisdiction of the Regional Water Quality Control Board – Lahontan Region (Lahontan Regional Board), a State of California agency.

2.4.3 Water and Wastewater Agency Summary

Water suppliers in the Region range from small private water systems to larger public districts including those listed below. Figure 2-3 shows the service areas for the larger water suppliers and identifies almost 100 other California Department of Public Health (CDPH) regulated community and non-community water systems, which are numbered on Figure 2-3 and listed numerically in Appendix 2-A.

- North Tahoe Public Utility District (North Tahoe PUD)
- South Tahoe Public Utility District (South Tahoe PUD)
- Squaw Valley Public Service District (Squaw Valley PSD)
- Tahoe City Public Utility District (Tahoe City PUD)
- Truckee Donner Public Utility District (Truckee Donner PUD)
- Placer County Water Agency (PCWA)
- Almost one hundred other small private water suppliers

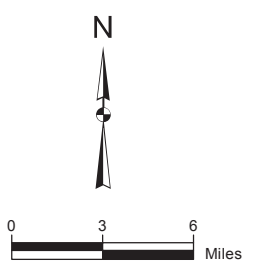


Source: Land Status, Bureau of Land Management, 2011.

Sources: Esri, USGS, NOAA

Legend

- ★ City
- Places
- Woodfords Community
- Bureau of Land Management
- Bureau of Reclamation
- Military
- Other State Lands
- US Forest Service
- Other/Privatey Owned
- Tahoe Regional Planning Agency (TRPA)
- National Forests
- Tahoe-Sierra IRWM Boundary
- California Counties
- State Parks

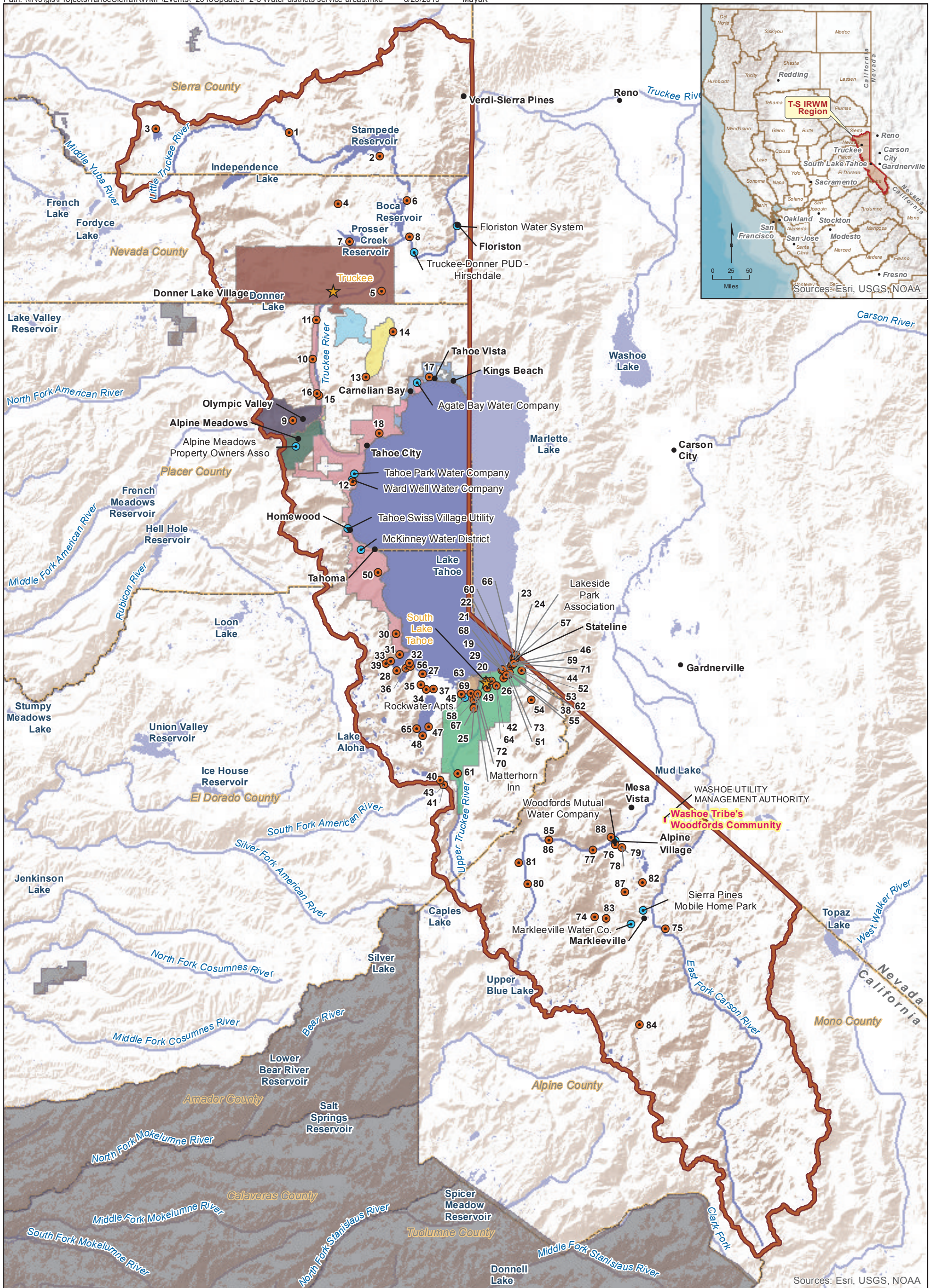


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Land Management Agencies

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Figure 2-2



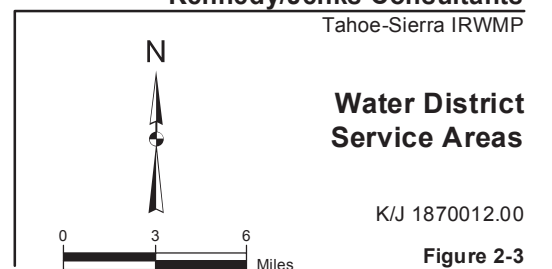
Source: California Department of Public Health, California State Water Resources Control Board

Legend

- | | | |
|---------------------------------------|--|-------------------------------------|
| Washoe Tribe Woodfords Community | Community Water Districts, Area Shown | SOUTH TAHOE PUD - MAIN |
| Tahoe-Sierra IRWM Boundary | ALPINE SPRINGS COUNTY WATER DISTRICT | SQUAW VALLEY MWC |
| California Counties | FULTON WATER COMPANY | SQUAW VALLEY PSD |
| Non-Community Water System | LUKINS BROTHERS WATER COMPANY | TAHOE CITY PUD - MAIN |
| Community Water System | NORTH TAHOE PUD - MAIN | TAHOE KEYS WATER COMPANY |
| Water Districts Outside of the Region | NORTHSTAR C.S.D. | TALMONT RESORT IMPROVEMENT DISTRICT |
| | NORTHSTAR CSD - MARTIS VALLEY | TRUCKEE-DONNER PUD, MAIN |

Note: Community water system is defined as serving at least 25 yearlong residents or having at least 15 yearlong service connections. Non-community water system label numbers reference the corresponding row in Appendix 2-A.

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Water District Service Areas

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Figure 2-3

Outside of these districts' and water companies' jurisdictions, water is supplied through individual private water wells. Some individual property owners located within the service areas of the water suppliers listed above also maintain private water wells.

Wastewater from north Lake Tahoe communities is collected by North Tahoe PUD, Tahoe City PUD, Squaw Valley Public Service District (Squaw Valley PSD), and Alpine Springs, and transported to the Tahoe-Truckee Sanitation Agency (T-TSA). The Truckee Sanitary District (TSD) collects wastewater in the Truckee area and transports it to T-TSA. Wastewater from South Lake Tahoe communities is collected by South Tahoe PUD. The Markleeville Public Utility District collects wastewater in the Markleeville area. Within the Lake Tahoe and Upper Truckee River watersheds, the Porter-Cologne Act requires all wastewater to be collected and discharged outside of the Lake Tahoe Basin. In the rest of the Region, sewerage in areas outside of any public utility districts is through individual septic systems or small ponds.

There are no dedicated flood control agencies in the Region. Stormwater management and flood control is within the purview of the cities and counties, as well as Caltrans along the highways.

2.5 Social and Cultural Makeup

The Region has a relatively small population with most residents concentrated in a few cities and towns, as much of the Region's lands are in Federal management. The Region's economy is dominated by tourism and recreation, which are often associated with seasonal employment, which contribute to the low median household incomes in several communities in the Region.

2.5.1 Population

Based on the 2010 Census data, the total permanent population of the Region is approximately 64,600. Table 2-2 presents the population breakdown by county, and Table 2-3 summarizes select demographic data by county. Nearly all (98%) of the population in the Region is found around Lake Tahoe and along the Truckee River; and approximately 96% of the population is located in the service areas for the four major water districts. Almost half of the permanent population is located in and around the City of South Lake Tahoe.

Table 2-2: Population by County Within the Region

County	2000 Census Population ^(a)	2010 Census Population ^{(a)(b)}	2010 Estimated Population in major water districts ^(b)
Alpine	747	726	
El Dorado	34,042	30,728	33,124 South Tahoe PUD
Nevada	14,950	17,433	16,280 Truckee Donner PUD
Placer	13,973	12,802	7,500 North Tahoe PUD 5,089 Tahoe City PUD ^(c) 1,366 Squaw Valley PSD
Sierra	566	515	
Total	64,278	62,205	61,993

(a) Population calculated from Census tract data, proportional to the area of the tract within the Region (More information in Appendix 2-F).

(b) Census population and water district populations may not be directly comparable as Census population includes only full-time residents while water district populations may include an estimate of non-full-time residents.

(c) Tahoe City PUD service area also includes a small area within El Dorado County.

In the Region there is a significant population of part-time residents including second homeowners, renters, and visitors. According to the 2010 Census data, seasonal, recreational, or occasional use homes account for an average of between 40% and 45% of all homes in the Region. The proportion of seasonal, recreational, or occasional use homes in individual census tracts (or portions thereof) ranges from 16% in east Truckee to 80% along the southwest shore of Lake Tahoe.

Most of the population growth in the Lake Tahoe area occurred immediately after the 1960 Winter Olympics at Squaw Valley. Since 2000, the permanent population has decreased in the entire Lake Tahoe Basin including both California and Nevada (TRPA 2013) from 63,000 residents to 53,000. In Alpine County the population increased 3.7% between 2003 and 2008, with a 4% increase for Markleeville and Woodfords (Alpine County 2009). Unincorporated Nevada County has seen slow population growth of approximately 1 to 1.5% between 2000 and 2008. Overall within the Region, the population growth between 2000 and 2010 has been very modest at less than 0.5%. The major water suppliers in the Region serve most of the population within the Region and have projected approximately 0.4% annual population growth in the next two decades (PR Design and Engineering 2011, Winzler & Kelley 2011, Auerbach Engineering 2011, Truckee Donner PUD 2011).

Table 2-3: Regional Demographics

	Alpine County	Eldorado County	Nevada County	Placer County	Sierra County
Age					
Under 5 years	6%	6%	6%	5%	5%
5 to 9 years	7%	5%	7%	5%	4%
10 to 14 years	6%	5%	6%	5%	5%
15 to 19 years	5%	6%	6%	5%	5%
20 to 24 years	4%	8%	5%	7%	4%
25 to 29 years	4%	8%	8%	9%	4%
30 to 34 years	4%	7%	7%	8%	4%
35 to 39 years	5%	6%	8%	7%	5%
40 to 44 years	7%	6%	8%	7%	6%
45 to 49 years	9%	8%	8%	7%	8%
50 to 54 years	10%	9%	9%	8%	10%
55 to 59 years	11%	8%	8%	8%	11%
60 to 64 years	9%	6%	6%	7%	11%
65 to 69 years	6%	4%	4%	5%	7%
70 to 74 years	4%	2%	2%	3%	5%
75 to 79 years	3%	2%	1%	2%	4%
80 to 84 years	2%	1%	1%	1%	2%
85 years and over	1%	1%	0%	1%	2%
Gender					
Male:	52%	53%	52%	54%	51%
Female:	48%	47%	48%	46%	49%

Race, Ethnicity	Alpine County	Eldorado County	Nevada County	Placer County	Sierra County
White	75%	79%	87%	90%	93%
American Indian	20%	1%	1%	0%	1%
Asian	1%	4%	1%	1%	0%
Black or African American	0%	1%	0%	0%	0%
Two or More Races	2%	3%	2%	2%	2%
Other Race	2%	11%	8%	5%	2%
Hispanic or Latino (of any race)	7%	24%	18%	23%	8%

(a) Source: 2010 US Census, by census tract, proportional to area of tract within Region.

2.5.2 Socioeconomic Conditions

All of the communities in the Region share a largely tourist-based economy as people from around the world are attracted to the area's year-round natural resources. Approximately 3 million people visit the Lake Tahoe Basin each year (North Lake Tahoe Visitors Bureau 2013), and some of these individuals visit the Truckee and Alpine County areas as well. Tourist attractions include skiing and other winter sports, hiking, fishing, kayaking, and boating on Lake Tahoe. Recreation and tourism accounts for approximately one third of employment throughout the Region (American Community Survey, 2007-2011), and education and public service account for another fifth. Priority LU-1.1 of the TRPA Regional Plan states that "the primary function of the region shall be as a mountain recreation area with outstanding scenic and natural values" (TRPA 2012b).

2.5.3 Disadvantaged Communities

Disadvantaged Communities (DACs) are defined by both Propositions 50 and 84, the 2002 Water Security, Clean Drinking Water, Coastal and Beach Protection Act and 2006 Safe Drinking Water Bond Act, as communities whose average median household income (MHI) is less than 80% of the statewide MHI. The statewide MHI for the 5-year period of 2012-2016 was \$ 63,783, so the DAC threshold is \$51,026. Severely disadvantaged communities are defined as communities whose average MHI is less than 60% of the statewide MHI or \$38,270.

In the Region approximately 21% of the population resides in DACs, including parts of City of South Lake Tahoe, Kings Beach, the Washoe Tribe's Woodford Community, and part of rural Nevada County as shown on Figure 2-4. Table 2-4 summarizes the DAC data by Census block group, census tract, and census designated place within the Region. The block groups, tracts, and places can overlap therefore an accurate total of DAC residents cannot be calculated. However, based on the MHI data within the Region, it appears that about one-third of Alpine County is DAC, up to two-thirds of El Dorado County/South Lake Tahoe may be DAC, almost one-third of Placer County is DAC and about 10% of Nevada County is DAC.

2.5.4 Native American Tribes

As discussed earlier, the historic range of the Washoe Tribe was centered around Lake Tahoe in both California and Nevada, both geographically and spiritually. Like most native peoples the Washoe lifestyles revolved around the environment; the people were part of the environment, and everything was provided by the environment (Washoe Tribe 2014). Allotments were given to the Washoe in 1893, including allotments in Alpine County in California. Currently most of the

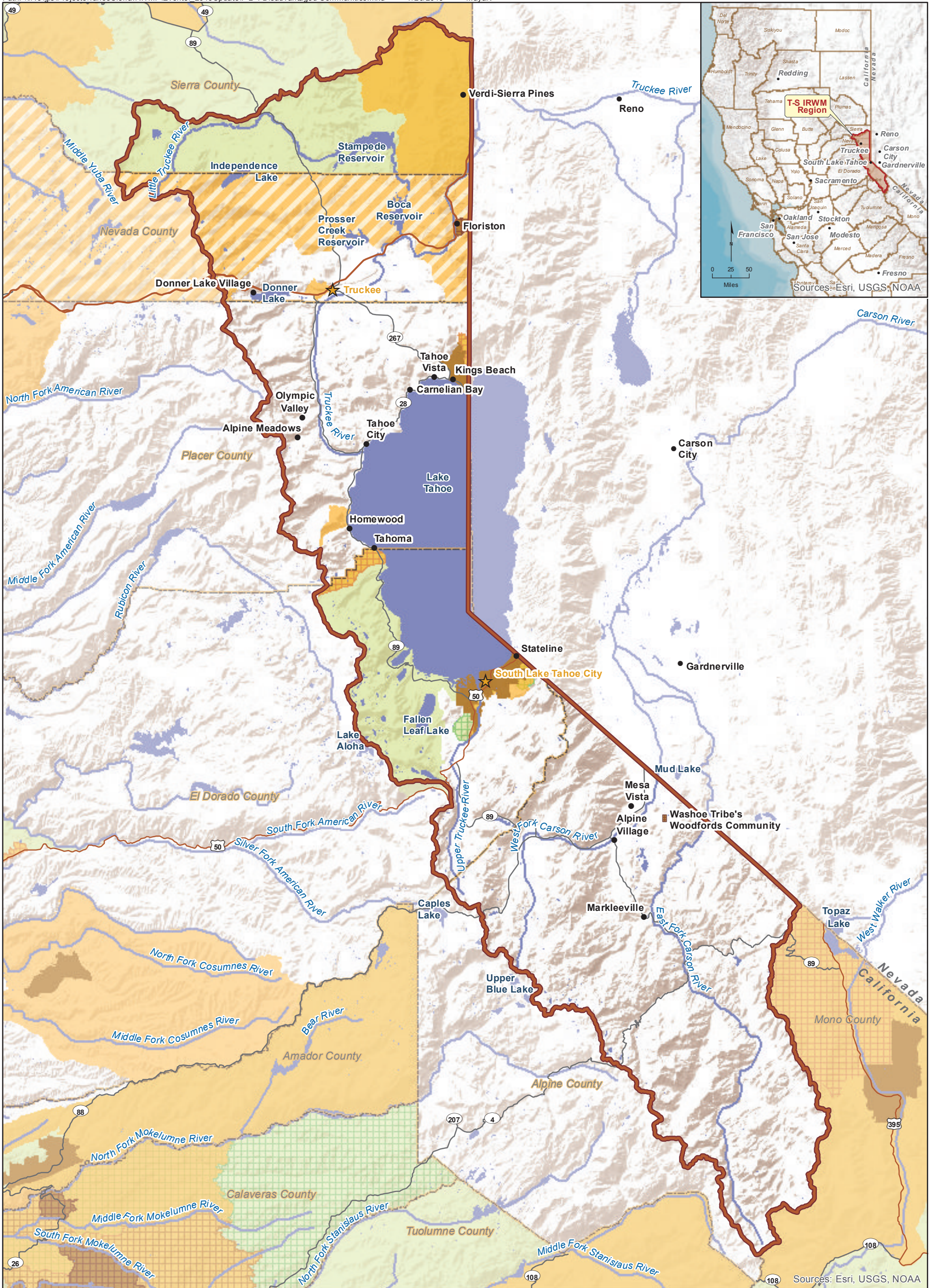
Washoe tribal colonies are located in Nevada under the leadership of the Washoe Tribe of Nevada and California, which is a federally recognized tribe of Washoe first organized in 1937.

The Washoe Tribe’s only community within California is the Tribe’s Woodfords Community (Hung- A-Lel-Ti), which is located in Alpine County near Alpine Village (Figure 2-1). In 1920, Congress passed Public Law 91-362 which granted 80 acres of land to the Tribe. On July 31, 1970 Congress finally passed a bill which established the present Woodfords Community. Woodfords Community is in one of the most remote and rugged areas of the Eastern Sierra Nevada Range. The Community is located on a very rocky hilltop which required blasting of trenches to install water and sewer lines (Washoe Tribe 2008). The Woodfords Community was initially granted 80 acres and has supplemented with other parcels over time, some of which are in conservation or used for cultural activities. The Washoe have several hundred acres of

Table 2-4: DAC Population

County	Total Population in Region ^(a,d)	DAC Population by Census Block Groups ^(a,b,d)		DAC Population by Census Tract ^(a,b,d)		DAC Population by Census Designated Place ^(a,b,d)		
Alpine	732	None		None		Washoe Tribe's Woodfords Community	230	
El Dorado	22,222			Tract 302 BG 1 & 2 ^(c)	3,086	South Lake Tahoe	21,506	
		Tract 303.01 (South Lake Tahoe)	2,279	Tract 303.01 BG 1, 2, & 3	2,279			
		Tract 303.02 (South Lake Tahoe)	2,783	Tract 303.02 BG 1, 2, 3, & 4	2,783			
				Tract 304.01 BG 4 & 5	1,452			
		Tract 304.02 (South Lake Tahoe)	3,754	Tract 304.02 BG 2 & 4	1,643			
		Tract 316 (South Lake Tahoe)	3,854	Tract 316 BG 1, 3 & 4	2,561			
Nevada	17,576	None		Tract 12.06 BG 2	1,354	Floriston	30	
Placer	61,528	Tract 201.07 (Kings Beach)		2,968	Tract 201.07 BG 1 & 3	1,639	Kings Beach	3,230
					Tract 223 BG 1	102		
Sierra	467	Tract 100	467	Tract 100 BG 1	260	None		

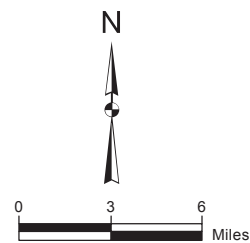
- (a) Based on proportion of area of county within the region.
- (b) Census tracts, blocks and census designated places can overlap and cannot be summed to calculate the percentage of the population in DACs.
- (c) BG = Block Group
- (d) Data source: California Department of Water Resources DAC GIS files for 2012-2016 Census



Source: DAC Areas compiled by DWR Using US Census Bureau - American Community Survey (ACS); 5-year period 2006-2010.

Legend

- ★ City
 - Places
 - ▭ Tahoe-Sierra IRWM Boundary
 - ▭ California Counties
- | | |
|--|---|
| <p>DACs (Census Places, 2016)</p> <ul style="list-style-type: none"> ▭ Severely DAC (MHI < \$38,270) ▭ DAC (MHI < \$51,026) <p>DACs (Census Tract, 2016)</p> <ul style="list-style-type: none"> ▭ Severely DAC (MHI < \$38,270) ▭ DAC (MHI < \$51,026) | <p>DACs (Census Blocks, 2016)</p> <ul style="list-style-type: none"> ▭ Severely DAC (MHI < \$38,270) ▭ DAC (MHI < \$51,026) <p>DACs (Census Blocks, 2010)</p> <ul style="list-style-type: none"> ▭ DAC (MHI < \$48,706) ▭ (No Data Available 2016) |
|--|---|



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Disadvantaged Communities

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Figure 2-4

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Washoe allotment lands in Alpine County and also have tribal lands in the northern portion of the Region, although no people reside there (Washoe Tribe 2009). The Washoe Tribe also has several enterprises around Lake Tahoe including the Meeks Bay Resort & Marina, which is operated by the Washoe Tribe under a Special Use Permit from the USFS.

2.6 Land Use Summary

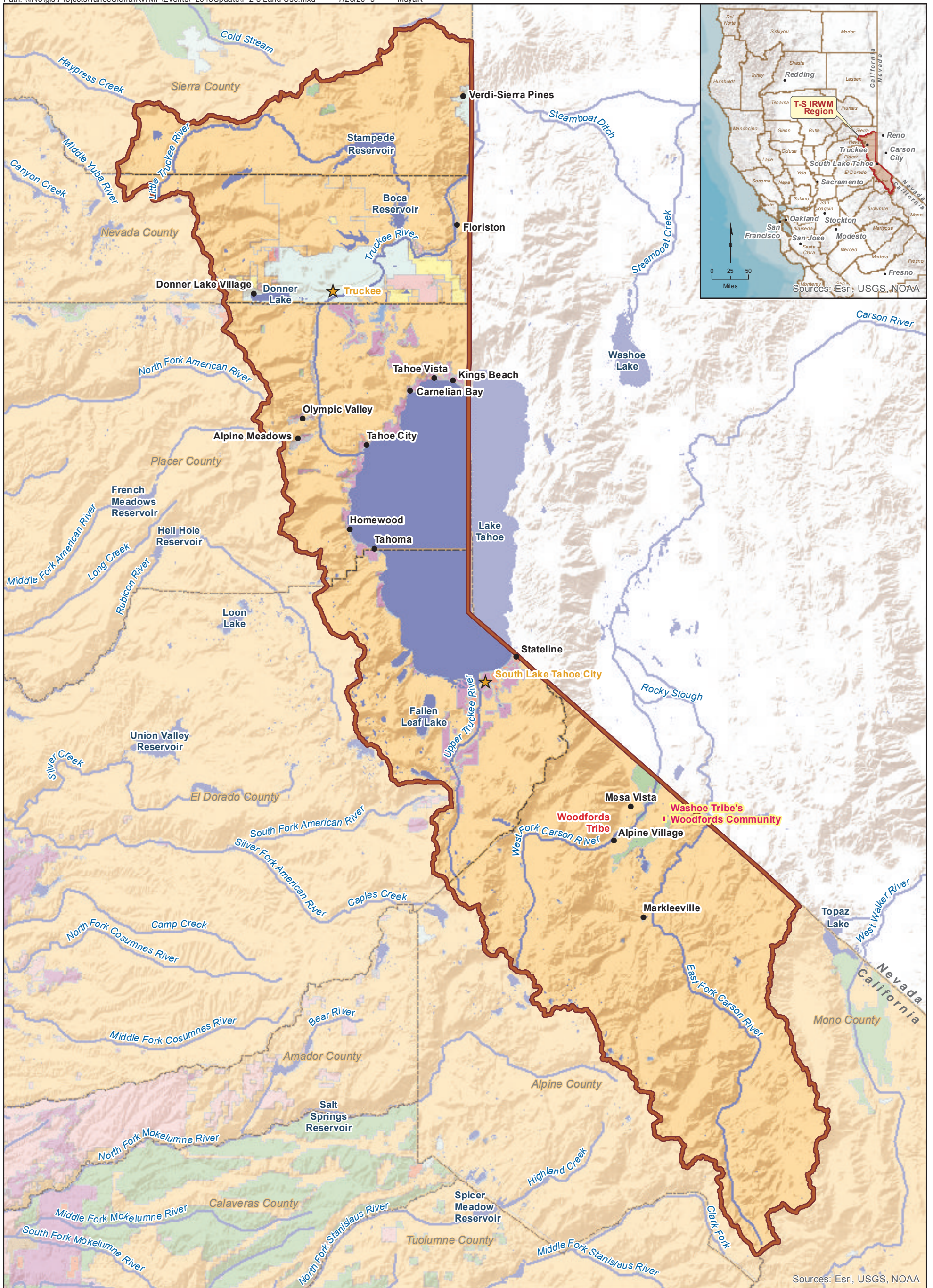
The majority of the land in the Region, approximately 80% of the total area, is open space (including both public and privately owned lands) as shown on Figure 2-5. Approximately 3% of the land area is residential development (mostly located around Lake Tahoe), 3% is mixed urban (the Town of Truckee), and only 1% of the land area is used for agriculture. Most of the urban areas and rural communities are clustered around Lake Tahoe or are located along highways. Most of the agricultural land is located in Alpine County along the East and West Forks of the Carson River and consists of predominantly alfalfa or pasture grasses for grazing.

The public lands and open space such as national forests, parks, wilderness, reservoirs, timberlands, ranches, and private resorts within the Region accommodate a variety of uses including timber harvesting, mineral extraction, grazing, research, wilderness, and recreation. Historically, timber harvesting and mineral extraction were the main economic drivers in the national forests; however, recreation is now the prevailing economic driver. National forests within the Region contain many varied opportunities for recreation including ski resorts; campgrounds; and trails for hiking, biking, cross-country skiing, horseback riding, and off-highway vehicles.

In the Lake Tahoe Basin, land use and development has been tightly regulated since the 1980s by TRPA in order to maintain the water quality and clarity of Lake Tahoe. The Bi-State Compact required TRPA to develop environmental threshold carrying capacities and develop a regional plan for implementing those thresholds. TRPA uses land coverage, or impervious surface area, as determined through the Bailey Land Scoring System for lots developed prior to 1987 and the Individual Parcel Evaluation System for lots developed since 1987. Limits on land coverage effectively limit residential and commercial development within the Lake Tahoe Basin.

More detailed discussion on land use and its relationship to water planning is found in Section 3.

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Source: California Resources Agency Land Use, 2010.

<p>Legend</p> <ul style="list-style-type: none"> ★ City ● Places ▭ Woodfords Community ▭ Tahoe-Sierra IRWM Boundary ▭ California Counties 		<p>Land Use (2010)</p> <ul style="list-style-type: none"> ▭ Agricultural ▭ High Density Commercial ▭ Low Density Commercial ▭ Mixed Use (Res/Comm) ▭ High Density Residential ▭ Medium Density Residential ▭ Low Density Residential ▭ Very Low Density Residential ▭ Industrial ▭ Public Lands ▭ Planned Development ▭ Urban Reserve ▭ Water 	<p>Kennedy/Jenks Consultants Tahoe-Sierra IRWMP</p> <p>Land Use</p> <p>KJ 1870012.00</p> <p>Figure 2-5</p>
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2.7 Climate

The Tahoe-Sierra Region is located in the Sierra Nevada mountain range, with elevations ranging from 4,840 to 10,881 feet amsl at Freel Peak. The majority of the Region is above 5,000 feet amsl. Due to the high elevation, the Region experiences an alpine climate that is dominated by long winters with significant snow fall. Summers are generally short and dry.

Meteorological data including temperature and precipitation is collected at stations located throughout the US by the National Oceanic and Atmospheric Administration and available for download at the Western Regional Climate Center. The stations located within the Region are located around 6,000 feet amsl elevation; higher elevations in the Region would be expected to have more annual average snowfall and lower annual average temperatures than the available station data.

Figures 2-6 and 2-7 present plots of the average minimum temperatures and average precipitation for the periods of record at select stations throughout the Region. Station locations are shown on Figures 2-8, 2-9, and 2-10 for each watershed area. Table 2-5 summarizes the minimum, average, and maximum precipitation for the periods of record at the selected stations. In the Truckee River and Lake Tahoe vicinities, the average low temperatures are typically above freezing for only three to four months of the year and snow is typically present for seven months per year. Most precipitation occurs as snow during the winter months, with a minor amount of rain falling during the summer months. Higher elevation stations, such as at Donner Memorial State Park, typically have higher precipitation than lower elevation stations such as Tahoe Valley near South Lake Tahoe.

Table 2-5: Historical Precipitation Summaries

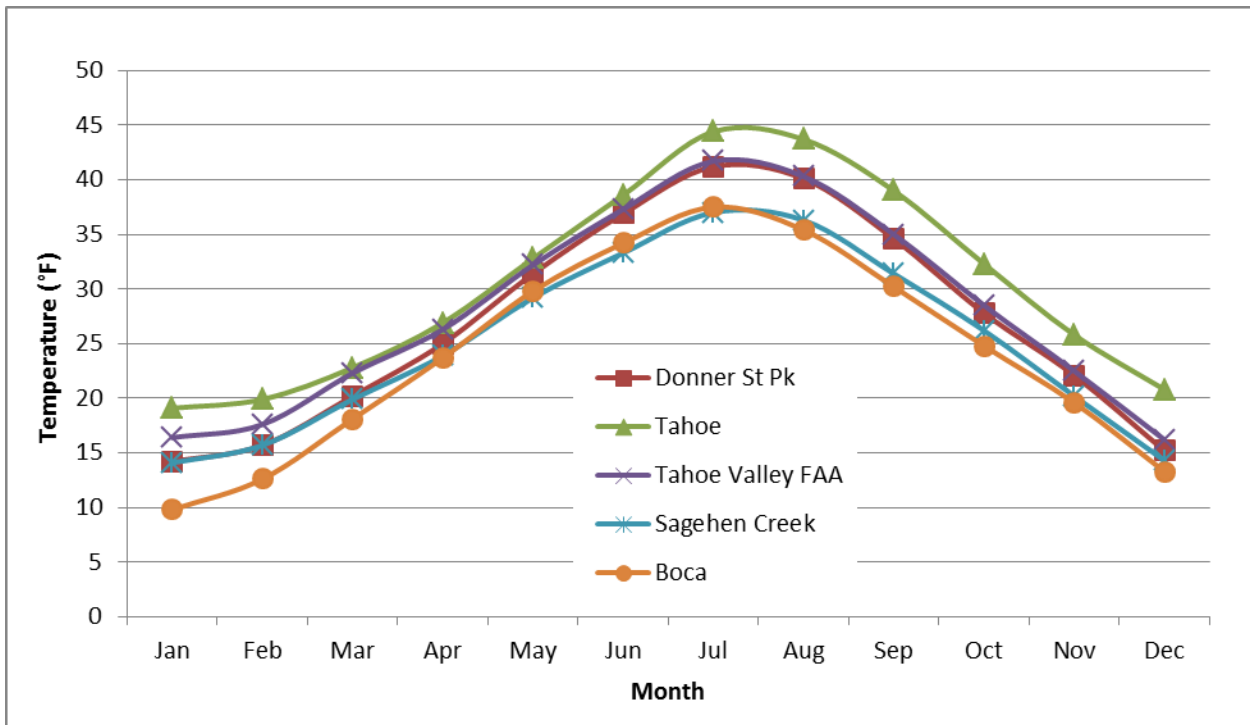
	Boca (Little Truckee River HU)			Sagehen Creek (Little Truckee River HU)			Donner Memorial St Pk (Truckee River HU)			Tahoe City, California (Lake Tahoe HU)			Tahoe Valley FAA Ap, California (Lake Tahoe HU)		
	min	mean	max	min	mean	max	Min	mean	max	min	mean	max	min	mean	max
Jan	0.01	4.33	23.6	0.31	5.54	20.33	0.16	7.01	19.79	0.08	5.92	22.82	0.03	1.9	4.73
Feb	0	3.27	16.31	0.1	5.29	23.67	0.02	6.09	16.41	0	5.24	22.25	0	1.85	4.97
Mar	0.1	3.05	19.43	0.3	4.71	18.62	0.46	5.73	20.89	0.11	4.1	19.58	0.42	2.25	6.45
Apr	0	1.2	6.12	0.09	2.16	6.98	0	2.67	9.88	0.06	2.14	8.25	0.02	1.19	2.77
May	0	1.11	5.59	0.14	1.52	6.39	0	1.61	6.26	0	1.2	4.33	0.03	0.93	3.04
Jun	0	0.63	4.07	0	0.68	2.71	0	0.85	2.99	0	0.65	2.64	0	0.41	2.37
Jul	0	0.45	2.4	0	0.41	2.83	0	0.35	3.93	0	0.26	2.66	0	0.32	2.17
Aug	0	0.4	3.18	0	0.56	3.89	0	0.5	3.58	0	0.3	2.56	0	0.29	1
Sep	0	0.54	4.17	0	0.83	4.8	0	0.8	4.93	0	0.59	4.78	0	0.16	0.48
Oct	0	1.23	6.27	0	2.13	11.12	0	2.06	12.12	0	1.81	8.34	0	1.63	5.95
Nov	0	2.41	10.68	0	4.01	17.08	0	4.53	16.65	0	3.59	13.73	0.59	1.74	4.25
Dec	0	3.6	14.92	0	5.64	25.68	0	6.9	29.03	0	5.61	27.55	0	3.63	13.83
Annual	10.1	22.09	43.6	14.87	34.16	66.21	18.47	39.59	73.51	9.34	31.66	66.41	7.71	17.1	31.15

(a) Boca (040931) period of record 1906-2013, elevation 5580 feet amsl; Sagehen Creek (047641) period of record 1953-2010, elevation 6340 feet amsl; Donner Memorial St Pk (042467) period of record 1953-2013, elevation 5940 feet amsl; Tahoe City, California (048758) period of record 1903-2013, elevation 6230 feet amsl; Tahoe Valley FAA Ap, California (048762) period of record 1968-2013, elevation 6250 feet amsl.

(b) All measurements in inches.

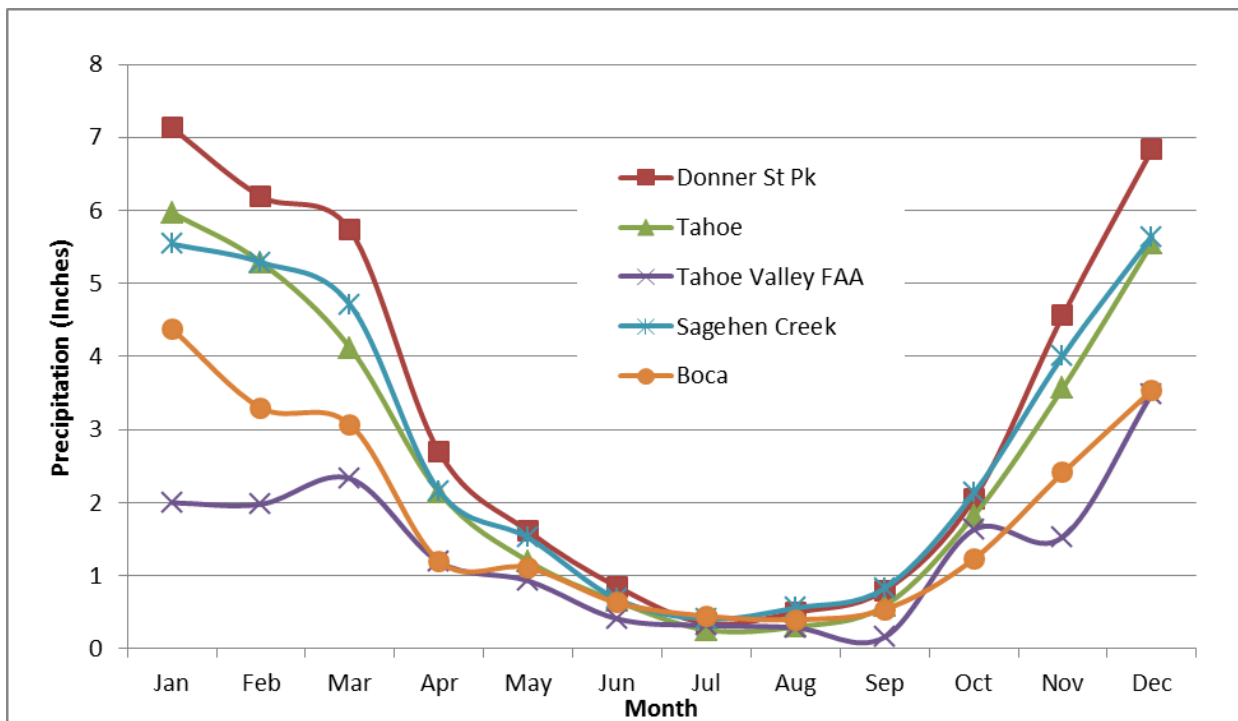
Climate change models project potential changes for the Region and surrounding areas in the coming decades. According to the climate change model results presented on Cal-Adapt.org, a web resource for accessing data and visualizing model results of the potential effects of climate change in California, over the next century the Region could see a 2.5 to 4 degree increase in both winter low and high temperatures under a low greenhouse gas (GHG) emissions scenario and a 4.5 to 5.5 degree increase under a high GHG emissions scenario; and 3.5 to 5 degree increase in summer high temperatures under a low GHG emissions scenario and a 7 to 9 degree increase under a high GHG emissions scenario (Degrees of Change Tool, Cal-Adapt 2014b). Increases in the winter temperatures may affect snowpack, with potential decreases in accumulation of snow. More information about the climate models referenced in this section is found in Appendix 2-F.

Climate models do not show that significant change in total precipitation is likely in the Region and surrounding areas, but they do project a shift towards more precipitation in the form of rain instead of snow. Precipitation pattern projections are uncertain, but the snowpack in the Sierra Nevadas may decrease by 35% for a low GHG emissions scenario to 90% for a high GHG emissions scenario (Snowpack Decadal Averages Tool, Cal-Adapt 2014a). Increasing temperatures would affect the Region’s snowpack through decreases in the amount of water stored in the snowpack, shifts in the timing of peak snowmelt to occur earlier in the season, and accelerated melt due to more occurrences of rain-on-snow events with potential increases in erosion and sedimentation.



Source: Western Regional Climate Center, <http://www.wrcc.dri.edu/climatedata/climsum/>

Figure 2-6: Historical Average Minimum Temperatures



Source: Western Regional Climate Center, <http://www.wrcc.dri.edu/climatedata/climsum/>

Figure 2-7: Historical Average Total Precipitation

2.8 Watersheds and Groundwater Basins

The Tahoe-Sierra Region includes the Little Truckee River, Truckee River, East Fork Carson River, West Fork Carson River, and Lake Tahoe (California) hydrologic units (HU) as defined by the Department of Water Resources (DWR) mapping unit (Figure 2-1). Hydrologic Units is the term used by DWR to define watersheds. The Lake Tahoe HU straddles the California-Nevada state line, however, only the portion that is in California is part of the Tahoe-Sierra Region. The watersheds defining the Tahoe-Sierra Region are not hydrologically connected to the Sacramento-San Joaquin River Delta, but instead drain east into Nevada. DWR has defined four groundwater basins in the Tahoe-Sierra Region, the Tahoe Valley Basin in the Lake Tahoe HU, the Martis Valley and Olympic Valley Basins in the Truckee River HU, and the Carson Valley Basin in the Carson River HUs. The HU and associated groundwater basins are described in the HU Sections that follow.

2.8.1 Beneficial Uses

The *Water Quality Control Plan for the Lahontan Region* (Basin Plan [Lahontan Regional Board 1995, amended 2011]) established beneficial uses for the surface water bodies and groundwater basins under the jurisdiction of the Lahontan Regional Board. Table 2-6 summarizes the beneficial uses by HU and groundwater basin. Beneficial uses that are common to almost all water sources in the Region include municipal and domestic supply, and agricultural supply. Contact and noncontact recreation, fishing, and habitat are beneficial uses designated for nearly all surface water bodies in the Region. Some individual surface water bodies have additional beneficial uses including freshwater replenishment (maintenance of surface water quantity or quality); navigation; preservation of biological habitats of special

significance; support of habitat necessary for rare, threatened, or endangered species; migration of aquatic organisms; water quality enhancement of downstream waters; and flood peak attenuation or flood water storage.

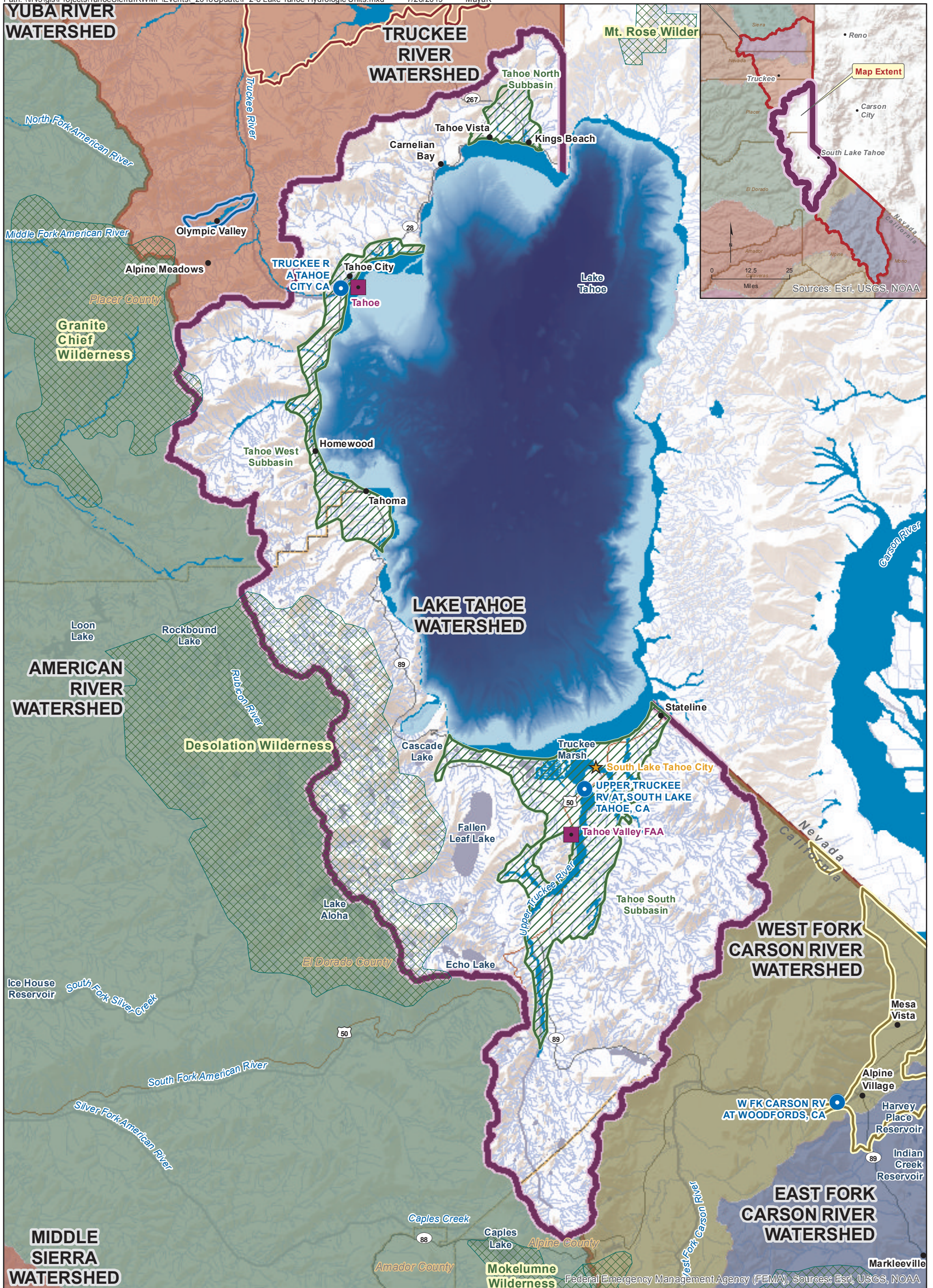
Table 2-6: Beneficial Use Designations

Beneficial Use	Surface Water					Groundwater				
	Lake Tahoe HU	Little Truckee River HU	Truckee River HU	West Fork Carson River HU	East Fork Carson River HU	Tahoe Valley – South Basin	Tahoe Valley – North Basin	Carson Valley Basin	Martis Valley Basin	Olympic Valley Basin
Municipal and domestic supply	■	■	■	■	■	■	■	■	■	■
Agricultural supply	■	■	■	■	■	■	■	■	■	■
Industrial service supply			■	■	■	■		■		
Groundwater recharge	■	■	■	■	■					
Freshwater replenishment	■	■	■	■	■			■		
Navigation	■	■	■	■	■					
Hydropower generation										
Recreation: water contact	■	■	■	■	■					
Recreation: noncontact										
Commercial and sport fishing	■	■	■	■	■					
Cold freshwater habitat	■	■	■	■	■					
Wildlife habitat	■	■	■	■	■					
Preservation of biological habitats of special significance	■	■	■	■	■					
Rare, threatened, or endangered species	■	■	■	■	■					
Migration of aquatic organisms	■	■	■	■	■					
Spawning, reproduction, and development	■	■	■	■	■					
Water quality enhancement	■	■	■	■	■					
Flood peak attenuation or flood water storage	■	■	■	■	■					

- (a) Black squares indicate that the beneficial use has been designated for all or nearly all surface water bodies in the HU, or for the entire groundwater basin. Shaded squares indicate that one or more surface water bodies in the HU have that beneficial use designation.
- (b) Source: Basin Plan (Lahontan Regional Board 1995, amended 2011)

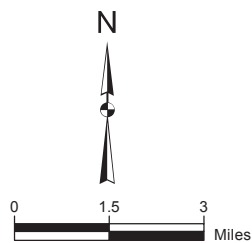
2.8.2 Lake Tahoe Basin

The Lake Tahoe HU in California, shown on Figure 2-8, drains an area of approximately 240 square miles that surrounds Lake Tahoe on the California side, and includes the Upper Truckee River on the south side of the lake. Approximately two-thirds of the entire Lake Tahoe HU is located in California, mostly in Placer and El Dorado Counties, with a small area in Alpine County at the southern tip of the headwaters to the Upper Truckee River. The Lake Tahoe HU is bounded to the west by the crest of the Sierra Nevadas and on the east by the Carson Range,



Source: California Interagency Watershed Mapping Committee, 2001; California Department of Water Resources (DWR), 2003.

- | | | | |
|------------------------------|-----------------|--------------------|-----------------|
| ★ City | ● Places | ■ Weather Stations | ● Stream Gauges |
| Legend | | | |
| Groundwater Basins | | | |
| ■ Olympic Valley | ■ Carson Valley | ■ Martis Valley | ■ Tahoe Valley |
| ■ Tahoe-Sierra IRWM Boundary | | | |
| ■ California Counties | | | |
| ■ Federal Wilderness Areas | | | |
| ■ 100 Year Flood Zones | | | |



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Tahoe-Sierra IRWMP

**Lake Tahoe
Hydrologic Units**

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Figure 2-8

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which is mostly located in Nevada. As a headwater HU, all surface water in the Lake Tahoe HU is from precipitation, mostly snowmelt, with no inputs from outside of the HU. The only discharge from the HU is through the Truckee River on the north side of Lake Tahoe at Tahoe City.

The principal feature of the Lake Tahoe HU is Lake Tahoe, which is approximately 192 square miles in total area. The surface elevation of Lake Tahoe ranges between 6,223 and 6,229.1 feet amsl, as controlled by the Lake Tahoe Dam at the discharge to the Truckee River. The highest point in the HU is Mount Freel at 10,881 feet amsl. In addition to Lake Tahoe, there are 170 other lakes and 63 tributary streams in the Lake Tahoe HU, most of which are located in California.

The Upper Truckee River is the main tributary to Lake Tahoe. It drains an area of approximately 57 square miles on the south side of Lake Tahoe (Lahontan Regional Board 2010) and supplies approximately 40% of the total flow to the lake (TERC 2013b). TRPA and the Regional Board selected the Upper Truckee River watershed as a Focus Watershed for water quality issues.

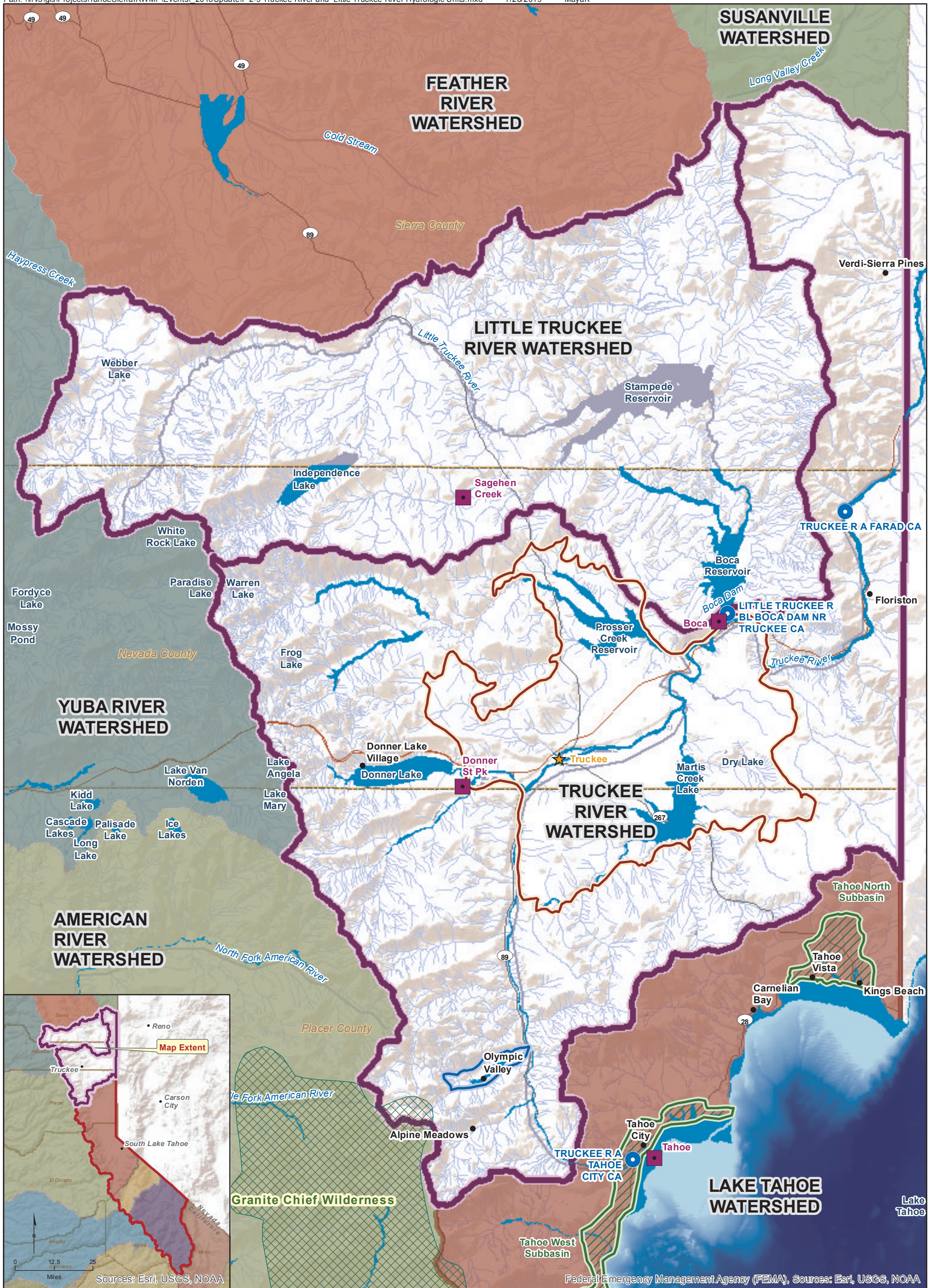
The Tahoe Valley groundwater basin is located within the Lake Tahoe watershed around the lake and to the south under the Upper Truckee River. The basin is divided into three subbasins: Tahoe South, Tahoe West, and Tahoe North. The Tahoe South subbasin underlies an area of approximately 23 square miles along the south edge of Lake Tahoe (DWR 2003) and extends south approximately 9 miles along the Upper Truckee River. Total storage capacity of the Tahoe South subbasin has been estimated at 936,760 acre-feet, with 827,625 acre-feet of groundwater in storage (DWR 2004a). Approximately fifty CDPH regulated water systems rely on the Tahoe South subbasin. The Tahoe West subbasin underlies approximately 9 square miles in a strip along the west edge of Lake Tahoe between Dollar Point on the north and Tahoma on the south. Fifteen CDPH regulated water systems rely on the Tahoe West subbasin. The Tahoe North subbasin underlies approximately 4 square miles on the north edge of Lake Tahoe extending north approximately 2 miles. Three CDPH regulated water systems rely on the Tahoe North subbasin. The primary source of groundwater in the Tahoe Valley basin are glacial, fluvial, and lacustrine basin fill deposits overlying the bedrock and recharged primarily through infiltration of snowmelt throughout the basin. Some recharge also occurs through stream seepage. The general groundwater flow direction in all of the Tahoe Valley groundwater basins is towards Lake Tahoe.

2.8.3 Truckee River

The Truckee River HU in California is approximately 255 square miles in the mountains on the north side of Lake Tahoe, located in Placer, Nevada, and Sierra Counties as shown on Figure 2-9. The Truckee River HU is bounded to the west by the crest of the Sierra Nevadas, to the south by the Lake Tahoe HU and to the north by the Little Truckee River HU. Inputs to the Truckee River HU include precipitation and surface water from Lake Tahoe and the Little Truckee River.

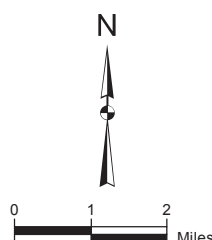
The principal feature of the HU is the Truckee River, which is the single outlet of Lake Tahoe, generally flowing north and east into Nevada and ultimately draining to Pyramid Lake in Nevada. From the outlet of Lake Tahoe to the state line, the Truckee River drops approximately 1,200 feet in elevation to approximately 5,050 feet amsl. The main tributary to the Truckee River in California is the Little Truckee River, which is in a separate HU. There are several lakes in the

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Source: California Interagency Watershed Mapping Committee, 2001; California Department of Water Resources (DWR), 2003, National Hydrography Dataset (NHD) USGS, 2012.

- Legend**
- ★ City
 - Places
 - Weather Stations
 - Stream Gauges
 - ▭ Tahoe-Sierra IRWM Boundary
 - 100 Year Flood Zones
 - ▭ California Counties
 - ▭ Federal Wilderness Areas
 - ▭ Groundwater Basins
 - ▭ Olympic Valley
 - ▭ Carson Valley
 - ▭ Martis Valley
 - ▭ Tahoe Valley



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Truckee River and Little Truckee River Hydrologic Units

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Figure 2-9

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Truckee River watershed including Donner Lake, Martis Creek Reservoir, and Prosser Creek Reservoir. Donner Lake is dammed naturally by a glacial moraine; in 1928 an outlet structure with flow measurement was constructed. The Prosser Creek Reservoir was created in 1962 when the Prosser Creek Dam was constructed 1.5 miles upstream of the confluence with the Truckee River as part of the Washoe Project. The Martis Creek Reservoir was created in 1972 when the Martis Creek Dam was constructed approximately 2 miles upstream of the confluence with the Truckee River.

The Martis Valley and Olympic Valley groundwater basins are located within the Truckee River watershed. The Martis Valley basin underlies approximately 57 square miles in and around the Martis Valley approximately 5 miles north of Lake Tahoe. It is an intermontane basin with most storage occurring in glacial and alluvial basin fill deposits. The total groundwater storage capacity has been estimated to be 9,680,000 acre-feet with 484,000 acre-feet of groundwater in storage (DWR 2006a). Studies of the basin have estimated groundwater recharge to range from 18,000 to 34,560 acre-feet per year ([afy] Brown and Caldwell 2013). Recharge by T-TSA also contributes to the total recharge of the basin, up to 9.6 million gallons per day (mgd) 7-day average (Quad Knopf, Inc. 2003). The Olympic Valley groundwater basin underlies an approximately 1 square mile valley in the mountains west of the Truckee River along Squaw Creek. Groundwater storage in the Olympic Valley groundwater basin is primarily in glacial, alluvial, and lacustrine basin fill deposits recharged through infiltration of snowmelt. Ten CDPH regulated water systems rely on the Martis Valley groundwater basin, and three CDPH water systems rely on the Olympic Valley groundwater basin.

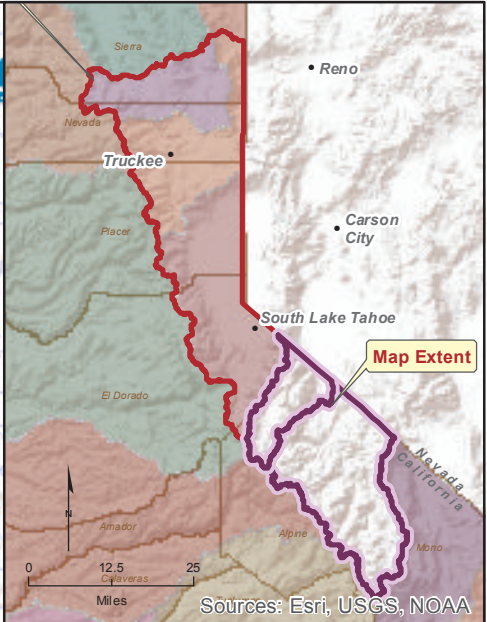
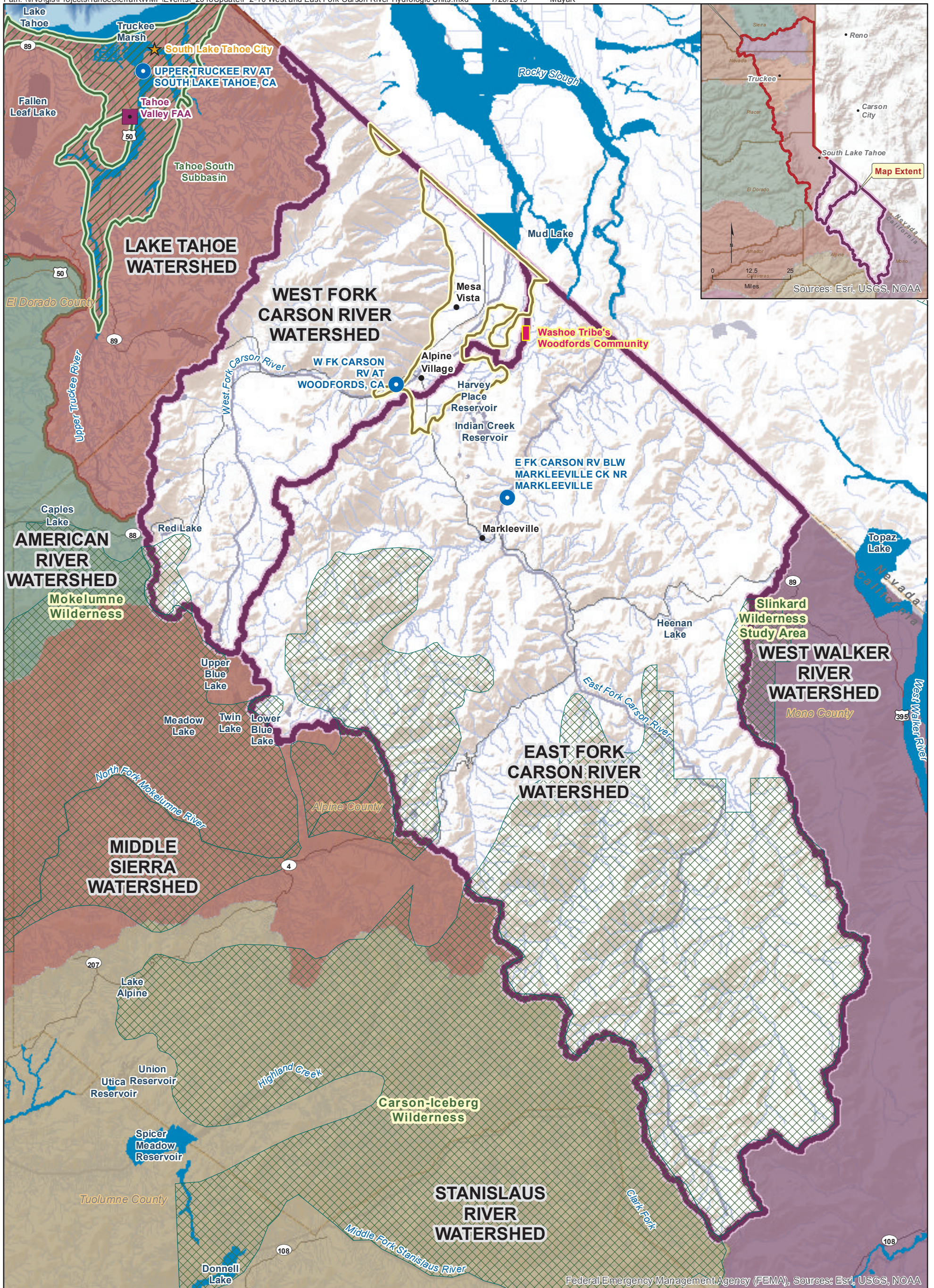
2.8.4 Little Truckee River

The Little Truckee River HU is an approximately 175 square mile watershed in the mountains northwest of the Truckee River as shown on Figure 2-9. It is located on the east slope of the Sierra Nevadas in Sierra and Nevada Counties. As a headwater HU, all surface water in the Little Truckee River HU is from precipitation, mostly snowmelt, with no inputs from outside of the HU. The principal feature of the HU is the Little Truckee River, which is the largest tributary to the Truckee River entirely within California. There are several lakes in the HU including Webber Lake and Independence Lake, and two man-made reservoirs, Boca Reservoir and Stampede Reservoir. Boca Reservoir was created when the Boca Dam was constructed approximately one third of a mile upstream of the confluence with the Truckee River in 1939 as the main part of the Bureau of Reclamation's Truckee Storage Project. The Stampede Reservoir was created when the Stampede Dam was constructed approximately 8 miles upstream of the confluence with the Truckee River in 1970 as part of the Bureau of Reclamation's Washoe Project.

2.8.5 West Fork Carson River

In California, the West Fork Carson River HU is approximately 105 square miles located south of the Lake Tahoe HU in El Dorado and Alpine Counties as shown on Figure 2-10. The West Fork Carson River HU is bounded on the southwest by the crest of the Carson Range of the Sierra Nevadas, to the northwest by the Lake Tahoe HU and to the southeast by the East Fork Carson River HU. At the north end of the HU is the southern tip of the Carson Valley. As a headwater HU, all surface water in the West Fork Carson River HU is from precipitation, mostly snowmelt, with no inputs from outside of the HU. The principal feature of the HU is the West Fork of the Carson River which flows northeast into Nevada and ultimately into the Carson Sink. There are several small lakes in the headwaters of the West Fork Carson River.

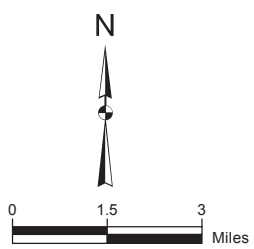
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Source: California Interagency Watershed Mapping Committee, 2001; California Department of Water Resources (DWR), 2003.

Legend

- ★ City
- Places
- Weather Stations
- Stream Gauges
- Groundwater Basins
 - Olympic Valley
 - Carson Valley
 - Martis Valley
 - Tahoe Valley
- Tahoe-Sierra IRWM Boundary
- California Counties
- Federal Wilderness Areas
- 100 Year Flood Zones
- Washoe Tribe's Woodfords Community



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West and East Fork Carson River Hydrologic Units

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Figure 2-10

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The Carson Valley groundwater basin is located in the West Fork Carson River and East Fork Carson River HUs. The California portion of the basin overlies approximately 17 square miles. Groundwater storage is primarily in basin fill deposits recharged through infiltration of snowmelt in the West Fork Carson River. Outside of the Carson Valley groundwater basin are unconsolidated aquifers in the Hope, Diamond, Pleasant, and Bagley/Silver King Valleys, and various volcanic or granitic bedrock aquifers (Brown and Caldwell 2007). Significant agricultural pumping in Nevada raises concerns in California regarding long-term depletion of groundwater storage in the basin. Five CDPH regulated water systems rely on the Carson Valley groundwater basin.

2.8.6 East Fork Carson River

In California, the East Fork Carson River HU is approximately 350 square miles in the mountains of Alpine County, California as shown on Figure 2-10. The East Fork Carson River HU is bounded to the southwest by the crest of the Sierra Nevadas, to the northwest by the West Fork Carson River HU, and to the southeast by the West Walker River HU. As a headwater HU, all surface water in the East Fork Carson River HU is from precipitation, mostly snowmelt, with no inputs from outside of the HU. The principal feature of the HU is the East Fork of the Carson River, which originates in the Carson-Iceberg Wilderness in the eastern Sierra Nevadas in California, flows northeast into Nevada, and ultimately into the Carson Sink. There are several small lakes and man-made reservoirs in the East Fork Carson River HU including Harvey Place Reservoir, which stores South Tahoe PUD recycled water, and Indian Creek Reservoir.

Indian Creek is a sub-watershed within the East Fork Carson River which flows from Indian Creek Reservoir through the Diamond Valley Ranch and the “Narrows” to another ranch. Indian Creek flows through the ranch’s agricultural/wetland that is adjacent to the Washoe Tribes’ two Woodford’s Community drinking water wells, and then flows through the Tribe’s Washoe Ranch and then into the East Fork of the Carson River. Because of agricultural diversions and limited drought flows, Indian Creek is ephemeral.

2.9 Water Resources

The Region is the source of significant water resources that contribute to the economies in the Region through support of tourism and recreation, and support downstream watersheds through hydropower, agriculture, and municipal and industrial consumptive uses. This section describes the Region’s surface and groundwater supplies and provides an estimate of consumptive water demands in the Region.

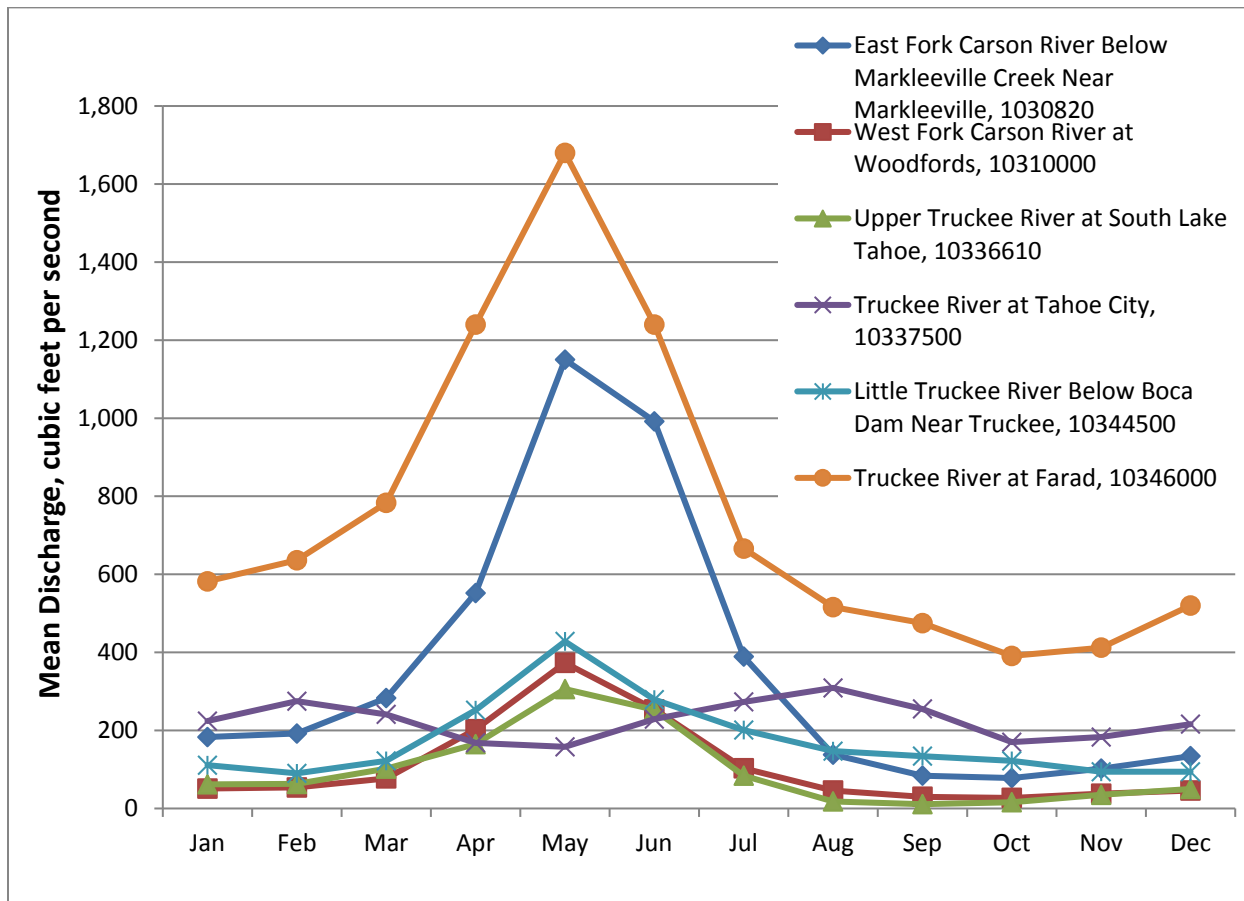
2.9.1 Water Supply

Water supply in the Region includes both surface water and groundwater. A minor amount of recycled water is exported from the Tahoe Basin into Alpine County for agricultural use. Communities in the Region do not import water, nor is desalination a consideration due to the inland location of the Region.

2.9.1.1 Surface Water Sources

Runoff feeding the surface water bodies in the Region is mostly snowmelt, with characteristic peak flow in the late spring, as shown on Figure 2-11. Figure 2-11 provides average streamflow data for the East Fork Carson River near Markleeville, West Fork Carson River at Woodfords (Alpine County community near Alpine Village, not the Washoe Tribe’s Woodfords Community),

Upper Truckee River at South Lake Tahoe, Truckee River at Tahoe City, Little Truckee River below Boca Dam, and the Truckee River at Farad (near the California-Nevada border). River discharge is unimpeded in the Upper Truckee River and the East and West Forks of the Carson River. Discharge in the Truckee River is managed through releases from the dams at Lake Tahoe and tributaries to the Truckee River.



Source: USGS Surface Water data for California: USGS Surface-Water Monthly Statistics (more information in Appendix 2-F)

Figure 2-11: Average Streamflows

The total annual runoff volume at each of the streamflow gauges listed above is presented in Table 2-7. The 1990 Truckee-Carson-Pyramid Lake Water Rights Settlement Act allocated 23,000 afy of Lake Tahoe Basin water to California users, and 11,000 afy to Nevada users.

The historic stream flow pattern of peak streamflow during spring snowmelt and lowest flow during fall and early winter after the dry summer would likely shift with future climate change. The volume of snowpack, and therefore associated snowmelt, is projected to decrease by the end of the century (Cal-Adapt 2014a), which would reduce the peak flow.

Table 2-7: Yearly Runoff Volume

Hydrologic Unit	Station Name	Number	Drainage Area (sq mi)	Period of Record	Yearly Runoff Volume in Acre-Feet					Max. - Year
					Min.	Min. - Year	Median	Average	Max	
Lake Tahoe	Upper Truckee River at South Lake Tahoe	10336610	54.9	1981-2011	21,479	1988	59,553	71,811	159,143	1983
	Truckee River at Tahoe City	10337500	507	1909-2012	62	1994	136,323	162,848	846,941	1983
Truckee River and Little Truckee River	Truckee River at Farad	10346000	932	1909-2011	127,194	1931	469,116	553,094	1,858,435	1983
	Little Truckee River Below Boca Dam Near Truckee	10344500	173	1970-2011	40,175	1992	108,616	126,978	376,949	1983
West and East Fork Carson River	East Fork Carson River Below Markleeville Creek near Markleeville	10308200	276	1961-2012	61,863	1977	240,562	258,769	596,019	1983
	West Fork Carson River at Woodfords	10310000	65.4	1939-2012	18,904	1977	66,251	74,342	185,707	1983

(a) Source: USGS Surface Water data for California: USGS Surface-Water Monthly Statistics (more information in Appendix 2-F)

2.9.1.2 Groundwater Resources

Groundwater is the primary source of water for most communities in the Lake Tahoe Basin, Martis Valley, and individual property owners outside of the Region's developed areas. Few groundwater studies have been conducted within the Tahoe-Sierra Region, except for portions of the Martis Valley basin (Brown and Caldwell 2013). Therefore, sustainable groundwater supply cannot be quantified for most of the Region. Drawdown of groundwater levels has not been a significant problem within the Region recently, indicating ample supply. In the 1960s and 1970s, a cone of depression developed beneath the City of South Lake Tahoe, but groundwater levels have since recovered (DWR 2004a).

A decrease to the snowpack, as projected by climate models for the Region, could potentially decrease groundwater recharge through infiltration as more precipitation events will likely be rain events that generate more surface runoff and provide less water storage as snowpack. In addition, an increase in annual average temperature due to climate change is expected to reduce soil moisture, which could also impair groundwater recharge rates.

2.9.1.3 Regional Water Supplies and Projections

In addition to the four major public water districts in the Region (North Tahoe PUD, South Tahoe PUD, Tahoe City PUD, and Truckee Donner PUD), there are over twenty smaller community water suppliers listed below, as well as over 100 non-community water suppliers and individual property owners with groundwater wells as shown on Figure 2-3.

- Lake Tahoe HU (shown on Figure 2-8)
 - Agate Bay Water Company
 - Fulton Water Company
 - Lake Forest Utility Company
 - Lakeside Park Association
 - Lukins Water Company
 -
 - McKinney Water District
 - Rockwater Apartments
 - Tahoe Keys Homeowners Association
 - Tahoe Park Water Company
 - Tahoe Swiss Village Utility, Inc.
 - Talmont Resort Improvement District
 - Ward Well Water Company
- Truckee River HU (shown on Figure 2-9)
 - Alpine Meadows Property Owners Association
 - Alpine Springs County Water District
 - Floriston Water System
 - Northstar Community Services District (Northstar CSD)¹
 - Squaw Valley Mutual Water Company
 - Squaw Valley Public Service District (Squaw Valley PSD)
- West Fork and East Fork Carson River HUs (shown on Figure 2-10)
 - Markleeville Water Company
 - Sierra Pines Mobile Home Park

¹ As of 2015, Northstar Community Services District serves the area formerly known as PCWA Zone 4.

- Woodfords Mutual Water Company
 - Washoe Utilities Management Authority
 - 82 other non-community water suppliers*
 - 10 non-transient non-community water suppliers*
 - 10 small private water suppliers*
- * Listed numerically in Appendix 2-A and shown with numbers on Figure 2-3

Over 90% of the potable water supplied in the Region is pumped from groundwater, with some limited surface water use from Lake Tahoe, Carson River, other lakes in the Region, and various springs. Table 2-8 provides a summary of the water sources for larger water suppliers in the Region.

Table 2-8: Water Supply Sources

Water Supplier	Surface Water Source	Groundwater Source
North Tahoe PUD ^(a)	Lake Tahoe	Tahoe Valley North
South Tahoe PUD ^(a)	–	Tahoe Valley South
Lukins Water Company		Tahoe Valley South
Tahoe Keys Homeowners Association		Tahoe Valley South
Tahoe Swiss Village Utility		Tahoe Valley West
Tahoe City PUD ^(a)	Lake Tahoe	Tahoe Valley West; Olympic Valley - Purchased from Squaw Valley PSD
Truckee Donner PUD ^(a)	–	Martis Valley
Northstar CSD	Springs	Martis Valley
Alpine Springs CWD	Springs	Groundwater
Squaw Valley PSD ^(b)	–	Olympic Valley
Squaw Valley Mutual Water Company ^(b)	–	Olympic Valley
Resort at Squaw Creek ^(b)	–	Olympic Valley
Glenshire Mutual Water Company	–	Groundwater
Donner Lake Utility Company	Springs, Donner Lake	–
Markleeville Mutual Water Company	Carson River	–
Washoe Utilities Management Authority		Carson Valley
Other small water systems		Groundwater
Individual property owners		Groundwater

Water supply projections for the 20-year planning horizon of this IRWM Plan are tabulated in Table 2-9 based on the water suppliers' 2015 Urban Water Management Plans. In general, water supplies in the Region are considered to be highly reliable into the future. The exception is the Markleeville Mutual Water Company, which requires that new developments provide wells and increased storage because of difficulties meeting current and projected demand.

Table 2-9: Water Supply Projections (afy)

Water Supplier	2015 (actual)	2020	2025	2030	2035	2040
North Tahoe PUD	338	321	314	319	319	Not provided ^(a)
South Tahoe PUD	5,241	6,019	6,137	6,255	6,373	Not provided ^(a)
Tahoe City PUD	334	922	1,442	1,442	1,442	Not provided ^(a)
Truckee Donner PUD	1,384	24,000 ^(a)	24,000 ^(b)	24,000 ^(b)	24,000 ^(b)	24,000 ^(b)
NCSD Martis Valley Water System ^(c)	252	439	573	707	800	801

Sources: Water Suppliers' 2015 Urban Water Management Plans.

- (a) Water supply projections for 2040 were not available for these agencies, but based on UWMP reliability assessments, supplies are anticipated to be sufficient to meet projected demands
- (b) Sustainable yield of the Martis Valley Groundwater Basin is 24,000 afy
- (c) 2015 actual supply based on Northstar Community Services District, *2015 Water Quality Report for Martis Valley Water System*, which stated that over 82 million gallons were delivered in 2015. Projections (2020-2035) are based on projections stated in PCWA 2010 UWMP for Zone 4.

2.9.1.4 Recycled Water

There are limited opportunities for additional water reclamation within the Region. The Porter-Cologne Act requires that all wastewater be exported from the Lake Tahoe Basin with a few minor exceptions. The Porter-Cologne Act allows for approval of pilot reclamation projects in the Lake Tahoe Basin, but none have been approved to-date. As a result, all wastewater in the northern part of the Lake Tahoe Basin is collected by North Tahoe PUD or Tahoe City PUD and transported to T-TSA in Truckee for treatment and discharge to a disposal field in Martis Valley. Reclamation of this water for other uses is limited as the Settlement Act prohibits any reduction in return flow of treated wastewater to the Truckee River without offset or acquisition of water rights.

In the southern part of the California side of the Lake Tahoe Basin, all wastewater is collected by South Tahoe PUD. South Tahoe PUD treats the wastewater and then pumps it to Alpine County over Luther Pass for storage in Harvey Place Reservoir and summer irrigation use by area ranches. Approximately 4.5 mgd is pumped to Harvey Place Reservoir for reuse. In the year 2000, a special legislative act allowed South Tahoe PUD to install six fire hydrants at the base of the reclaimed water export pipeline to provide fire protection for a small community in the Lake Valley Fire Protection District service area that does not have municipal water service. The TRPA Regional Plan Update (TRPA 2012b) further expanded allowable uses of recycled wastewater in the Tahoe Basin to include emergency wildfire suppression, when the activity is approved by the fire incident commander and is necessary to prevent severe harm to life, property, and the environment and to protect public facilities.

2.9.2 Water Demands

Nearly all of the water demand in the Region is residential, with some commercial demand in the urban areas of the Lake Tahoe Basin and Truckee. There is very little demand for irrigation water within the service areas of the regional water suppliers. This is partly because of the lack of agricultural land within these service areas, and partly because many individual property owners, such as golf courses, maintain private irrigation wells. Demand volumes for the major water suppliers are summarized in Table 2-10.

Table 2-10: 2015 Water Demand by Sector (afy)

Water Supplier	Total Accounts	Residential	Commercial	Irrigation	Other	Losses	Total (afy)
North Tahoe PUD	3,883	185	51	11	-	91	338
South Tahoe PUD	14,077	2,768	1,950	6	-	517	5,241
Tahoe City PUD	4,194	220	53	23	-	38	334
Truckee Donner PUD	12,497	671	91	44	233 ^(a)	345	1,384
NCSD Martis Valley Water System ^(b)	805	NA ^(b)	NA	NA			252

Sources: Water Suppliers' 2015 Urban Water Management Plans.

(a) Includes governmental and institutional sector, and "other"

(b) Values are based on Northstar Community Services District, *2015 Water Quality Report for Martis Valley Water System*

(c) NA = Not available

2.9.2.1 Municipal Water Demands

Around Lake Tahoe, water demands fluctuate greatly on a daily to seasonal basis due to the high percentage of part-time residences and visitation from tourism. Projected population growth and water demand in the major service areas are summarized in Table 2-11 for the 20-year planning horizon of this IRWM Plan. Development is politically and legally limited in the Lake Tahoe Basin because of land use controls related to water quality, thus limiting the potential increase in water demands.

Table 2-11: Municipal Water Demand and Population Projections

Water Supplier	2015 (actual)		2020		2025		2030		2035		2040	
	Pop ^(a)	afy ^(b)	Pop	afy	Pop	afy	Pop	afy	Pop	afy	Pop	afy
North Tahoe PUD	4,781	338	4,967	321	5,161	314	5,363	319	5,572	319	NA	NA
South Tahoe PUD	29,236	5,241	29,851	6,019	30,405	6,137	30,990	6,255	31,575	6,373	NA	NA
Tahoe City PUD	5,741	334	5,816	337	5,891	349	5,966	363	6,041	376	NA	NA
Truckee Donner PUD	16,211	1,384	17,898	1,768	19,761	2,022	21,818	2,260	24,089	2,481	26,596	NA
NCSD Martis Valley Water System ^(c)	NA ^(d)	252	NA	439	NA	579	NA	707	NA	800	NA	801
Other ^(e)	2,607	854	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Sources: Water Suppliers' 2015 Urban Water Management Plans.

- (a) Pop = population
- (b) Volume of water demand
- (c) 2015 demand based on Northstar Community Services District, *2015 Water Quality Report for Martis Valley Water System*
- (d) NA = not available
- (e) 2015 actual demand based on Northstar Community Services District, *2015 Water Quality Report for Martis Valley Water System*, which stated that over 82 million gallons were delivered in 2015. Projections (2020-2035) are based on projections stated in PCWA 2010 UWMP for Zone 4.

2.9.2.2 Non-Consumptive Demands

There are additional non-municipal demands of equal importance within the Region that are non-consumptive in that they do not remove water from the environment.

Stampede Powerplant: The powerplant is operated as a run-of-the-river plant, and as such does not have minimum flow requirements.

Fisheries: The various judicial decisions and settlements in the history of the Region have included minimum water flows to support the fisheries in the Truckee River and Pyramid Lake.

Snow-making: Groundwater serves as the source of snow-making water at ski resorts within the Region. Melted snow from ski slopes returns to local streams.

Water-Dependent Recreation: Lake Tahoe is an internationally known destination for water-dependent recreation, including boating and fishing. The communities surrounding Lake Tahoe are economically dependent on recreation and tourism both at and around the Lake. Additionally, the Truckee and Carson Rivers provide opportunities for fishing, white water rafting, and kayaking.

2.9.2.3 Water Exports from the Region

Although surface water is not the predominant source of water for communities in the Tahoe-Sierra Region, downstream communities in Nevada rely heavily on surface water from the Truckee River and Carson River for municipal supply, irrigation, and fisheries. Through various court cases and agreements described in Section 2.3, Nevada users on the Truckee River are allocated 11,000 afy of Lake Tahoe water and the remainder of the Truckee River water after the 10,000 afy allocation for California users (Benoit 2008). Downstream water users on the Truckee River include the Reno-Sparks metropolitan area (population 417,000 people in 2010),

Pyramid River Paiute Tribe, and various agricultural areas. Downstream water users on the Carson River include the Carson City metropolitan area and Gardnerville micro area (population 102,000 people in 2010), the Fallon metropolitan area (population 25,000 in 2010), the Washoe Tribe's Washoe Ranch, the Washoe Tribe's Dresslerville Community, the Washoe Tribe's Stewart Ranch, and various agricultural users (US Census Bureau 2011 and Washoe Tribe 2014).

Currently, the major water suppliers in the Region do not directly export water outside of the Region, and none is projected in the future. El Dorado Irrigation District (EID) diverts water from Echo Lake through the Echo Conduit into the South Fork of the American River as part of hydroelectric Project 184 on the South Fork of the American River. Echo Lake naturally drains into the Upper Truckee River. The maximum flow through the Echo Conduit is 30 cubic feet per second, and EID is required to maintain minimum flows and minimum navigability per the water quality certification (State Water Resources Control Board 2006). The Sierra Valley Water Company diverts water from the Little Truckee River into Webber Creek for supplemental irrigation water use in Sierra Valley. The maximum diversion flow is 60 cubic feet per second, with a total diversion typically ranging from 1,500 afy to 10,000 afy (State of Nevada 2013).

2.10 Water-Related Infrastructure

The water-related infrastructure in the Region consists of dams and reservoirs, used mostly for downstream flood storage, water supply, and hydropower, as well as local groundwater and surface water treatment and distribution facilities. The water quality regulations in the Region require high levels of wastewater treatment in most watersheds, which occurs at two treatment facilities described in Section 2.10.4. Much of the water-related infrastructure is aging; dating back to the growth boom of the 1960s, and in some cases may be undersized for current levels of development.

2.10.1 Surface Water Infrastructure

2.10.1.1 Dams and Reservoirs

In Alpine County there are two man-made reservoirs: Indian Creek Reservoir and Harvey Place Reservoir. Indian Creek Dam and Reservoir was constructed originally by South Tahoe PUD as the reclaimed water reservoir that was jointly managed for irrigation storage and a fishery; however high nutrients led to eutrophic conditions, which resulted in the need to construct the Harvey Place Reservoir for the storage of recycled water. Harvey Place Dam and Reservoir was constructed by South Tahoe PUD to provide additional storage capacity for the reclaimed treated wastewater from the southern portion of the Lake Tahoe Basin.

There are four dams within the Truckee River and Little Truckee River HUs; the Lake Tahoe Dam, the Prosser Creek Dam, the Stampede Dam, and the Boca Dam. These four dams are owned by the US Bureau of Reclamation. The Lake Tahoe Dam is operated by the Truckee-Carson Irrigation District and the Prosser Creek Dam is operated by the Washoe County Water Conservation District. The Stampede and Boca Dams are operated by the US Bureau of Reclamation.

The Lake Tahoe Dam, located at the outlet of Lake Tahoe in Tahoe City was constructed in 1913 after a long legal battle as part of the Newlands Project to provide irrigation water to Nevada farmers. The dam impounds water above the natural rim of the lake, providing 6.1 feet of storage (Bureau of Reclamation 1996).

The Boca Dam, located on the Little Truckee River approximately one-third of a mile upstream of the confluence with the Truckee River, and Boca Reservoir were constructed in 1939 as the main part of the Bureau of Reclamation's Truckee Storage Project. The dam regulates the Little Truckee River and provides irrigation water for agriculture in the Truckee Meadows (Bureau of Reclamation 2001a).

The Prosser Creek Dam, creating the Prosser Creek Reservoir, is located on Prosser Creek approximately 1.5 miles upstream of the confluence with the Truckee River. The Stampede Dam, creating the Stampede Reservoir, is located on the Little Truckee River approximately 8 miles upstream of the confluence with the Truckee River. The Prosser Creek and Stampede Dams were constructed in the 1960s as part of the Bureau of Reclamation's Washoe Project to regulate the runoff flow in the Truckee River for fishery enhancement at Pyramid Lake, flood control, and recreation. The Stampede Power Plant, built in 1987 at the dam, generates approximately 12 million kilowatt-hours per year, primarily for operational use with excess sold on the market (Bureau of Reclamation 2001b).

In addition to Lake Tahoe and the man-made reservoirs, Fallen Leaf Lake, Echo Lake, Donner Lake, and Independence Lake are natural reservoirs within the Region. Fallen Leaf Lake and Echo Lake are located in the Lake Tahoe HU, Donner Lake is located in the Truckee River HU, and Independence Lake is located in the Little Truckee River HU. While these lakes were naturally formed, Fallen Leaf Lake and Echo Lake have dams at their outlets to increase water storage. The Fallen Leaf Lake Dam was originally constructed in the late 1800s by early homesteaders and resort developers, and is currently owned and operated by the USFS Lake Tahoe Basin Management Unit (LTBMU) (USDA 2013b). The original Echo Lake dam, and flume for diversion of water to the South Fork of the American River, was constructed in the late 1800s by a gravel mining company (Echo Lakes Association 2014), and was later owned and operated by Pacific Gas & Electric (PG&E). The dam is currently operated by EID as part of Project 184, a hydroelectric project purchased from PG&E (EID 2011).

2.10.1.2 Intakes

For municipal water supply there are several surface water intakes in the northern Lake Tahoe area. North Tahoe PUD's active intake is located at the end of National Avenue in Tahoe Vista. There is an inactive intake located at Dollar Cove, and one off of Brockway Road. Tahoe City PUD's Chambers intake is in the McKinney/Quail system and there are three inactive intakes for the main system.

There are no surface water intakes on the Truckee or Little Truckee Rivers.

The Markleeville Mutual Water Company operates a surface water intake from Markleeville Creek, which is a tributary to the East Fork Carson River in Alpine County.

2.10.2 Groundwater Infrastructure

There are numerous groundwater wells in the Region. Table 2-12 lists wells operated by public water suppliers and some private water suppliers; however, there are also an unknown number of wells used by individual property owners within both the sparsely populated and the developed areas of the Region.

Other than the backup supply well for the Markleeville Mutual Water Company and the main wells for the Washoe Tribe's Woodfords Community, there are no commercial, municipal, or

irrigation wells in the Alpine County portion of the Carson Valley groundwater basin and there are fewer than 100 domestic wells (Resource Concepts Inc. 2013).

Table 2-12: Groundwater Infrastructure

Water Supplier	System	Active Supply Wells	Backup Supply Wells
North Tahoe PUD	Main	1	
	Carnelian Bay	1	
	Dollar Cove (joint with Tahoe City PUD)	1	
South Tahoe PUD	Main	13	Several
Tahoe City PUD	Main	6	
	Madden Creek	1	
	McKinney/Quail	1	
	Rubicon	3	
	Tahoe Cedars	2	
Truckee Donner PUD	Main	10	
	Glenshire	11	
	Hirshdale	1	
PCWA	Zone 4	2	
Northstar CSD	Main	2	
Alpine Springs CWD	Main	1 vertical	
		2 horizontal	
Squaw Valley PSD	Main	4 vertical	
		2 horizontal	
Squaw Valley Mutual Water Company	Main	2 vertical	
		2 horizontal	
Lukins Water Company	Main	3	
Tahoe Keys Homeowners Association	Main	3	
Tahoe Swiss Village Utility	Main	1	
Markleeville Mutual Water Company	Main		1
Washoe Utilities Management Authority	Washoe Tribe's Woodfords Community	2	

(a) Sources: 2010 Urban Water Management Plans, 2008 El Dorado County LAFCO Water, Wastewater, and Power Municipal Services Review (Dudek 2008), 2007 Olympic Valley Groundwater Management Plan (2007 Hydrometrics), and individual water purveyor websites.

(b) Note: As of 2015, Northstar Community Services District serves the area formerly known as PCWA Zone 4.

2.10.3 Water Treatment and Distribution Infrastructure

The water treatment and distribution infrastructure for the five major water suppliers is summarized below.

North Tahoe PUD: The three systems within North Tahoe PUD's service area are the Main system, Carnelian Bay system, and Dollar Cove system. For the entire service area, North Tahoe PUD has eight storage facilities for 3.5 million gallons, three booster systems, and 45 miles of water lines. Surface water from Lake Tahoe is treated at the National Avenue Water Treatment Plant (ultraviolet and chlorine disinfection).

Tahoe City PUD: The five systems within Tahoe City PUD's service area are the Main system, McKinney/Quail system, Rubicon system, Alpine Peak system, and Tahoe-Truckee Forest Tract

system. These systems are completely separate from each other. The main system has six wells, six tanks, three inactive surface water intakes, and four booster pump systems; the McKinney/Quail system has one surface water intake and summer surface water treatment plant, one well, and one tank; the Rubicon system has three wells, three tanks, and one booster pump system; the Alpine Peak system has two spring wells and one tank; the Tahoe-Truckee Forest Tract has a distribution system only as the water is supplied by the Squaw Valley PSD.

South Tahoe PUD: South Tahoe PUD's water supply system consists of a groundwater treatment plant, 13 active supply wells, several standby wells, 16 booster pump stations, 23 storage tanks, 26 pressure reducing valves, and 320 miles of water lines.

Truckee Donner PUD: The two systems in the Truckee Donner PUD service area are the Truckee system and the Hirschdale system. Between the two systems there are 22 active groundwater wells, 4 active spring wells, 36 active storage tanks, 29 booster pumping stations, and 186 miles of water lines. All groundwater is disinfected by chlorine at the wellhead. The Northside groundwater treatment system also removes arsenic, and the Hirschdale groundwater treatment system removes arsenic, iron, and manganese.

PCWA: The PCWA system in Martis Valley consists of 2 wells, 6.1 million gallons of storage, and 26 miles of water lines.

2.10.4 Wastewater and Recycled Water Infrastructure

As described earlier, all wastewater must be collected and pumped out of the Lake Tahoe Basin per the Porter-Cologne Act. Wastewater from communities in the northern portion of the Lake Tahoe Basin and along the Truckee River from Lake Tahoe to Truckee is pumped to the T-TSA, and wastewater from South Lake Tahoe and other communities in the southern portion of the Lake Tahoe Basin is treated at the South Tahoe PUD facility and pumped into Alpine County. Septic systems are not allowed in the Lake Tahoe Basin.

In the north Lake Tahoe and Truckee River watersheds, wastewater is collected by North Tahoe PUD, Tahoe City PUD, Squaw Valley PSD, Alpine Springs County Water District, Northstar CSD, and TSD to the T-TSA. T-TSA operates and maintains the Truckee River Interceptor from Tahoe City to the Water Reclamation Plant in Martis Valley. The T-TSA treatment plant provides tertiary-level treatment and discharges the treated effluent to subsurface disposal fields.

The North Tahoe PUD collection system consists of 75 miles of sewer line, 7 miles of force main, and 18 pump stations. The Tahoe City PUD collection system serves 7,540 customers and consists of 21 pump stations over 31 square miles. The TSD collection system has 9,764 residential connections and 840 commercial connections, and consists of approximately 300 miles of gravity pipelines, 9 miles of pressure pipeline, and 40 lift stations.

South Tahoe PUD collects wastewater from all communities in the southern portion of the Lake Tahoe Basin, treats the wastewater, and operates a 27 mile export pipeline to Harvey Place Reservoir in Alpine County for reuse. The collection system has 17,000 connections and consists of 330 miles of sewer lines and 42 lift stations. The export pipeline includes three sections with a pump station at Luther Pass and discharges treated effluent to the Harvey Place Reservoir to be used for irrigation by ranchers in Alpine County.

In Alpine County most communities and individual property owners utilize septic tank systems for wastewater treatment. Within the portion of Alpine County located in the Region, the only small wastewater treatment plants are Markleeville Public Utility District (Markleeville PUD) (approximately 100 connections), and the Washoe Tribe's Woodfords Community wastewater treatment system maintained by the Washoe Utility Management Authority (Alpine County 2009 and Washoe Tribe 2014). The Markleeville PUD facility consists of three unlined ponds including one mechanically aerated oxidation pond and two evaporation-percolation ponds. The Washoe Tribe's Woodfords Community facility consists of two aging lined ponds.

In the portion of Sierra County that is located in the Region, wastewater is managed through onsite septic systems for individual properties.

2.10.5 Flood Management and Infrastructure

There are no flood management or irrigation districts in the Region. Localized flooding has recently occurred in the Region in 1997 and 2005 caused by significant rain-on-snow events. Flood management infrastructure in the Region includes the Lake Tahoe Dam in Tahoe City that outlets to the Truckee River; Prosser Creek Dam and Reservoir on a tributary to the Truckee River; and Boca Dam and Reservoir, and Stampede Dam and Reservoir on the Little Truckee River. These dams and storage reservoirs regulate the flows in the Truckee River in part to provide some measure of flood protection for downstream communities including Reno and Sparks in Nevada.



Boca Dam

(Photo courtesy of the US Bureau of Reclamation)

2.11 Water Quality

Water quality is one of the more significant drivers for bringing the various partners together to participate in IRWM Planning in the Tahoe-Sierra Region. The discussion that follows includes a summary of regulations, as well as key water quality concerns in the Region.

2.11.1 Water Quality Regulations

As discussed in previous sections, communities in the Region are economically dependent on tourism, much of which is related directly or indirectly to the water resources of the Region. Maintaining high quality water sources is, therefore, essential to the overall health of the Region. There are many tools, whether regulatory, voluntary, or incentive based, currently available for preventing pollution. The US Environmental Protection Agency (USEPA), California State Water Resources Control Board (SWRCB), and California Regional Water Quality Control Boards have permitting, enforcement, remediation, monitoring, and watershed-based programs to prevent pollution. Pollution can enter a water body from point sources that directly discharge to the river or lake and from nonpoint sources over a broad area, such as runoff from an urban area or grazing area located adjacent to the water body. Preventing pollution from most point sources relies on a combination of source control and treatment, while preventing nonpoint source pollution generally involves the use of best management practices (BMPs), efficient water management practices, and source control.

The Federal Clean Water Act (CWA) contains two strategies for managing water quality including a technology-based approach to maintain a minimum level of pollutant management using the best available technology, and a water quality based approach that relies on evaluating the condition of surface waters and setting limitations on the amount of pollution that the water can be exposed to without adversely affecting the beneficial uses of those waters. Oftentimes, limits to water quality are based on the sensitivity of the ecosystem in the receiving water to contaminants, often at trace levels well below drinking water standards. Section 303(d) of the CWA bridges these two strategies. Section 303(d) requires that the States identify waters that are not attaining standards after the technology-based limits are put into place. For waters on this list (and where the USEPA administrator deems they are appropriate) the States are required to determine all the sources of the pollutants that caused the water to be listed including contributions from point sources and non-point sources, and to develop a Total Maximum Daily Load (TMDL) for each listing.

The California State Porter-Cologne Water Quality Control Act authorizes the SWRCB to formulate, adopt, and revise water policies; and authorizes the Regional Water Quality Control Boards to formulate and adopt water quality control plans for areas within each region, establish water quality objectives to ensure reasonable protection of beneficial uses, and develop and enforce waste discharge requirements. The Tahoe-Sierra Region is located within the jurisdiction of the Lahontan Regional Board. The Lahontan Regional Board implements the federal Clean Water Act, the California Water Code (including the Porter-Cologne Act) and a variety of laws related to control of solid waste and toxic and hazardous wastes. It has authority to set and revise water quality standards and discharge prohibitions; and may issue permits, including federal National Pollutant Discharge Elimination System (NPDES) permits and Section 401 water quality certifications, and State waste discharge requirements or waivers of waste discharge requirements.

Water quality standards and control measures for surface water and groundwater are contained in the Basin Plan. The Basin Plan designates beneficial uses for water bodies as described in Section 2.8.1. It establishes water quality objectives, waste discharge prohibitions, and other implementation measures to protect those beneficial uses. Chapter 5 of the Basin Plan, Water Quality Standards and Control Measures for the Lake Tahoe Basin, summarizes a variety of control measures specifically for the protection and enhancement of Lake Tahoe. The Washoe Tribe is currently developing water quality standards for Tribal lands and is applying to USEPA for Treatment As State.

The Safe Drinking Water Act (SDWA) was originally passed by Congress in 1974 to protect public health by regulating the nation's public drinking water supply. SDWA applies to every public water system in the United States. SDWA authorizes the USEPA to set national health based standards for drinking water to protect against both naturally-occurring and man-made contaminants that may be found in drinking water. Originally, SDWA focused primarily on treatment as the means of providing safe drinking water at the tap and drinking water standards are based on health risk balanced by economic factors. Amendments in 1996 greatly enhanced the existing law by recognizing source water protection, operator training, funding for water system improvements, and public information as important components of safe drinking water. Under the SDWA, technical and financial aid is available for certain source water protection activities. In California, the CDPH regulates drinking water in community water systems.

2.11.2 Surface Water Quality

Ambient water quality objectives (WQOs) are established by the Lahontan Regional Board as limits of constituents or characteristics for protection of beneficial use of surface water. Beneficial uses for waterbodies within the Region are summarized in Section 2.8. WQOs applicable to all surface waters within the Region include ammonia, coliform bacteria, biostimulatory substances, chemical constituents, total residual chlorine, color, dissolved oxygen, floating materials, oil and grease, non-degradation of aquatic communities and populations, pesticides, pH, radioactivity, sediment, settleable materials, suspended materials, taste and odor, temperature, toxicity, and turbidity.

Surface water sources in the Region are generally acceptable for municipal use after treatment with disinfection. However, several bodies of water, listed in Table 2-13 and shown on Figure 2-12, are 303(d) listed impaired waterbodies for pathogens, salinity (total dissolved solids and chloride), sedimentation, nutrients (nitrate, nitrogen, phosphorus), metals (aluminum, iron, manganese, silver), sulfates, and other organics. Sources range from natural processes to urban runoff to mine tailings.

2.11.2.1 Lake Tahoe Basin

The USEPA has designated Lake Tahoe an Outstanding National Resource Water (ONRW). ONRWs are provided the highest level of protection under USEPA's Antidegradation Policy. The USEPA interprets the Antidegradation Policy to mean no new or increased discharges to ONRWs and no new or increased discharge that would result in lower water quality.

Section 303(d) of the Clean Water Act requires states to compile a list of impaired water bodies that do not meet water quality standards and to develop a TMDL for impaired water bodies to determine the key pollutants and contributing sources to the impairment. The Lahontan Regional Board has identified Lake Tahoe's lack of transparency as the primary basis for its impaired status under its Section 303(d) impaired water listings filed with the USEPA. To comply with the Lake Tahoe transparency standard, a 25 centimeter white Secchi disk would need to be visible 29.7 meters (97.4 feet) below the surface of Lake Tahoe on an average annual basis to achieve regulatory targets. Recent data have shown values ranging from maximum clarity of 75.3 feet in 2012 to minimum clarity of 64.1 feet in 1997 (UC Davis 2014).

In the Lake Tahoe HU there are nine 303(d) listed waterbodies, including the Upper Truckee River and Lake Tahoe itself. Pollutants impacting the listed water bodies include nutrients, sediment, iron, chloride, and pathogens. Appendix 2-B provides a detailed listing of identified pollutant sources. Three TMDLs have been approved as of 2013. A sediment TMDL was approved for Heavenly Valley Creek in 2002, a sediment TMDL was approved for Blackwood Creek in 2008, and a sediment and nutrient (nitrogen and phosphorus) TMDL was approved for Lake Tahoe in 2011. Total nitrogen loadings in Cold Creek are being addressed by a USFS restoration project with an expected attainment date of 2028. Elimination of grazing in some parts of the Upper Truckee River watershed have allowed the Upper Truckee River to be delisted for some of these pollutants (USEPA 2010).

California's Lake Tahoe TMDL (dated November 2010 and approved by the EPA) requires attainment of the transparency standard for Lake Tahoe over a 65-year implementation period. The Lahontan Regional Board has the obligation to implement and enforce the Lake Tahoe TMDL through NPDES stormwater discharge permits issued to the California governmental

entities (City of South Lake Tahoe, Placer County, El Dorado County, and the California Department of Transportation).

TRPA has also established environmental thresholds, goals and policies, and ordinances directed at protecting and improving water quality in Lake Tahoe and the Tahoe Basin. TRPA has established water quality threshold standards for six indicator categories, including: 1) Lake Tahoe pelagic (deep) waters; 2) Lake Tahoe littoral (nearshore) waters; 3) tributaries; 4) direct surface runoff and storm water discharge to surface waters; 5) stormwater discharge to groundwater; and 6) other lakes (i.e., lakes in the Tahoe Basin other than Lake Tahoe). Water quality threshold standards adopted by TRPA set a target to return Lake Tahoe to the transparency observed in the late 1960s, which is similar to the Lahontan Regional Board's Lake Tahoe transparency standard of roughly 98 feet (TRPA 2012a).

TRPA has established a number of goals and policies related to water quality. Goals include the reduction of sediment and nutrients to Lake Tahoe and the elimination or reduction of other pollutants. Policies address a range of issues including snow removal, wastewater spill prevention, underground storage tanks (USTs), dredging, and reduction of impacts from motorized watercraft. The existing goals and policies for water quality protect and enhance lake clarity and beneficial uses within the following regulatory framework (TRPA 2012a):

- Concentration-based discharge standards and infiltration requirements for stormwater treatment that control water quality impacts associated with new development.
- Regulations requiring the retrofitting of developed properties with BMPs that reduce erosion and eliminate stormwater runoff.
- Regulatory protections and restoration of Stream Environment Zones (SEZs) to protect and enhance their water quality values. In the Lake Tahoe Basin, SEZs are meadows, marshes, and permanent, intermittent, and ephemeral streams that provide significant filtering of nutrients and sediment.
- Prohibiting the discharge of wastewater, toxic waste, and solid waste into Lake Tahoe, its tributaries, and groundwater resources.

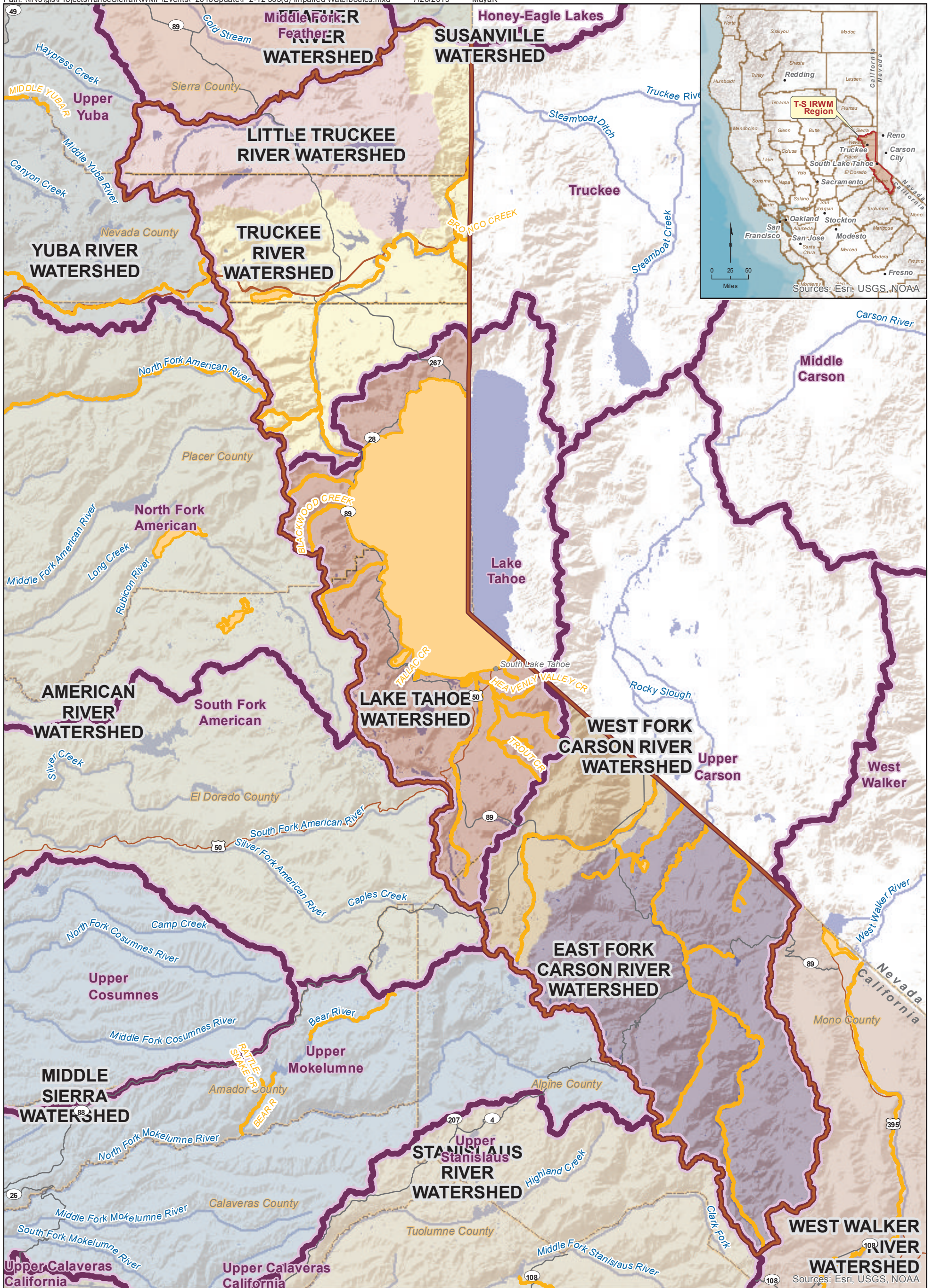
Table 2-13: 303(d) Listed Waterbodies

Water Body Name	Estimated Size Affected	Pollutant	Final Listing Decision	USEPA TMDL Approved Date
East Fork Carson River				
Carson River, East Fork	48 Miles	TDS ^(a)	TMDL required list	
Wolf Creek (Alpine County)	12 Miles	Sedimentation/Siltation	TMDL required list	
Monitor Creek	4.0 Miles	Aluminum, Iron, Manganese, Silver, Sulfates, TDS	TMDL required list	
Aspen Creek	0.9 Miles	Metals	Being addressed by action other than TMDL	
Bryant Creek	5.2 Miles	Metals	Being addressed by action other than TMDL	
Leviathan Creek	3.2 Miles	Metals	Being addressed by action other than TMDL	
Indian Creek (Alpine County)	13 Miles	Pathogens	TMDL required list	
Indian Creek Reservoir	164 Acres	Phosphorus	Being addressed by USEPA approved TMDL	7/1/2003
West Fork Carson River				
Carson River, West Fork (Headwaters to Woodfords)	18 Miles	Nitrate, Nitrogen, Phosphorus	TMDL required list	
Carson River, West Fork (Woodfords to Paynesville)	3.6 Miles	Nitrogen, Pathogens	TMDL required list	
Carson River, West Fork (Paynesville to State Line)	3.3 Miles	Pathogens	TMDL required list	
Lake Tahoe				
Truckee River, Upper (above Christmas Valley)	4.5 Miles	Iron, Phosphorus	TMDL required list	
Truckee River, Upper (below Christmas Valley)	11 Miles	Iron, Phosphorus	TMDL required list	
Trout Creek (above Hwy 50)	10 Miles	Iron, Nitrogen, Phosphorus, Pathogens	TMDL required list	
Trout Creek (below Hwy 50)	0.8 Miles	Iron, Nitrogen, Phosphorus, Pathogens	TMDL required list	
Cold Creek	7.1 Miles	Total Nitrogen as N	Being addressed by action other than TMDL	
Heavenly Valley Creek (source to USFS boundary)	2.0 Miles	Chloride, Phosphorus	TMDL required list	
Heavenly Valley Creek (source to USFS boundary)	2.0 Miles	Sedimentation/Siltation	TMDL required list	9/30/2002
Heavenly Valley Creek (USFS boundary to Trout Creek)	1.4 Miles	Chloride, Sedimentation/Siltation	TMDL required list	
Tallac Creek (below Hwy 89)	1.3 Miles	Pathogens	TMDL required list	
Ward Creek	5.7 Miles	Iron, Nitrogen, Phosphorus, Sedimentation/Siltation	TMDL required list	
Blackwood Creek	5.9 Miles	Iron, Nitrogen, Phosphorus	TMDL required list	
Blackwood Creek	5.9 Miles	Sedimentation/Siltation	Being addressed by USEPA approved TMDL	7/11/2008
General Creek	9.1 Miles	Iron, Phosphorus	TMDL required list	
Tahoe, Lake	85364 Acres	Nitrogen, Phosphorus, Sedimentation/Siltation	TMDL required list	8/16/2011

Table 2-13: 303(d) Listed Waterbodies

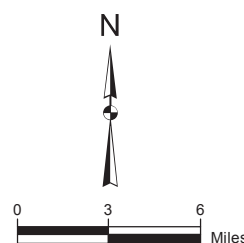
Water Body Name	Estimated Size Affected	Pollutant	Final Listing Decision	USEPA TMDL Approved Date
Truckee River				
Truckee River	39 Miles	Sedimentation/Siltation	Being addressed by USEPA approved TMDL	9/16/2009
Squaw Creek	5.8 Miles	Sedimentation/Siltation	Being addressed by USEPA approved TMDL	7/27/2007
Donner Lake	819 Acres	Priority Organics	TMDL required list	
Gray Creek (Nevada County)	2.8 Miles	Sedimentation/Siltation	Being addressed by USEPA approved TMDL	9/16/2009
Bronco Creek	1.3 Miles	Sedimentation/Siltation	Being addressed by USEPA approved TMDL	9/16/2009
Little Truckee River				
(none)				

(a) TDS = Total Dissolved Solids



Source: 2010 303(d) Listed Waters, SWRCB, 2012, National Hydrography Dataset 2012.

- Legend**
- Tahoe-Sierra IRWM Boundary
 - California Counties
 - Hydrologic Units
 - 303(d) Impaired Rivers and Streams (2014/2016 List)
 - 303(d) Impaired Waterbodies (2014/2016 List)



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303(d) Impaired Waterbodies

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Figure 2-12

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Lake Tahoe is classified by limnologists as an oligotrophic lake, which means the lake has very low concentrations of nutrients that can support algal growth, leading to clear water and high levels of dissolved oxygen. The exceptional transparency of Lake Tahoe results from naturally low inputs of nutrients and sediment from the surrounding watershed. Lake Tahoe's famed transparency has declined by roughly 27 feet since monitoring began in the 1960s (TERC 2013b). The transparency decline has been attributed to land disturbance, air pollution, soil erosion, stormwater runoff, and the loss of natural landscapes capable of detaining and infiltrating runoff. Scientific research developed in support of the Lake Tahoe TMDL (Swift et al. 2006) points to inorganic fine sediment particles less than 16 micrometers in diameter as the primary pollutant of concern impairing Lake Tahoe's transparency. This finding is based on the ability of inorganic fine sediment particles to efficiently scatter light and decrease observed transparency. Additional pollutants of concern include phosphorus and nitrogen, as these nutrients can stimulate algal growth in Lake Tahoe.

Lake Tahoe TMDL research (Lahontan Regional Board 2010) included an analysis of pollutant sources to identify the magnitude of pollutant loads to Lake Tahoe from source categories defined as: surface runoff from developed lands; atmospheric deposition; forested runoff; stream channel erosion; groundwater; and shoreline erosion. The research identified surface runoff from developed lands as the most significant source of pollutant loading for fine sediment particles (the primary pollutant of concern) and phosphorus. Surface runoff from developed lands is estimated to deliver over 70% of the average annual fine sediment particle load and roughly 40% of the average annual phosphorus load to Lake Tahoe. For nitrogen, atmospheric deposition is identified as the most significant source of loading to Lake Tahoe, contributing 55% of the average annual load.

In addition to the WQOs established for the entire jurisdiction of the Lahontan Regional Board, WQOs have also been established for all surface waters in the Lake Tahoe HU, and for specific water bodies. These include WQOs for TDS, nitrogen, phosphorus, iron, chloride, algal growth potential, biological indicators, clarity, electrical conductivity, plankton counts, suspended sediment, and transparency.

2.11.2.2 Truckee River and Little Truckee River

While there are no 303(d) listed waterbodies in the Little Truckee River HU, there are five listed waterbodies in the Truckee River HU, including the Truckee River itself. Pollutants impacting the listed water bodies include sediment and priority organics. Sediment TMDLs have been approved for Squaw Creek (2007), Bronco Creek (2009), Gray Creek (2009), and the Truckee River (2009). A TMDL for "priority organics" (persistent organic compounds including pesticides and PCBs) has not yet been developed for Donner Lake.



Lost Lakes, Alpine County, Headwaters of the West Fork of the Carson River

(Photo courtesy of Carson Water Subconservancy District)

Sources for sediment in the Truckee River HU include natural sources, habitat modification, urban runoff, recreation, construction and land development, and silviculture. Sources for priority organics in Donner Lake have not been identified although Donner Lake is 303(d) listed.

The Lahontan Regional Board has also established WQOs for all surface waters in the Little Truckee River HU and Truckee River for TDS, nitrogen, phosphorus, iron, chloride, algal growth potential and species composition.

2.11.2.3 East and West Forks Carson River

There is one 303(d) listed waterbody in the West Fork Carson River HU, and that is the West Fork Carson River itself. There are three 303(d) listed waterbodies in the East Fork Carson River HU including the East Fork Carson River. Pollutants impacting the listed waterbodies in the East and West Fork Carson River HUs include metals, nutrients, pathogens, sediment, TDS, and sulfate. A phosphorus TMDL was approved for Indian Creek Reservoir in 2003.

Additionally, metals from historic mining in Aspen Creek, Bryant Creek, and Leviathan Creek are being addressed through a Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA, or Superfund) remediation program and ongoing Lahontan Regional Board work with an expected attainment date of 2019.

Resource extraction, including mining and silviculture, is a source for metals, sulfate, and sediment in water. There are many former mines within the Carson River HU that are sources of metals and acid mine drainage, including the Leviathan Mine, some of which are being actively addressed. Grazing in scrub lands and riparian areas is a source of nutrients, sediment, and pathogens. Other sources for nutrients include habitat modification, waste storage and disposal, recreation, and atmospheric deposition. Other sources for pathogens include recreation. Natural sources also exist for some of the metals, nutrients, and pathogen loads.

The Lahontan Regional Board has also established WQOs including TDS, nitrogen, phosphorus, sulfate, boron, algal growth potential, sodium adsorption ratio, and species composition for all surface waters in the East and West Fork Carson River HUs as well as some specific water bodies.

2.11.3 Groundwater Quality

Groundwater in the Region is generally of good quality, suitable for municipal water use. Threats to groundwater quality in the Region are both natural and anthropogenic. Naturally occurring uranium, radon, arsenic, iron and magnesium affect some wells within the Region. In the Tahoe Valley South groundwater sub-basin, uranium, iron, and manganese have been detected in some wells at concentrations exceeding the respective primary or secondary maximum contaminant levels (MCLs).

Arsenic, which is naturally occurring and has a primary MCL of 10 µg/L, has also been detected in some wells in the South Lake Tahoe groundwater sub-basin, but at concentrations below the current MCL in all but one well, at which a treatment system is operating. Arsenic affects some Truckee Donner PUD and PCWA groundwater wells in the Martis Valley groundwater basin, and manganese has been detected above the MCL in a PCWA groundwater well. Arsenic, iron, manganese, and total dissolved solids (TDS) have been detected above the MCLs in monitoring wells in the east part of the Olympic Valley groundwater basin, but not in the production wells in the west part of the basin. Water agencies use treatment and/or source blending to meet MCLs for water that is delivered to their customers.

In the Lake Tahoe Basin, the nutrient loading in groundwater flowing into the lake contributes 13% of the annual nitrogen budget and 15% of the annual phosphorus budget for Lake Tahoe. These loadings are based on average ambient well concentrations ranging from 0.018 milligrams per liter (mg/l) to 0.35 mg/l for nitrate and 0.005 mg/l to 0.065 mg/l for total phosphorus; and average well concentrations in residential, commercial, or recreational areas ranging from 0.002 mg/l to 8.7 mg/l nitrate and 0.006 mg/l to 0.6 mg/l for phosphorus (Army Corps of Engineers 2003). Out of a total of 92 wells sampled since 2010, nitrate concentrations have averaged around 0.3 ppb. These concentrations are not a concern for drinking water, compared to the USEPA and State MCL for drinking water of 10 mg/l for nitrate, but as a contributor to the excess nutrients in Lake Tahoe. Sources of nitrogen and phosphorus include fertilizers and sewage leaks or residual septic system leachate that infiltrates to groundwater.

There have been no observations of chromium levels above the MCL over the last decade. Measured concentrations have averaged about 0.7 µg/L, which is significantly lower than the MCL of 50 µg/L. Similarly, there have been no measurements of perchlorate above the MCL of 6 µg/L over the last decade. Concentrations have generally been reported below 1 µg/L.

Leaking USTs and other cleanup sites may pose a threat to groundwater, especially in urban areas. Common groundwater contaminants include aromatic volatile organic compounds such as benzene, ethylbenzene, toluene, and xylenes found in gasoline, oxygenated ethers such as methyl tert-butyl ether (MTBE) from gasoline, and chlorinated hydrocarbons from dry cleaners or industrial solvent usage. MTBE contamination has impacted several South Tahoe PUD supply wells, requiring inactivation or reduction in pumping rate from some water wells, installation of wellhead treatment systems, and pursuit of source area protection measures (Winzler & Kelley 2011). Some South Tahoe PUD supply wells are also impacted by chlorinated hydrocarbons, requiring treatment to meet the respective MCLs.

The State Water Resources Control Board Geotracker website lists 51 open cleanup sites within the Region, not all of which impact groundwater. Additionally, there are 80 permitted USTs, and 256 closed sites in the Region. Nearly all of the cleanup sites are located around Lake Tahoe, in Truckee, or along Interstate-80. Responsible parties are addressing these open sites, which include petroleum, MTBE, and chlorinated hydrocarbon impacts, under the regulatory oversight of the Lahontan Regional Board.

2.12 Ecological Resources

The ecological resources of the Region are significant and contribute to the recreation and tourism of the Region. The waterways provide habitat for common and sensitive fish, amphibian, and invertebrate species, while the adjacent terrestrial habitats support numerous bird, mammal, and plant species.

2.12.1 Terrestrial Ecosystems

Terrestrial vegetation in the Region is dominated by coniferous forest as shown on Figure 2-13 and summarized in Table 2-14, which tabulates the percent land cover by type in each HU within the Region.

The general vegetation zones in the Region are subalpine, upper montane, montane, and sagebrush scrub in parts of the Carson River HUs. The predominant plant communities in the Region include Jeffrey pine, mixed conifer, white fir series, red fir series, lodgepole pine, and

aspen. At the higher elevations mixed subalpine forest, Western white pine, whitebark pine, and subalpine meadow are common. Big sagebrush is common in the lower elevations in the Truckee River and Carson River HUs. Alpine grassland, montane meadow, and sedge meadow are also present (TRPA 2013).

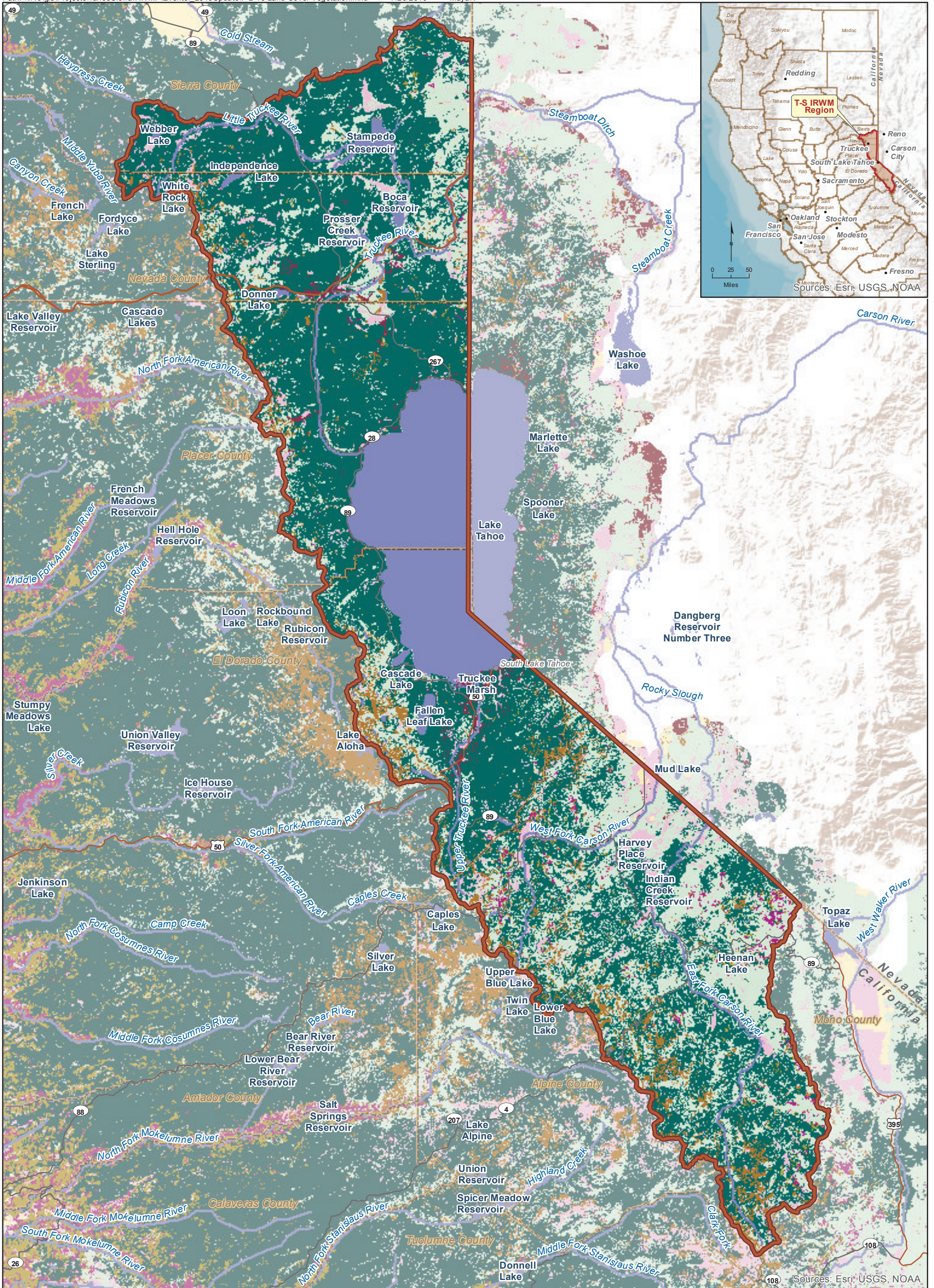
Table 2-14: Percent Coverage of Land Cover Types by HU

Land Cover	Lake Tahoe HU	Little Truckee River HU	Truckee River HU	West Fork Carson River HU	East Fork Carson River HU	% of Total Region
Agriculture	0%	0%	0%	5%	1%	0.7%
Barren/Other	1%	2%	4%	17%	13%	6.6%
Conifer Forest	44%	74%	63%	39%	43%	51.3%
Conifer Woodland	0%	0%	0%	0%	8%	2.1%
Hardwood Forest	0%	1%	1%	1%	1%	0.7%
Herbaceous	1%	3%	2%	4%	2%	2.2%
Shrub	10%	13%	23%	34%	32%	21.1%
Urban	5%	0%	4%	0%	0%	2.4%
Water	37%	5%	1%	0%	0%	11.9%
Wetland	1%	3%	1%	0%	0%	1.0%

(a) Sources: Land Cover shapefile, Department of Water Resources, 2002; California Interagency Watersheds shapefile 2.2.1

Wildfires are a significant factor in the ecosystems throughout the Region, and their effect has changed and will change over time with changing climate conditions, land cover, land use, and policies. Within the forested areas, wildfires used to occur with a frequency of 5 to 20 years prior to the start of the Comstock mining era. During that time, between the mining and timber harvesting, large tracts of land were clear cut and the regrowth consisted of different species mixtures and increased densities that changed the fire regime. In addition, for many decades fire management policy on the extensive federal and state lands was focused on fire suppression, which allowed increased densities of trees and underbrush to grow. More recently fire management policy has focused on maintaining defensible spaces and on fuel reduction to reduce fuel severity (USDA 2014b).

The impact of wildfires includes not only the immediate and long-term changes in vegetation, but also increased erosion and peak flow volumes immediately after the event. The loss of the vegetated ground cover leaves the soil and fire ash susceptible to erosion during rain events and snow melt, washing sediment and nutrients into the receiving waterbodies. Without the natural retardation of the stormwater or snow melt by the vegetated ground cover, less infiltration to groundwater occurs and flood peak flows are increased. Regrowth after a wildfire may include different species distributions and densities as well, causing further changes to the ecosystem. Sometimes invasive plant species gain a foothold and start to crowd out native plant species after a fire event. The Region is expected to become increasingly vulnerable to wildfire risk due to increased frequency of drought, altered soil moisture regimes, and changing precipitation patterns. Wildfires are expected to become more intense, frequent, and increase in area burned (Cal-Adapt 2014c, CNRA 2013).

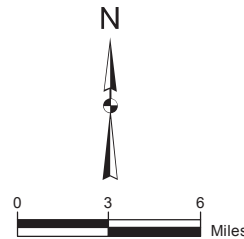


Source: Land Cover, CDF-FRAP, 2002.

- Tahoe-Sierra IRWM Boundary
- California Counties

- Legend**
- California Wildlife Habitat Relationship Cover Type**
- Agriculture
 - Barren [Rock/Soil/Sand/Snow]
 - Conifer forest/woodland
 - Hardwood forest/woodland

- Herbaceous
- Mixed conifer and hardwood forest/woodland
- Shrub
- Urban
- Water



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Land Cover Vegetation

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Figure 2-13

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2.12.2 Aquatic Ecosystems and Fisheries

The many creeks, rivers, lakes, and wetlands in the Region support many different aquatic ecosystems. Releases from Prosser Creek, Boca, and Stampede dams support fisheries in the Truckee River and Pyramid Lake. Vernal pools are found in Martis Valley, supporting sensitive plant species.

Trout habitat: The Region is in the historic ranges for the Lahontan cutthroat trout and the Paiute cutthroat trout, both of which are federally listed as threatened species. Currently the Paiute cutthroat trout is only found in Silver King Creek, a tributary to the East Fork Carson River. Populations of the Lahontan cutthroat trout are currently found in the following waters (Ascent Environmental 2013, The Nature Conservancy 2014):

- Upper Truckee River above Meiss Meadows (in the Lake Tahoe HU)
- Fallen Leaf Lake/Glen Alpine watershed (in the Lake Tahoe HU)
- Lake Tahoe
- Pole Creek (in the Truckee River HU)
- Truckee River, at Granite Flat Campground
- Independence Lake (in the Little Truckee River HU)
- East Fork Carson River

Other fish species such as brook, rainbow, brown, and Mackinaw/lake trout, and kokanee salmon are also found in the lakes and rivers of the Region. The California Department of Fish and Wildlife (CDFW) has named the followings waters in the Region as Wild Trout Waters:

- Heenan Lake in the East Fork Carson River HU, also named “Heritage Trout Water” for the Lahontan Cutthroat trout
- East Fork Carson River upstream of the confluence with Wolf Creek
- East Fork Carson River from Hangman’s Bridge near Markleeville to the Nevada state line
- Martis Creek Reservoir
- Truckee River, between the confluence with Trout Creek and the confluence with Gray Creek
- Upper Truckee River upstream from the confluence with Showers Creek

State and Federally Designated Areas: There are no federally designated wild and scenic rivers in the Region, although there are several stretches being considered for listing. Approximately 10 miles of the East Fork of the Carson River, between Markleeville and the California-Nevada border, is designated as a California Wild and Scenic River. This designation prohibits the construction of dams, reservoirs, and diversion facilities along that stretch of river.

The Region includes parts of the Carson-Iceberg and Mokelumne Wildernesses in the Toiyabe National Forest, and part of Desolation Wilderness in the El Dorado National Forest and LTBMU. The USFS has also designated Grass Lake as a Research Natural Area.

SEZs: In the Lake Tahoe Basin SEZs are riparian areas, wetlands, and other areas with a seasonally high groundwater level and/or surface water. They protect water quality through infiltration, nutrient uptake, denitrification, and sediment capture. Protection of these areas are vital to the health of the lakes and rivers receiving the runoff.

2.12.3 Endangered and Special-Status Species and Habitats

The California Natural Diversity Database lists special status species whose historical range is known to include parts of the Region. Table 2-15 lists species with legal protection as federally or state listed threatened or endangered, or that are candidates/proposed for listing. Appendix 2-C includes an expanded list that also includes species of concern by other agencies and organizations. There have not been critical habitats designated for any of the threatened or endangered species within the Region.

2.12.4 Invasive Species

Invasive species are non-native species that adversely affect the ecology and/or economy of the environment. They may out-compete native species for scarce resources such as water or a particular type of food, and they may have no natural predators or other checks to their growth and expansion.

Aquatic invasive species that are of concern and present in the Region include large-mouth bass, bluegill, goldfish, bull frogs, Asian clam, curly leaf pondweed, and Eurasian watermilfoil (Tahoe Resource Conservation District 2014). The invasive fish can outcompete native fish for food, and in some cases prey on the native fish. Goldfish also stir up lake sediment (LTBMU 2014). Asian clam can damage water intakes and other submerged structures, outcompete other species for available food, and add bioavailable nitrogen and phosphorus to the water (TERC 2014). Watermilfoil and curly leaf pondweed grow into thick mats at the surface of the waterbody, changing the ecosystem of the waterbody by increasing phosphorus, and entangling rudders and paddles.

Aquatic invasive species that are of concern in the Region for prevention include quagga mussel, zebra mussel, New Zealand mudsnail, and spiny water flea (Tahoe Resource Conservation District 2014, Caldwell 2013). Quagga and zebra mussels cement themselves to underwater stationary surfaces in such densities as to cause damage and interfere with the functions of utilities, watercraft, and other structures.

The Lake Tahoe Basin Weed Coordinating Group has prioritized the terrestrial invasive plant species in the Lake Tahoe Basin. Class One weeds, which are present in the basin but only in relatively small infestations yet, include Canada thistle, Russian knapweed, diffuse knapweed, sulfur cinquefoil, hoary cress, teasel, rush skeletonweed, and yellow starthistle. Class Two weeds, which have been found in isolated infestations, include bull thistle, perennial pepperweed, dalmation toadflax, Scotch broom, klamathweed, spotted knapweed, oxeye daisy, and yellow toadflax.

Other invasive plant species of concern in the Region include field bindweed, cheatgrass, poison hemlock, purple loosestrife, common mullein, purple starthistle, white sweetclover, yellow sweetclover, Russian thistle, tree-of-heaven, and dyer's woad.

2.13 Summary of Major Concerns and Conflicts

Healthy stream and lake ecosystems are essential to the communities in the Region that are economically reliant on outdoor recreation and tourism. Public and private landowners must continue to be engaged in water management strategies.

Table 2-15: Endangered and Threatened Species

Common Name	Scientific Name	Federal Status	California Status
<u>Amphibians</u>			
Sierra Nevada yellow-legged frog	<i>Rana sierra</i>	Candidate	Candidate Threatened
southern mountain yellow-legged frog	<i>Rana muscosa</i>	Endangered	Endangered
Yosemite toad	<i>Anaxyrus canorus</i>	Candidate	None
<u>Birds</u>			
bald eagle	<i>Haliaeetus leucocephalus</i>	Delisted	Endangered
bank swallow	<i>Riparia</i>	None	Threatened
great gray owl	<i>Strix nebulosa</i>	None	Endangered
greater sandhill crane	<i>Grus canadensis tabida</i>	None	Threatened
willow flycatcher	<i>Empidonax traillii</i>	None	Endangered
<u>Fish</u>			
Lahontan cutthroat trout	<i>Oncorhynchus clarkii henshawi</i>	Threatened	None
Paiute cutthroat trout	<i>Oncorhynchus clarkii seleniris</i>	Threatened	None
<u>Mammals</u>			
California wolverine	<i>Gulo</i>	Proposed Threatened	Threatened
fisher - West Coast DPS	<i>Martes pennant</i>	Candidate	Not Warranted
gray-headed pika	<i>Ochotona princeps schisticeps</i>	None	Candidate Threatened
Sierra Nevada red fox	<i>Vulpes necator</i>	None	Threatened
<u>Plants</u>			
Tahoe yellow cress	<i>Rorippa subumbellata</i>	Candidate	Endangered
Webber's ivesia	<i>Ivesia webberi</i>	Candidate	None

(a) Source: California Department of Fish and Game's California Natural Diversity Database (accessed May 2013 via Quick Viewer, more information in Appendix 2-F)

2.13.1 Potential Climate Change Impacts and Vulnerabilities

Major climate change vulnerabilities in the Tahoe-Sierra Region include decreased snowpack, reduced groundwater recharge, increased flooding potential, increased wildfire risk and potential impacts to the recreation- and tourism-based economy. The Region is economically and ecologically dependent on the snowpack. Economically, winter snow-related recreation, especially skiing, is vital to the Region to provide jobs and tourist dollars.

In the IRWM Region, most precipitation occurs as snow during the winter months. Anticipated increases in winter temperatures, under climate change, would result in a shift towards more precipitation in the form of rain instead of snow. Increasing temperatures would also result in a decreased amount of water stored in the snowpack, a shift of peak snowmelt to earlier in the season, and accelerated melt due to more occurrences of rain-on-snow events. These conditions may also lead to higher peak stormflows, and increased erosion and sedimentation.

Changes to the snowpack and stormflow patterns could potentially decrease groundwater recharge through infiltration. Reduced soil moisture resulting from higher annual average temperatures could also impair groundwater recharge rates. Increases in peak stormwater runoff and reduced infiltration also increase flooding potential in the Region which could be exacerbated by increased wildfire occurrences. An increased frequency of drought, altered soil moisture regimes, changing precipitation patterns, as well as increasing temperatures are expected to result in wildfires becoming more frequent, intense, and larger in size. Losing the natural retardation of the stormwater or snow melt by vegetated ground cover may then result in less infiltration to groundwater, increased peak flood flows and enhanced erosion.

These impacts will in turn likely have negative impacts on the Region's ecological resources as well as the recreation- and tourism-based economy.

Appendix 2-D provides the prioritized climate change vulnerability checklist for the Region per DWR's *Climate Change Handbook for Regional Water Planning* (DWR 2011).

In addition, the Lake Tahoe Sustainable Communities Program (LTSCP), which is a group consisting of agencies, organizations, and stakeholders in the Lake Tahoe Basin, completed a Sustainability Action Plan for the Lake Tahoe Basin portion of the Region (LTSCP 2013). The plan includes actions for local and regional agencies to incorporate sustainability into their planning processes. The Sustainability Action Plan also includes a chapter dedicated to climate change-related vulnerabilities applicable to the Region. Areas of vulnerability identified in the plan include:

- Impaired water quality
- Reduced snowpack, variable precipitation levels, and unpredictable water supply
- Flooding hazards
- Wildfire hazards
- Impaired air quality and public health
- Impacts to biological resources, ecosystem function, and biodiversity
- Increase in quantity and distribution of disease vectors
- Impacts to forest resources
- Energy supply and services variability
- Direct disruption of services to energy infrastructure
- Economic impacts

The Science Synthesis Report prepared by the Tahoe Science Consortium in 2016 encompasses research on the Lake Tahoe Basin over a 10-year period. Key findings of the climate change focus are consistent with vulnerabilities noted above. As noted in the report, the Lake Tahoe Basin has experienced warmer temperatures, changes in winter precipitation with more rain and less snow, extended droughts, and extreme winter storms. These and other related changes are impacting forest health, wildfire risks, invasive species survivability, habitat integrity, air quality, lake levels, and nearshore conditions. These changes are anticipated to also potentially result in secondary changes including negative impacts to the tourism economy (TSC 2016).

More recently the California Tahoe Conservancy completed the *Climate Change Vulnerability Assessment of the Lake Tahoe Basin* in June 2019. This Vulnerability Assessment focused on future climate impacts to resources on a system-wide basis by projecting future climate conditions (temperature, precipitation, snowpack, climate-related water deficit, runoff, wind speed, and the kinetic energy of raindrops) onto the Lake Tahoe System, the Basin's Upland System, and the Basin's Built Environment and Communities. The Vulnerability Assessment is intended to support the development of the Climate Adaptation Action Plan (CTC 2019).

Additional information on climate change-related studies relevant to the Region is found in Section 3.2.3.

2.13.2 Water Quality

Water quality is a major concern throughout the Region. Many waterbodies in the Region are considered to be detrimentally impacted by pollutants including sediment, nutrients, and metals. TMDLs have been developed for Lake Tahoe, Heavenly Valley Creek, and Blackwood Creek in the Lake Tahoe HU; Truckee River, Squaw Creek, Bronco Creek, and Gray Creek in the Truckee River HU; and Indian Creek Reservoir in the East Fork Carson River HU. Additional TMDLs for these and many other waterbodies are in development. Lake Tahoe's clarity historically was decreasing by an average of one foot per year, largely due to nutrient and sediment loads in runoff into Lake Tahoe. While some improvements in lake clarity have been observed recently; climate change will make continued improvements challenging. More frequent warm storm events will increase runoff volumes, which can threaten water quality of Lake Tahoe. For the protection of these waterbodies, quality of runoff is an issue in both urban and undeveloped areas. In urban areas stormwater transports sediment and other pollutants from impermeable surfaces into receiving waterbodies. In undeveloped areas the wetlands, meadows, and riparian areas that would naturally provide filtration and removal of sediment and nutrients are in some cases impaired and can no longer provide that filtration, and may instead contribute through erosion to the sediment loading in downstream waterbodies. In addition to surface water quality concerns, groundwater in some areas is impacted

Other Water-Related Concerns

- Basin Plan Water Quality Objectives, including Lake Tahoe clarity
- Future surface and groundwater supply availability
- Surface water storage and releases managed by entities outside of the Region
- Localized flooding
- Drinking water standards
- Habitat protection and restoration
- Invasive species
- Water conservation

with naturally-occurring chemicals like arsenic, or man-made contaminants such as MTBE or chlorinated organic chemicals.

2.13.3 Forest Management

Because most of the land area in the Region consists of steep forested mountainsides, wildfires and the subsequent erosion by wind and water is a major concern. According to Cal-Adapt, climate models indicate that through the year 2085, the Region may see up to a 2- to 10-fold increase in fire risk (Wildfire Risk Tool, Cal-Adapt 2014c). Erosion following wildfires could become even more of a problem as wildfire risk is projected to increase. In the Tahoe Basin, continued decreases in the clarity of Lake Tahoe would result from increased erosion.

Additionally, nutrient levels may increase if a decrease in snow pack causes a decrease in the travel time for runoff to enter the lake, therefore decreasing the natural filtration and removal of nutrients from the water in the SEZs and riparian areas. The risks and impacts of wildfires in the Region were exemplified by the Angora fire in the Lake Tahoe Basin in 2007. The Angora fire burned over 3,000 acres, and raised significant concerns about the increased erosion and sedimentation of Lake Tahoe from burned areas, as well as potentially hazardous impacts to Lake Tahoe from the debris of the hundreds of structures that were burned in the fire.

2.13.4 Infrastructure Needs

As mentioned in Section 2.10, aging and deteriorating infrastructure is a problem in the Region. The dams in the Region were all initially constructed between the 1910s and 1970s, although rehabilitation work has been done on several dams, as needed. The Martis Creek Dam, however, is currently operating with open spillways due to excessive risks associated with the dam (Balance Hydraulics 2012). Much of the existing water and wastewater infrastructure including treatment facilities and distribution or collection infrastructure was constructed in the 1960s and is nearing or long past the design lifespan. In the Lake Tahoe Basin especially, deterioration of wastewater collection infrastructure can contribute to excess nutrient levels in waterbodies either through exfiltration from leaking pipelines or failures and breakages causing spills. In addition, water distribution pipelines are equally deteriorating with main leaks causing excessive water loss and intermittent runoff. Although some water districts are actively replacing aged water pipelines, it is a long-term process. The small customer bases for utility districts in the Region contribute to financing issues, and the problem of financing improvement projects is exacerbated by the fact that there are many small private water providers in the Region that do not qualify for many grant programs.

2.13.5 DAC Needs

During the update of this IRWM Plan a survey was conducted of DAC residents and hard-to-reach communities within the Region. A summary of the survey is provided in Appendix 2-E. The results of the survey indicate that especially in DACs and other low income communities in the Region there is a need for more education about drinking water sources and quality, watershed protection, and opportunities for water conservation. There is also a need to provide better access to programs to help with water conservation, water testing, and other related services.

Section 3: Relation to Local Planning

This section provides an overview of the relationship between this IRWM Plan (Plan) and the local water planning efforts, the current state of the relationships between local water and land use planning entities, and steps to foster more collaborative and proactive relationships in the future. This Plan is intended to support and incorporate local planning efforts by cities, counties, water agencies, federal agencies, and other local entities rather than replacing or overriding them. By providing a forum for interaction and communication, the IRWM process can assist local planning bodies in becoming more consistent and proactive, and thereby better able to protect and manage water resources.

Local planning efforts and documents have been integral to the development of the original Plan and this update. Partners and stakeholders that have participated in the development of this Plan include representatives of the counties (Alpine, El Dorado, Nevada, Placer, Sierra), cities, major communities, and major water suppliers within the Region as well as representatives of Tahoe Regional Planning Authority (TRPA), a bi-state regional agency. TRPA was created by Congress in 1969 as a separate legal entity comprised of members from both California and Nevada, expressly “to encourage the wise use and conservation of the waters of Lake Tahoe and of the resources of the area around said lake” (US Congress 1980 [Bi-State Compact]).

This Plan was developed by drawing information from many different local planning documents including Urban Water Managements Plans (UWMPs), Groundwater Management Plans (GWMPs), city and county General Plans, Local Agency Formation Commission (LAFCO) documents, water quality plans, and others. These local plans and their relationship to the IRWM effort are listed in Appendix 3-A, and summarized below. Many of these documents have been created or updated since the 2007 IRWM Plan was developed, and this update to the Plan has incorporated the new and updated documents. In addition, state and federal agencies manage over 70 percent of the Region’s land therefore their respective plans must also be considered. During future review cycles of the Plan, any updated versions of these local planning documents will be reviewed for inclusion or modification of the Plan.

Most of the original agencies have continued to participate in the IRWM Plan update. In addition, local water agencies will continue to coordinate with land use managers through review and participation in LAFCO Municipal Service Reviews, preparation of UWMPs, local Community Plans, and review of project-specific documents.

3.1 Relation to Local Water Planning

This section specifically describes the relationship of the plan to documents that relate directly to water planning including UWMPs, GWMPs, water quality control plans, and the Truckee River Operating Agreement (TROA).

3.1.1 Urban Water Management Plans and Water Supply Assessments

The Urban Water Management Planning Act of the Water Code requires development of an UWMP by water suppliers that deliver at least 3,000 acre-feet of water per year or serve at least 3,000 connections. These UWMPs are to be updated every five years. UWMP requirements

include: assessment of water supply reliability over a 20-year horizon, and development of water conservation programs to meet statewide goals established by SBx7-7 to reduce water consumption by 20% per capita by 2020. The five water districts in the Region that meet the requirement to develop UWMPs are North Tahoe Public Utility District (North Tahoe PUD), South Tahoe Public Utility District (South Tahoe PUD), Tahoe City Public Utility District (Tahoe City PUD), Truckee Donner Public Utility District (Truckee Donner PUD), and Placer County Water Agency (PCWA). Most of the water districts are active partners or stakeholders in the Plan and have partnered to provide regional water use efficiency programs. The supply and demand projections which reflect current and future water use and supplies from the UWMPs have been incorporated into the Region Description (Section 2) of the IRWM Plan. Section 2 indicates that agencies are able to meet future demands resulting from modest growth with existing supplies. UWMPs also often support water supply assessments and verifications under SB 221 and SB 610 as discussed below.

Two water supply planning bills passed by the state legislature, SB221 and SB610, also address the need for coordination between water suppliers and local land use planning agencies. SB221 requires projects that include subdivisions with more than 500 proposed dwelling units to obtain verification from the water supplier to ensure it has sufficient water supply over a 20-year period. This verification requirement also applies to increases of at least 10% of service connections for public water systems that have fewer than 500 service connections. SB610 requires that public water systems prepare a water supply assessment for use by the lead planning agency for any proposed project consisting of more than 500 dwelling units or more than 10% increase in service connections for the water system.

These two state requirements for verification of adequate water supply only apply to developments consisting of more than 500 dwelling units or increasing the number of water system service connections by 10%. Smaller development projects do not trigger these verification requirements, however land use planning agencies, through their General Plans, require that adequate water supply be available currently and in the future for development projects of all sizes. Within the Region, some development projects may be large enough to trigger the water supply verification requirements, but much smaller-scale development occurs for which such requirements must be made at the local level. For example, the area with the highest potential for a development requiring SB221/SB610 compliance is in Martis Valley while TRPA notes that there are a total of 482 developable parcels in South Lake Tahoe which even if aggregated, would be below the 500 dwelling unit threshold. It is likely that most of the development of the Region will likely occur on an individual home basis, rather than multi-home developments. That said, local government has applied the concepts of SB221/SB610 in developments at Homewood and other larger developments.

Plan objectives that relate to UWMPs include *WS1 Provide water supply to meet projected demands for a 20-year planning horizon*, and *WS3 Implement and promote water conservation measures and practices to meet state goals*.

3.1.2 Stormwater Resource Planning

Water Code 10562 (b)(7) requires the development of a stormwater resource plan to receive grants for stormwater and dry weather runoff capture projects. The 2018 Storm Water Resource Plan for the Tahoe-Sierra Region (SWRP) was developed by the Tahoe Resource Conservation District in accordance with stormwater resource plan guidelines. Benefit categories for project evaluation focused on water quality, flood management, environmental and community. As

such, implementation of the SWRP and its projects will help to further the Tahoe-Sierra IRWM Plan's progress toward attaining its flood control and stormwater focus objectives and goals.

The SWRP was submitted to the Tahoe-Sierra RWMG for incorporation into this IRWM Plan Update at the IRWM Partnership Meeting on September 19, 2017. The SWRP was developed to be consistent with the IRWM Plan, relying on information from the IRWM Plan, including region description, organization and governance structure, community participation procedures, and IRWM project lists. The SWRP was incorporated into this IRWM Plan as Appendix 3-B, and a link to the SWRP is posted on the Tahoe-Sierra IRWM website, enabling access to the SWRP document and project list. The link will remain current as the SWRP project lists are updated over time.

3.1.3 Groundwater Management Plans

There are four DWR-recognized groundwater basins in the Region; the Tahoe Valley groundwater basin with three sub-basins: Tahoe South, Tahoe West, and Tahoe North; the Martis Valley and Olympic Valley groundwater basins and the Carson Valley groundwater basin. GWMPs have been prepared for the Tahoe South, Martis Valley, and Olympic Valley basins, each of which is described below. These basins are where much of the population in the Region is concentrated therefore interest in the groundwater resource is also a focal point.



Barton Meadows
(Photo courtesy of California Tahoe Conservancy)

Guidelines for the development of GWMPs include collaboration between all public water systems and other public entities overlying the particular groundwater basin, presentation of historical data (i.e., groundwater level, groundwater quality, and pertinent surface water parameters), and establishment of management objectives and monitoring protocols. Groundwater basin conditions including general descriptions, quality, and quantity available for use have been incorporated into the Plan.

A GWMP has been developed by South Tahoe PUD in collaboration with the El Dorado County Water Agency for the Tahoe South groundwater sub-basin, which underlies much of South Lake Tahoe. The key concerns in the South Tahoe groundwater basin are related to water quality as there is ample supply. An update to the 2000 GWMP was developed in 2014.

Squaw Valley Public Service District (Squaw Valley PSD) prepared a GWMP in 2007 for the Olympic Valley groundwater basin. In Olympic Valley, the key concerns are avoiding impacts of drought and future demand increases, since groundwater quantity on an annual basis and quality are generally sufficient to meet current needs.

PCWA/Truckee Donner PUD/Northstar Community Services District (Northstar CSD) jointly prepared a GWMP in 2013 for the Martis Valley groundwater basin. Similar to Olympic Valley, Martis Valley groundwater concerns are managing pumping to meet the stakeholders' needs as well as the requirements of the TROA.

Alpine County prepared a GWMP in 2007 for the entire area of Alpine County including the portion of the Carson Valley groundwater basin in California. The management objectives established in the GWMP are minimizing long-term drawdown of groundwater supplies, protecting groundwater quality, preventing land subsidence, and protecting against undesirable surface-ground water interactions.

South Tahoe PUD, Squaw Valley PSD, and Alpine County are active partners and PCWA, and Truckee Donner PUD are stakeholders in the IRWM Plan.

The Washoe Tribe has developed a *Wellhead Protection Plan: 2005* (Washoe 2005) for the groundwater underlying the Washoe Tribe's Woodfords Community, which used a two-dimensional groundwater model to delineate the 2, 5, and 10-year wellhead protection areas for the Washoe Tribe's Woodfords Community's two drinking water wells.

Plan objectives that relate to groundwater management planning include *GWM1 Maintain and monitor groundwater supply to assure future reliability, GWM2 Promote groundwater protection activities for high quality groundwater, and advocate for improvements to impacted groundwater quality through public education, and GWM3 Manage groundwater for multiple uses*. These objectives are also consistent with Groundwater Sustainability Planning described below.

3.1.4 Groundwater Sustainability Planning

The Sustainable Groundwater Management Act (SGMA) passed by the Legislature on August 29, 2014 requires the designation of groundwater sustainability agencies and the adoption of groundwater sustainability plans for basins designated by the Department of Water Resources (DWR) as medium- or high-priority basins. The GSAs and GSPs are intended to provide planning and implementation for the sustainable management of groundwater in their respective groundwater basins. The Olympic Valley and, Carson Valley basins, and Tahoe Valley West and North subbasins have been designated very low priority. The Tahoe Valley South Subbasin was designated medium-priority during the 2014 assessment and again in the 2018 Phase 1 Final Prioritization. The Martis Valley Basin was designated medium-priority during the 2014 assessment, but was re-prioritized as very low-priority during the 2018 prioritization. Medium- and high-priority basins have been permitted to submit alternative groundwater management plans (Alternatives) in lieu of a GSP, if it satisfies the objectives of Water Code §10733.6.

The Martis Valley Basin Local SGMA Agencies (Truckee Donner Public Utility District, Northstar Community Services District, Placer County Water Agency, Town of Truckee, Nevada County, and Placer County) executed a Memorandum of Agreement to prepare an Alternative Submittal in compliance with SGMA. The Submittal was supported by a technical report that demonstrated that the Basin has operated within its sustainable yield for at least 25 years. Documentation was uploaded to the SGMA portal in December 2016, and an annual report uploaded in March 2018. However, due to the re-prioritization to very low, the Martis Valley Basin local SGMA agencies agreed to withdraw the Alternative Plan. Local stakeholders have decided to re-focus their efforts on basin management based on the 2013 GWMP.

The South Tahoe Public Utility District submitted an Alternative Plan covering the Tahoe Valley South Subbasin in 2016. The Alternative demonstrated, as required, that the Basin has operated within its sustainable yield for at least a 10-year period. In addition, the 2014 Groundwater Management Plan was submitted to meet alternative plan requirements. As of the writing of this update, the DWR decision on the Alternative Plan was still pending. The District

has been recognized as the Groundwater Sustainability Agency for the portion within its service area boundaries, whereas El Dorado County Water Agency was elected to serve as the GSA for the portion outside of the District's service area boundaries. Both agencies have agreed through a 2017 Memorandum of Understanding to cooperatively manage groundwater resources and coordinate implementation of the SGMA throughout the Basin. Pending decision from DWR, the District will continue to manage the Basin under the AB3030 GWMP or submit initial notification of intent to prepare a SGMA GSP.

3.1.5 Water Quality Control and Management Plans

The Water Quality Control Plan for the Lahontan Region (Basin Plan [Regional Board 1995 with amendments through 2011]) is the primary regional water quality planning document and is also the basis for regulation by the Regional Water Quality Control Board, Lahontan Region (Regional Board), including the Tahoe-Sierra IRWM Plan Region. The Basin Plan establishes beneficial uses and water quality objectives of both surface water bodies and groundwater basins. It also outlines implementation programs such as control and enforcement actions, and describes current monitoring activities. Programs used to implement Basin Plan objectives include waste discharge prohibitions; spills, leaks, investigations, and cleanups; stormwater, erosion, and sedimentation control measures; wastewater treatment, disposal, and reclamation measures; oversight of land disposal of solid and liquid waste; groundwater protection and management; total maximum daily loads (TMDLs); and other measures related to specific resource uses and development activities. The Basin Plan is periodically amended to clarify and modify provisions, including modifications of beneficial use designations, water quality objectives, and the addition of new TMDLs.

Water quality standards and control measures for the Lake Tahoe Basin are addressed separately from the rest of the Lahontan Region in the Basin Plan due to the unique sensitivities and concerns for Lake Tahoe and the surrounding tributaries. The TRPA Regional Plan, discussed in Section 3.2 further addresses water quality and other development-related topics for the Lake Tahoe Basin.

The Section 2 of this Plan incorporated information from the Basin Plan including beneficial uses and water quality objectives for waterbodies in the Region, and the current listing of impaired waterbodies including Lake Tahoe, Upper Truckee River and the West Fork Carson River and associated TMDLs for those water bodies.

In addition, Clean Water Act Section 208 requires preparation of Water Quality Management Plans to promote efficient and comprehensive programs for controlling water pollution in a defined geographic area. In the Tahoe-Sierra Region, there are Water Quality Management Plans (WQMPs) for both Lake Tahoe and the Carson River, which are described below.

The Lake Tahoe Water Quality Management Plan (208 Plan), updated by the TRPA in 2012, describes the water quality management system in the entire Lake Tahoe Basin, the desired water quality outcomes, and the methods to achieve those outcomes. The 208 Plan incorporates by reference many documents by local, state, and federal agencies including the TRPA Regional Plan and Regional Plan Environmental Impact Statement, Lahontan Basin Plan, Lake Tahoe Basin Management Unit Land and Resource Management Plan, and area plans for the City of South Lake Tahoe and the counties in the basin. Roles and responsibilities for water quality management in the Lake Tahoe Basin are laid out in the 208 Plan with different federal, state (California and Nevada), county, city, and private entities responsible for establishment of

standards and policies, monitoring, enforcement, completion of projects, and operations and maintenance activities. The 208 Plan also summarizes the TMDLs for Lake Tahoe established by both the Lahontan Regional Board and the Nevada Department of Environmental Protection, lists the general and specific National Pollutant Discharge Elimination System (NPDES) permits that have been issued in the Basin, lists the wastewater and solid waste collection agencies in the Basin, describes the programs and best management practices (BMPs) that are used in the Basin to protect water quality, and summarizes existing programs to protect groundwater.

The Water Quality Management Plan for the Carson River was prepared in 2005 for the Carson Water Subconservancy District, which includes Alpine County. The East and West Fork Carson River HUs in California are a small area of the overall Carson River HU. The Carson River 208 Plan focuses more on larger and higher density population areas of Nevada. For the California portion of the HU, the Carson River 208 Plan lists the TMDLs, wastewater treatment facilities, nonpoint sources, and BMPs in place.

Several Plan objectives (Section 4) relate directly or indirectly to standards or programs outlined in the Basin Plan and 208 Plans including *WQ1 Meet approved TMDL standards in accordance with the attainment date, and participate in the development of future TMDLs; WQ2 Reduce pollutant loads by implementing measures such as storm water LID retrofits, erosion control/restoration to meet Water Quality Objectives (WQOs) for receiving water bodies established in the water quality Control Plan for the Lahontan Region within the planning horizon; and WQ3 Implement water quality monitoring programs through planning horizon, and coordinate annually throughout the Region.*

3.1.6 Truckee River Operating Agreement

Water planning within the Region also must take into account the Truckee River Operating Agreement (TROA), an agreement for the allocation of the waters of Lake Tahoe and the Truckee River between California and Nevada users. Parties to the TROA include the United States; State of California; State of Nevada; Truckee Meadows Water Authority; Pyramid Lake Paiute Tribe of Indians; Washoe County Water Conservation District; City of Reno, Nevada; City of Sparks, Nevada; City of Fernley, Nevada; Washoe County, Nevada; Sierra Valley Water Company; Truckee Donner PUD; North Tahoe PUD; Carson-Truckee Water Conservancy District; and PCWA. Key elements of the TROA are that it allows storage of water in Truckee River reservoirs (including Lake Tahoe) for new purposes and operational flexibility, provides a permanent allocation of water between California and Nevada from Truckee, Carson, and Lake Tahoe waters with tracking and measurement requirements, and protects Lake Tahoe elevation so that shoreline erosion would not increase and water quality is not affected.

The Plan objective (Section 4) that relates directly to the complex relationship between TROA and the IRWM is *IWM6 Monitor water storage, release and exchange activities in order to improve coordination with regional planning.*

3.2 Relation to Local Land Use Planning

Land use decisions can have significant effects on water resources and local water management planning, yet land use planning and water management planning are commonly not done in a collaborative and proactive fashion. In a largely rural area such as the Region, state policies that attempt to link land use and water management planning and decisions have limited effect because they are primarily meant for urban areas or rural areas undergoing

significant development. Within the Region, the majority of the land is public open space with a few clustered areas of urban development. The rate of growth in the Region is relatively low and as a result significant changes in land use are not projected.

Generally, water management and land use planning in the Region are conducted by separate entities. Currently in California, general planning by counties and municipalities, and urban water management planning by water suppliers are the primary means of collaboration between these water management and land use planning entities. State law requires that every county and municipality adopt a long-term General Plan that includes seven required elements. Water-related issues are generally addressed directly in the Conservation element but may also be addressed directly or indirectly in Land Use, Circulation, Housing, Open Space, Noise, Safety, or other elements.

Additionally, LAFCOs provide municipal service reviews (MSR) that evaluate how local water and wastewater districts serve the needs of their communities. As noted in Appendix 3-A, the El Dorado County LAFCO has water-related MSRs for South Tahoe PUD and the City of South Lake Tahoe. Nevada County has MSRs for East County and Eastern Nevada County. The Placer County LAFCO has MSRs for North Lake Tahoe and Martis Valley, Alpine and Sierra Counties have LAFCO which are not active. Individual agencies also prepare water and wastewater system infrastructure planning documents such as master plans and optimization plans.

3.2.1 Local Land Use and Land Management Summary

Land use and land management agencies in the Region, including the five counties, the City of South Lake Tahoe, Town of Truckee, the TRPA, and the national forests including such as the Lake Tahoe Basin Management Unit (LTBMU) have planning documents that include goals and policies related to water supply, wastewater collection, stormwater management, and protection of water resources. Elements of these and other management plans and studies by partners and stakeholders of this IRWM Plan have also been incorporated into this IRWM Plan. Several of these land management agencies are partners in the IRWM Region or have otherwise participated in this Plan.

Within the Lake Tahoe Basin, local land use planning has taken into account regional water issues for decades under the jurisdiction of the TRPA. TRPA was created by the Bi-State Compact in 1969 and was granted the authority to adopt and implement environmental threshold carrying capacities for the entire Lake Tahoe Basin through the development and enforcement of a regional plan and ordinances. The primary purpose of environmental threshold carrying capacities was to provide for growth and development while maintaining the environmental and ecological conditions of the Lake Tahoe Basin. Therefore, development in the Lake Tahoe Basin is strictly regulated to protect water quality in the stream environment zones (SEZs) and Lake Tahoe.



City of South Lake Tahoe Welcome Sign
(Photo courtesy of the City of South Lake Tahoe)

It is important to note that while this IRWM Plan is specifically focused only on the California portion of the Lake Tahoe Basin, coordination between land use planning agencies and water management agencies is equally important throughout the entire Lake Tahoe Basin, including the Nevada portion. Water related goals and policies involving collaboration between water management agencies are outlined in planning documents for the land management agencies within the Region. They are summarized below with formal coordination efforts between land use and water management agencies. Additionally, there are many other opportunities for collaboration of land use and water management agencies. Public meeting attendance, public document feedback, and CEQA involvement are just a few examples.

There are several Plan objectives that address land use planning and coordination with water management including *IWM2 Ensure collaboration among multiple jurisdictions within the Region for information exchange*, as well as those addressing ecosystem restoration efforts (WQ5, ER1, ER3, ER4), and conservation (WS3). Through these efforts, it is expected that future collaboration between land use planning agencies and water management agencies will continue.

The various land-use management documents are identified in Appendix 3-A including key documents for each County in the Region. Water-related policies and objectives for each Document are described below.

Alpine County General Plan: Approximately 90% of Alpine County within the Region is managed by the US Forest Service (USFS) or Bureau of Land Management (BLM). There are no incorporated cities; therefore, the remaining land is governed by the County's General Plan (revised 2009). As there are no large public water agencies in Alpine County, the County's General Plan is also the main water management planning tool. Policies in the County's General Plan address: changes in stormwater and surface water flows due to development (Policies 4b and 4c), overpumping of groundwater (Policies 5a and 5b), minimizing decreases in groundwater recharge due to development (Policy 5c), identification of acceptable water supplies and wastewater disposal methods for new development (Policies 5d and 7b), prevention of areas with a high concentration of individual sewage disposal systems (Policy 7c), minimizing development in or conversion of wetlands (Policy 8), small scale hydroelectric power development where water loss will be insignificant (Policy 17a), flood zone identifications and development prohibitions (Policies 23a, b, c, and d), and land designated as stream environment. The public services section of the Land Use Element and the needs assessment section of the Circulation Element in the General Plan present concerns regarding the capacity, maintenance, and financial viability of the Markleeville Mutual Water Company and the Markleeville Public Utility Company. The Housing Element identifies availability of water and wastewater service as a limiting factor to development both generally in the County, and in the communities of Markleeville and Woodfords (Alpine County community near Alpine Village, not the Washoe Tribe's Woodfords Community).

El Dorado County General Plan: The land area of El Dorado County contained within the Region is located within the Lake Tahoe Basin. As a result land use regulation outside of the City of South Lake Tahoe is shared by the County and TRPA. The County's General Plan regarding land area in the Region emphasizes coordination with TRPA and other state and federal agencies with land use jurisdiction in the Lake Tahoe Basin (Policies 2.10.1.1 through 5, Measure LU-O). The General Plan also requires buffers to be established around future water supplies (Policy 2.2.5.14).

City of South Lake Tahoe General Plan: Land use regulation is shared by the City and TRPA because the City of South Lake Tahoe is located within the Lake Tahoe Basin. The City's General Plan (adopted 2011) contains many mutually-adopted policies of the two bodies. In addition to coordination with TRPA, coordination with South Tahoe PUD and other water providers is highlighted in the General Plan (Goal PQP-2 and Policies PQP-2.2, 2.5, and 2.7). Other policies related to protection of water quality include protection of the groundwater basin from overdraft and contamination (Policy PQP-2.9), protection of Lake Tahoe and other surface water streams from stormwater pollution through stormwater management (Goals PQP-4 and NCR-2, and Policies PQP-4.1 through 4.3, NCR-2.1 through 2.5, NCR-2.13 and NCR-2.14), considerations of snow removal practices (Policy PQP-11.8), and protection and restoration of SEZs and floodplains (Goal HS-4, Policies HS-4.1, 4.2, and 4.4, NCR-2.9 and NCR-2.12).

Nevada County General Plan: Outside of the Town of Truckee sphere of influence, the Nevada County General Plan, which was approved in 1996, governs private land use in Nevada County. Coordination between Nevada County and water agencies is primarily focused on water supply and water quality. General Plan objectives and policies direct the County to adopt Site Development Standards that would require all development projects to protect environmentally sensitive resources such as wetlands, riparian corridors, and floodplains (Policy 1.17), encourage use of community and public water systems instead of individual water supplies where possible (Policies 3.16 through 19), protect and improve water quality through cooperation for both point and non-point source pollution, enforce regulation of septic systems (Objective 11.2 and Policies 11.4 through 11.6B), and preserve floodplains (Objective 11.4, and Policies 11.9 through 11.9B).

Town of Truckee General Plan: The Town of Truckee General Plan (adopted 2006) includes the preservation of the Truckee River corridor and its tributary drainages as one of its guiding principles. Coordination with state and local agencies including the Regional Board and Truckee Donner PUD is a major focus of the General Plan's Conservation and Open Space Element. Policies in the General Plan related to water supply and quality include requiring sufficient water service capacity prior to rezoning and development (Policies P4.3 and P11.7), minimizing pavement and other development that may increase runoff and decrease groundwater recharge, implementing Best Management Practices, and cooperating with state and local agencies for pollution control and cleanup (Policies P11.1 through 11.9 and Actions A11.1 through 11.9).

Placer County General Plan: Part of the land area in the Region within Placer County is located within the Lake Tahoe Basin, where land use regulation is shared by the County and TRPA. Coordination between Placer County and water agencies is primarily focused on water supply. Policies in the Placer County General Plan (updated 2013) related to water supply concerns include: requiring new development to demonstrate the availability of a reliable water source with a focus on reliance on surface water provided through public water systems where possible, and requiring development near water bodies to mitigate water quality impacts from grading, impervious surfaces, and stormwater runoff, or septic systems (Policies 4.C.1 through 13). Policies related to drainage and water quality include maintenance of natural drainage channels, improvement of the quality of urban runoff, prohibition on underground storm drains in rural areas, requirements to mitigate impacts to stormwater quantity or quality, and consideration of the use of stormwater to replenish groundwater basins (Policies 4.E.1 through 20, and 4.F.1 through 14). Other water resource related policies include stream protection through buffers and restoration, minimization of impacts due to erosion, sedimentation, or

pollutants in stormwater, and groundwater protection (Policies 6.A.1 through 15), as well as protection of riparian and fish habitats (Policies 6.B.1 through 5 and 6.C.1 through 14).

Placer County Community Plans: Several unincorporated communities in Placer County have developed community plans that supplement the Placer County General Plan with locally-focused specifics. Communities and areas within the Region that have developed community plans include Alpine Meadows, Carnelian Bay, Kings Beach, Martis Valley, North Stateline, North Tahoe Area, Squaw Valley Area, Tahoe City Area, Tahoe Vista, and West Shore Area. The community plans provide additional goals and policies related to the specific concerns in each area, including coordination needs between County agencies and local water suppliers.

Sierra County General Plan: Approximately 80% of the area of Sierra County within the Region is managed by the USFS. The County's General Plan, which was adopted in 1996, is the primary land use management tool for the remainder of the area because the outskirts of Verdi, Nevada is the only community within Sierra County that is in the Region. As presented in Section 2, there are no community water systems in this area, and only a few non-community water systems for campgrounds. Goals of the General Plan include watershed protection and maintenance of the quality of the water resources in the County. Consideration of and coordination with other agencies is a focus of the General Plan (Policy LU-M and Implementation Measure LU-M, and Policies WR-1, 7, 17, 18, and 30a).

TRPA Regional Plan: TRPA is directed by the Bi-State Compact to adopt a Regional Plan and related ordinances to enforce the environmental threshold carrying capacities in the Lake Tahoe Basin, including the protection of water quality in Lake Tahoe. The TRPA Governing Board, Advisory Planning Commission, and other participants in the update of the Regional Plan (adopted 2012) include representatives of water management agencies with authority in the Lake Tahoe Basin. As noted in specific planning documents earlier, coordination with local, state, and federal agencies is considered important in order to achieve the goals of the Bi-State Compact (Goal WQ-1 and Policies WQ-1.1 through 1.7). The Regional Plan also addresses specific measures related to water quality protection and improvement (Goals WQ-2, WQ-3, SEZ-1, and PS-3; and Policies WQ-2.1 through 2.7, WQ-3.1 through 3.13, SEZ-1.1 through 1.8, and PS-3.1), as well as ensuring sufficient water supply (Goal PS-2 and Policies PS-2.1 through 2.3).

Land use planning agencies' involvement in water related issues goes beyond the general planning process in many cases. A couple examples are the *Placer County LID Guidebook*



Emerald Bay
(Photo courtesy of California State Parks)

(Placer County 2012) and the *Truckee River Water Quality Management Plan (2ND NATURE 2008)* produced for Placer County and the Town of Truckee respectively. The *Placer County LID Guidebook* is intended to promote the application of principles and strategies for stormwater and water quality management and encourages collaboration between design teams and planning agencies early in the process. These principles and strategies vary in scale from community to site including such practices as designing roads to maintain predevelopment drainage patterns and incorporating bioretention areas in site landscaping. The *Truckee River Water Quality Management Plan* is intended to evaluate the current stormwater management plans and to provide a

comprehensive stormwater management plan that includes monitoring with a goal of ensuring collaboration of monitoring efforts between entities.

3.2.2 Other Land Management Agency Summary

Approximately 63% of the of the Region is managed by USFS, of which half is in the Toiyabe National Forest (Toiyabe), most of the remainder is in the Tahoe National Forest (TNF) or the LTBMU, with a small area in the Eldorado National Forest. Approximately 2% of the Region is managed by the BLM, and another 2.5% is managed by various California state agencies including the California Department of Parks and Recreation, the California Department of Fish and Wildlife, and the State Lands Commission. The remaining 22% of the Region is privately owned, and includes preserved open space, rangeland, timber harvesting land, and urban development. Approximately 5% of the Region is within the city boundaries of South Lake Tahoe and Truckee, although their planning areas including surrounding unincorporated areas cover approximately 7% of the Region. The various boundaries are shown on Figure 2-2.

Sierra Nevada Forest Plan Amendment: The Sierra Nevada Forest Plan, finalized in 2004, amended the Land and Resource Management Plans (LRMPs) for the eleven national forests of the Sierra Nevada, including those in the Region. The Sierra Nevada Forest Plan provides management direction for five problem areas including old forest ecosystems conservation; aquatic, riparian, and meadow ecosystems management; fire and fuels management; lower westside hardwood ecosystems maintenance; and integrated noxious weed management. The broad goals for the management of aquatic, riparian, and meadow ecosystems include maintaining and restoring water quality, habitat, plant and animal community diversity, special habitats, watershed connectivity, floodplain connectivity, watershed condition, streamflow patterns and sediment regimes, and stream banks and shorelines.

Tahoe National Forest Land and Resource Management Plan: As shown on Figure 2-2, the portion of the TNF that lies within the Region is very discontinuous with many areas of private land interspersed with the forest lands, and therefore forest planning efforts have involved direct contact with individual private landowners of large holdings, and public outreach for other private landowners and stakeholders. The LRMP for the TNF was finalized in 1990 and is projected to be updated within the next three years. Management objectives for the TNF as outlined in the LRMP include managing riparian areas to preserve or improve their productivity for dependent resources such as water, protect water resources, improve water quantity and the timing of flows. Where possible, achieve water quality objectives established by the Regional Board are another objective of the TNF LRMP. On a smaller scale, management plans for specific projects are regularly developed and undergo environmental analysis within the overall management framework of the TNF and the Sierra Nevada Forest Plan.

Toiyabe National Forest Land and Resource Management Plan: The portion of the Toiyabe National Forest in the Region includes part of the Dog Valley watershed on the California-Nevada border east of the Little Truckee River, and much of the Carson River watersheds in Alpine County. These watersheds provide water for Markleeville and downstream municipalities outside of the Region in Nevada. The need to protect water quality, quantity, and timing for these municipalities is considered in the management plan. Management goals in the Toiyabe LRMP (finalized in 1986, most recently amended in 2001) for the Dog Valley and Alpine management areas of the Toiyabe include maintaining or improving the water quality of water resources and riparian areas, reintroducing the Lahontan cutthroat trout, studying the eligibility

of the East Fork Carson River to be designated as a Wild and Scenic River, and completing rehabilitation of the Leviathan Mine Site.

Lake Tahoe Basin Management Unit Draft Revised Land and Resource Management Plan: The LTBMU was established to bring consistency in planning within the portions of the TNF, Toiyabe, and Eldorado National Forests that lie within the Lake Tahoe Basin. Activities and management focus in the LTBMU differ from most national forests because there is a relatively small amount of timber harvesting, grazing, or mining. The management of the LTBMU is focused on forest ecosystem and watershed restoration, with an emphasis on erosion control and water quality improvement. The LTBMU and TRPA share the same planning area, and by law the LTBMU must cooperate with TRPA. Coordination is facilitated by a Memorandum of Understanding. Desired conditions in the LTBMU Draft Revised LRMP (published for public comment in 2013) include preserved clarity in Lake Tahoe (WQ-DC-1); maintained or improved water quality, soil function, riparian areas, and stream process to reduce erosion and maintain or improve water quality (SQ-DC-1 through 3 and 5, WQ-DC-2 and 3, HGP-DC-1 through 7); and sustained aquatic habitats including for Lahontan cutthroat trout (BR-DC-1, 2, 4, 5, 6, and 24).

Other Public Land Management Plans: Several California State Parks and Recreation Areas within the Region have established General Plans as long term management frameworks to meet the needs of the parks including resource protection, resource restoration, and public access. The California Department of Fish and Wildlife has developed a Land Management Plan for Heenan Lake Wildlife Area in the Upper Truckee River watershed, which includes a crucial egg taking station for the maintenance of Lahontan cutthroat trout stock throughout California and Nevada. Lands managed by the BLM are managed through the policies and guidance provided by the BLM manuals.

3.2.3 Climate Change Policies in Current Land Use and Management Plans

As discussed in Section 2, the Region has significant vulnerabilities to the effects of climate change, including changes to seasonal runoff timing and quantity. Across the Region, there is a range of climate change adaptation and mitigation planning by various jurisdictions. The vulnerabilities, adaptation, and mitigation strategies in various planning documents have been incorporated in the Plan in Section 2 and the Climate Change Vulnerability Checklist (Appendix 2-D).

The City of South Lake Tahoe included policies in the Natural and Cultural Resources element of its *General Plan* that consider potential adaptation and protection measures for climate change, as well as mitigation measures, emission analyses, and reduction targets. These policies also include directives to work with local and statewide greenhouse gas emission reduction efforts. The *Humboldt-Toiyabe National Forest Climate Change Vulnerability Report* (USFS 2011) identifies vulnerabilities of the Toiyabe with respect to climate change, and also forest management measures to respond to climate change. Alpine County and PCWA have completed greenhouse gas emissions inventories. PCWA's *Energy and Green House Gas Benchmark Study* (Brown and Caldwell 2009) is the first phase in a program to address climate change mitigation strategies. The report includes a greenhouse gas emissions inventory and establishes current energy use benchmarks, and identifies options for conservation and alternative sourcing. The *Sustainability Action Plan: A Sustainability Action Toolkit for Lake Tahoe (Lake Tahoe Sustainable Communities Program 2014)*, part of the cooperative

Tahoe Sustainability Program in the Lake Tahoe Basin led by TRPA, includes baseline greenhouse gas inventory information, reduction targets, a menu of GHG reduction actions and climate change readiness actions, and an assessment of risks and vulnerabilities.

3.2.3.1 Ongoing and Future Climate Change Analyses

Future climate change responses and mitigation efforts will require continued, robust collaboration between land use planning and water management planning. Various jurisdictions and organizations within the Region continue to gather data to assess the effects and vulnerabilities to climate change. Future updates to the Plan will incorporate this updated information, and project scoring for future project solicitations is also expected to reflect the Partnership members' updated understandings of the prioritized vulnerabilities within the Region.

There are numerous studies and efforts that provide valuable climate change-related information on the Tahoe-Sierra Region that will contribute to improved understanding of vulnerabilities to the Region and help identify approaches for improved resource management. Below is a summary of some of these major efforts.

Lake Tahoe Sustainability Action Plan

Among the documents relevant to the Region, is the Tahoe Regional Planning Agency's Sustainability Action Plan. This 2013 Plan is the third document in the Lake Tahoe Communities Program Document Series and is intended to serve as a toolkit for local governments, agencies, businesses, residents, visitors and community groups for prioritizing and adopting consistent sustainability actions throughout the Region. The Plan presents the regional greenhouse gas inventory and related reduction target, sustainability and greenhouse gas emission reduction actions, climate change readiness options, and methods for community engagement. As such, the Plan provides a valuable planning resource for IRWM efforts. The Plan and related information is available at: <http://laketahoesustainablecommunitiesprogram.org/sustainability-action-plan/>.

Tahoe Environmental Research Center

The UC Davis Tahoe Environmental Research Center (TERC) and its precursors has collected monitoring data of Lake Tahoe since 1968. These datasets on long-term air and lake temperature, as well as time series information on the basin's streams and other analyses are providing evidence of global climate change and warming in the Tahoe Basin. In addition, this compilation of information is allowing to model future impacts on the state of the lake. Among the trends identified, include a rise in the average daily minimum temperature by 4.2 degrees F over the last 100 years and an increase in the average water temperature by 1.4 degrees F since 1970. The awareness and better understanding of these potential impacts is essential for identifying approaches to mitigate impacts and optimize management of the basin. Among the solutions identified by the center are, 1) slowing the rate of oxygen depletion by reducing nutrient inputs, 2) sequestering nutrients and sediments in floodplains away from the lake, and 3) accelerating the pace of clarity recovery. Additional information on this work is available at: <https://tahoe.ucdavis.edu/climate-change>.

SNPLMA – Supported Projects

The Southern Nevada Public Lands Management Act (SNPLMA), administered by the U.S. Bureau of Land Management in partnership with the U.S. Forest Service, Pacific Southwest Research, has supported various research projects that have produced the scientific basis to preserve, protect and restore the ecosystems in the Lake Tahoe Basin. The Science Synthesis Report prepared by the Tahoe Science Consortium in 2016 encompasses the results of studies supported by the SNPLMA Science Program over a 10-year period. Among the focuses is climate change with an emphasis on informing policymakers and providing tools for proactive policy alternatives and effective resource management. Numerous key findings are laid out in the report ranging from vegetation, wildfire regimes, lake quality, groundwater and wetlands, and invasive species and pests. At the same time, the report notes the challenges of incorporating climate change model data with management strategies and the need to provide more actionable information related to climate impacts in the Tahoe Basin (TSC 2016). The report is available at:

<https://www.fs.fed.us/psw/partnerships/tahoescience/documents/TSCScienceSynthesisReport.pdf>.

Section 4: Objectives

The goals and objectives presented in this section represent the foundational intent of this Integrated Regional Water Management Plan (IRWM Plan) to improve water resources management throughout the Region over the planning horizon of the next 20 years to 2035. The five goals from the 2007 IRWM Plan were maintained. Updating the existing objectives to ensure they were still meaningful and relevant for the Tahoe-Sierra Region required a collaborative and interactive process amongst the Partnership sub-committee and Partnership over a 5-month period beginning in May 2013. The draft objectives were circulated for review and comment to the Partnership two times to allow for thorough consideration and refinement for what ultimately sets the direction of the IRWM Plan.

4.1 Key Terms

People familiar with the broad discipline of planning recognize that different agencies and organizations may use similar terms in slightly different ways in their processes. The following set of terms were established and used during the IRWM Plan preparation process:

- Plan Goal
- Plan Objective
- Measurable Planning Target (MPT)

Within this Plan, the term “goal” is defined as a desired outcome or result for which effort will be made to accomplish it. The “Plan goals,” which are presented in Section 4.3, give a high-level perspective of what the Plan is intended to address (and what it is not intended to address). The Plan goals are written to be relevant over the entire planning horizon and beyond, but they may never be fully realized. Efforts toward achieving the Plan goals are expected to continue indefinitely. For example, the first goal, “Protect and improve water quality,” is one that the stakeholders should always strive to achieve and improve.

In contrast, the term “objective” is defined as a specific and tangible outcome that is intended to be achieved by or during a designated time. The Plan objectives, presented in Section 4.4, were developed using “SMART” criteria, meaning that each objective should be **s**pecific, **m**easurable, **a**ttainable, **r**elevant, and **t**ime-based. When crafted properly, SMART objectives help to promote actions that lead to measurable results consistent with Plan goals. The Plan objectives allow people to measure and track progress toward improving integrated water management within the Region over time.

The term Measurable Planning Target (MPT) is used to mean a specific and tangible outcome of a Plan Objective that is intended to be achieved by or during a designated time. Each Plan Objective may have one or more Measurable Planning Target. The Measurable Planning Targets are the building blocks and “checkpoints” that will be used by the Region to confirm progress towards achieving each Plan Objective. Some of the Measurable Planning Targets are quantifiable, while others are qualitative. Quantifiable MPTs have specific defined targets, such as number of projects implemented. Qualitative MPTs are less specific, and might measure progress by tracking the number of meetings held, or attendance. Some of the MPTs are designed to collect fundamental information that is needed to fully understand and complete the overall Plan Objective. For example, Objective WQ2, which seeks to reduce pollutant loads to

meet Water Quality Objectives, has a Measurable Planning Target to track projects that are evaluating pollutant load reduction and receiving water standards.

The Plan Objectives were intended to focus areas throughout the Plan horizon. It is expected that the Plan Objectives and MPTs will be reviewed and potentially revised over time to reflect the benefits of increased coordination by Plan stakeholders.

4.2 Process for Developing Goals, Objectives and Measurable Planning Targets

The Plan Goals, Objectives and measurable planning targets were updated/developed using an iterative and collaborative approach that included three phases:

- Review the existing goals and objectives to ensure they still reflected the major water-related needs and challenges within the Region
- Propose revised draft Plan Objectives that address the major water-related needs and challenges, discuss, review and refine
- Propose draft MPTs that will demonstrate progress towards achieving Plan Objectives, discuss, review and refine

The first step in updating the Plan Goals and Objectives was to review the goals and objectives presented in the 2007 IRWM Plan and ensure they were still relevant and met the water-related needs and challenges currently important to the Region. The needs and challenges were compiled from the 2007 IRWM Plan, the Regional Acceptance Process application, as well as discussions at IRWM Plan Partnership meetings in May and September 2013.

Initial Measurable Planning Targets were developed and refined through discussion with the sub-committee during several meetings in 2013 and presented to the Partnership for review and comment in September 2013. In total, 40 MPTs were identified for the 22 Plan Objectives, each of which is described in the section that follows. It should also be noted that there is potential for some overlap between certain objectives because of the integrated nature of the needs and challenges; however, they were developed to be as specific and stand-alone as practical.

4.3 Plan Goals

The Plan goals are listed below:

1. **Protect and improve water quality.** A number of water quality concerns for surface water and groundwater exist particularly as they relate to Water Quality Control Plan beneficial uses and the water quality impairments to some of the major water bodies such as Lake Tahoe that occur in the Region. The main concerns expressed during the meetings are water quality and aging wastewater infrastructure that impact water quality in the region. This goal highlights the importance of improving the water quality of water bodies as appropriate to water uses and preserving water quality levels that are now within desirable levels.
2. **Protect the community water supply and treatment/delivery system.** Although water supply within the Region is adequate, local water/wastewater agencies recognize that

aging and deteriorating infrastructure is a problem in the Region. This goal acknowledges the importance of sustainability through the implementation of infrastructure improvements as well as cost-effective conservation and efficiency improvements to avoid wasting water and other natural resources.

3. **Manage groundwater for sustainable yield.** Groundwater is the main source of municipal water in the Region. This goal emphasizes the importance of managing groundwater through effective water management strategies that provide multiple benefits.
4. **Contribute to ecosystem restoration.** Improvements to the resources of the watershed including the many creeks, rivers, lakes, wetlands and forests can result in long-term benefits to the native habitats and their ecosystems as well as improvements to water quality. This goal highlights the importance of continuing to monitor, understand and mitigate the hazards associated with watershed management.
5. **Implement integrated watershed management throughout the Region.** This goal recognizes that with improved integration and collaboration more successful watershed management can be achieved when compared to individual efforts.

4.4 Plan Objectives and Measurable Planning Targets

4.4.1 Water Quality (WQ) Objectives

The water quality objectives that support the goal of protecting and improving water quality in the Region include:

WQ1 Meet approved TMDL standards in accordance with the attainment date, and participate in the development of future TMDLs.

This objective is based on the recognition of the importance of complying with respective State and Federal standards associated with developing and implementing activities to attain TMDLs for water bodies with water quality impairments. The associated Measurable Planning Targets focus on the activities that could be implemented to address this objective.

MPT WQ1.1 – Annually review the number of projects started or completed that contribute to meeting TMDLs (quantitative)

MPT WQ1.2 – Summarize the number of meetings or contacts made in development of future TMDLs (quantitative) annually

WQ2 Reduce pollutant loads by implementing measures such as storm water LID retrofits, erosion control/restoration to meet Water Quality Objectives (WQOs) for receiving water bodies established in the Water Quality Control Plan for the Lahontan Region within the planning horizon.

Similar to Water Quality Objective 1, this objective demonstrates the Region's priority in complying with the State's Water Quality Objectives through pollutant load reduction. The

associated Measurable Planning Targets focus on the activities that could be implemented to address this objective.

MPT WQ2.1 – Annually track projects that are evaluating pollutant load reduction and receiving water standards (quantitative)

MPT WQ2.2 – Number of projects started or completed that contribute to meeting WQOs (quantitative)

MPT WQ2.3 – Summarize pollutant load reductions for those projects with estimates (quantitative)



Landscaping BMPs
(Photo courtesy of the Town of Truckee)

WQ3 Implement water quality monitoring programs through planning horizon, and coordinate annually throughout the Region.

This objective is based on the challenge that monitoring changes to water quality is important to tracking water quality improvements within the Region. The Region also recognizes that water quality monitoring programs change with availability of funds and changes in Federal and State standards. While analysis of the data collected is critical and ongoing, inherent seasonal and hydrologic variability in monitoring results makes discernment of trends difficult. Therefore, the Measurable Planning Target identifies the specific action of monitoring that could be implemented to address this objective rather than quantitative measure of results.

MPT WQ3.1 – Summarize whether monitoring was conducted, where it was conducted, where it was reported, and the purpose of monitoring (qualitative/quantitative)

WQ4 Ensure that drinking water supplied by public water systems continues to meet Federal and State standards.

This objective is based on the challenge that drinking water treatment and distribution must meet regulatory requirements for protection of public health. The Measurable Planning Target identifies the specific action that could be implemented to address this objective.

MPT WQ4.1 – Number of water systems that met State and Federal standards (quantitative)

WQ5 Restore degraded streams, wetlands, riparian and upland areas to re-establish natural water filtering processes.

This objective is based on the challenge of enhancing stream environment zones (SEZ) and other areas that contribute to natural water filtering processes. As there are several

organizations in the Region working on restoration, the associated MPT focuses on inventory to provide as complete Regional coverage as possible to address this objective.

MPT WQ5.1 – Report the number of projects that contribute to restoration of streams, wetlands and riparian areas (quantitative).

WQ6 Operate and maintain, build, or replace infrastructure for reliable collection, treatment and disposal of wastewater.

This objective is derived from the challenge that wastewater collection, treatment and disposal must meet regulatory requirements particularly as it relates to reducing/eliminating wastewater spills and treating wastewater to meet discharge requirements. In addition, local wastewater agencies recognize that aging and deteriorating infrastructure is a problem in the Region that can contribute to wastewater spills. The associated Measurable Planning Targets focus on the activities that could be implemented to address this objective.

MPT WQ6.1 – Number of infrastructure failures per year (quantitative)

MPT WQ6.2 – Number of projects or length of pipeline rehabilitated/constructed (quantitative)

4.4.2 Water Supply (WS) Objectives

The water supply objectives that support the goal of protecting the community water supply and treatment/delivery system to provide sufficient supply to meet the Region's current and future needs include:

WS1 Provide water supply to meet projected demands for a 20-year planning horizon.

This objective is based in part on water suppliers complying with state requirements (i.e., Urban Water Management Plans for larger agencies) and the benefit of the Region having adequate water supply to support the communities in the Region. The associated MPT focuses on the actions that could be implemented to address this objective.

MPT WS1.1 – Compare current and projected supply vs. demand (quantitative)

WS2 Operate and maintain, build, or replace infrastructure to reliably supply water.

This objective is derived based on the challenge that local water agencies recognize aging and deteriorating water supply infrastructure is a problem in the Region. The associated MPTs focus on the activities such as monitoring to address this objective.

MPT WS2.1 – Number of infrastructure failures per year (quantitative)

MPT WS2.2 – Number of projects or length of pipeline rehabilitated/constructed (quantitative)

WS3 Implement and promote water conservation measures and practices to meet state goals.

This objective is based on the challenge of implementing cost-effective conservation and efficiency improvements while complying with state requirements (i.e., SBX7-7), most of which apply to larger water agencies. In addition, water conservation measures can also benefit the Region, much of which is disadvantaged (i.e., have lower incomes) by potentially reducing water bills. The associated MPTs focus on activities such as monitoring and implementation of conservation measures to meet this objective.

MPT WS3.1 – What measures and practices were implemented (qualitative)

MPT WS3.2 – Number of conservation measures implemented (quantitative)

MPT WS3.3 – Number of water meters installed (quantitative)

MPT WS3.4 – Percentage of unmetered connections out of all public water system connections (quantitative)

4.4.3 Groundwater Management (GWM) Objectives

The groundwater objectives are important because most of the municipal water supply in the Region is provided by groundwater. The Region is involved in groundwater management activities, including as related to AB3030 and SGMA, as noted in Section 3. The Groundwater Management objectives included here are consistent with those ongoing efforts. The objectives that support the goal of managing groundwater for sustainable yield include:

GWM1 Maintain and monitor groundwater supply to assure future reliability.

This objective focuses on future reliability given the potential vulnerabilities of groundwater to drought and climate change. The associated MPTs focus on monitoring to provide as complete regional coverage as possible to address this objective.

MPT GWM1.1 – Monitoring efforts reported per groundwater management plans (qualitative)

MPT GWM1.2 – CASGEM monitoring done and reported (qualitative)

MPT GWM1.3 – Groundwater management/protection plans developed/updated and implemented (qualitative)

GWM2 Promote groundwater protection activities for high quality groundwater, and advocate for improvements to impacted groundwater quality through public education.

This objective is derived from the concern over groundwater quality, particularly in areas where it is the primary drinking water source in the Region and preserving water quality levels that are now within desirable levels. The associated Measurable Planning Targets focus on the activities that could be implemented to address this objective.

MPT GWM2.1 – Public education efforts conducted (qualitative)

MPT GWM2.2 – Groundwater management plans developed/updated and implemented (qualitative)

GWM3 Manage groundwater for multiple uses (e.g., municipal/industrial/agricultural supply and environmental use).

This objective is based on the many different uses of water within the Region and the need to keep it available to meet these uses. The associated MPTs focus on the activities that could be implemented to address this objective.

MPT GWM3.1 – Groundwater management plans developed/updated and implemented (qualitative)

MPT GWM3.2 – Identify and monitor areas where groundwater extraction may be impacting environmental uses

4.4.4 Ecosystem Restoration (ER) Objectives

The Region's regulatory drivers and economic dependence on the tourism and recreation associated with a healthy ecosystem make this objective amongst the most important to the Partnership. The ecosystem restoration objectives that support the goal of understanding and mitigating the hazards of watershed management include:

ER1 Enhance and restore water bodies, wetlands, riparian areas and associated uplands to support healthy watersheds, viable native fish, wildlife and plant habitats.

The objective is based on the recognition that improvements to the watershed can result in long-term benefits not only to ecosystem form and function, but also to potential improved water supply yield and water quality. As there are several organizations in the Region working on restoration of water bodies, wetlands, riparian and associated uplands, the associated MPTs focus on inventory and coordination to provide as complete Regional coverage as possible to address this objective.

MPT ER1.1 – Regularly update areas of identified degraded water bodies, wetlands, riparian areas, and associated uplands for restoration or enhancement focus (quantitative)

MPT ER1.2 – Number of meetings held related to identifying locations for future projects, and revising project lists (quantitative)

MPT ER1.3 – Number of projects that contribute to restoration of water bodies, wetlands, riparian and upland areas restored or enhanced (quantitative)

ER2 Develop and implement programs to prevent the spread of existing invasive species and colonization of potential future invasive species.

This objective is based on the challenge that wetlands, vernal pools and native riparian habitats are vulnerable to the impacts of invasive species from grazing, forestry, and other human

activities. As there are several organizations in the Region working to prevent the spread of existing invasive species the associated MPT focuses on the inventory and coordination to provide as complete Regional coverage as possible to address this objective.

MPT ER2.1 – Number of projects addressing invasive species, including number of collaborative projects (quantitative)

ER3 Implement, in coordination with public and private landowners, activities to manage forest health and wildfire risks.



Trout Jumping
(Photo courtesy of Mary Davey)

This objective is based on the recognition that forest management practices (e.g., fuel management for fire risk reduction, forest thinning, etc.) can result in long term benefits for the Region, especially considering the potential increases in fire risk in the future related to climate change. Since almost 50 percent of the land in the Region is publicly managed, coordination between the public and private landowners is paramount since wildfire knows no political boundaries. Catastrophic wildfires in forests are understood to result in increased runoff and sediment loading from runoff from the burned landscape, with resulting water quality and ecosystem impacts. The Region is at the forefront of forest management science and the IRWM Plan creates a unique opportunity to use the science to improve forest management within the Region. The associated MPTs focus on the activities/projects to address this objective.

MPT ER3.1 – Number of projects addressing forest health (quantitative)

MPT ER3.2 – Acres of forest management by projects (quantitative)

MPT ER3.3 – Education/Outreach activities regarding defensible space (qualitative)

ER4 Minimize ecosystem impacts caused by existing and new development.

This objective is based on the recognition that storm water capture and management for both new and existing development is a large component of the overall ecosystem and water quality improvement strategies in the Region. The associated MPT focuses on the inventory of projects to address this objective.

MPT ER4.1 – Number of projects that meet or exceed requirements to implement infiltration and other water quality activities to restore natural hydrology (quantitative)

4.4.5 Integrated Watershed Management (IWM) Objectives

These more general integrated watershed management objectives that overlap with the other more specific objectives discussed in Sections 4.4.1 through 4.4.4 support the goal of implementing improved integration and collaboration for more successful watershed management include:

IWM1 Conduct local and regional water-related planning activities within the planning horizon as supported by current and future watershed science.

This objective is derived from the challenge in coordinating local and regional water-related planning activities. The associated MPT focuses on the activities conducted to promote integration and collaboration of watershed management.

MPT IWM1.1 – Use of integrated regional water management process to share science and lessons learned (qualitative)

IWM2 Ensure collaboration among multiple jurisdictions within the Region for information exchange.

This objective is based on the challenge of ensuring continuing communication and collaboration in information exchange within the Region. The associated MPTs focus on the activities implemented to address this objective.

MPT IWM2.1 – Number of meetings within the Region (quantitative)

MPT IWM2.2 – Number of collaborative projects within the Region (quantitative)

IWM3 Increase public education and awareness of watershed functions, protection and restoration needs to encourage stewardship by the public.

This objective is based on the recognition that people have a complex interdependence with their use of water, watersheds and associated ecosystems but may not always understand the various interrelationships. Also this objective underscores the importance of educating the public about their roles and what they can do to be active stewards of the environment. The associated MPT focuses on the activities implemented to increase public education and awareness.

MPT IWM3.1 – Number of educational programs conducted (quantitative)

IWM4 Promote activities that reduce flood risk.

This objective recognizes the focused efforts of the Region with respect to flood management through restoration of natural flood zones (Flood Management and Wetlands Enhancement and Creation) to manage peak hydrologic flows. The associated MPT focuses on the activities implemented to address this objective.

MPT IWM4.1 – Number of storm water mitigation/flood protection projects (quantitative)

IWM5 Address climate change (e.g., water quality, water supply, groundwater recharge, flood management) in local and regional planning efforts and support efforts to continue improving the science.

This objective is based on the challenge of responding to the evolving changes in climate change science that can impact the Region. Based on current knowledge, climate change vulnerabilities in the Region are prioritized as part of the checklist in Appendix 2-D. The

associated MPT focuses on the activities that can be conducted to learn more about the characteristics and functions of the Region in order to address this objective.

MPT IWM5.1 – Projects/studies/documents that address climate change challenges and/or further the science (qualitative)

IWM6 Monitor water storage, release and exchange activities in order to improve coordination with regional planning.

This objective is based on the recognition that water storage, release and exchange from the Region can impact a wide array of stakeholders and diverse interests both within the Region as well as downstream of the Region. The associated MPT focuses on the activities implemented to improve coordination as it relates to water storage, release, and exchange.

MPT IWM6.1 – Participation in regional water operations planning organizations and number of meetings attended (quantitative)

MPT IWM6.2 – Identification of future opportunities for coordination (qualitative)

It is important to note that all measures that enhance regional water supply reliability, improve water conservation, increase ecosystem resilience and address water quality impacts will help address adapting to changes in the amount, intensity, timing, quality and variability of runoff and recharge in years to come. Further, it is well-understood that water resources planning must take those factors into consideration in order to be effective.

It is also important to note that many objectives described above are closely related to reductions in energy consumption and associated GHG emissions, including measures to improve aging infrastructure, increase water conservation and prevent or reduce the need for water treatment. As such, IRWM Plan objectives are also consistent with goals and strategies of the AB 32 Scoping Plan adopted by the California Air Resources Board (CARB) in 2017.

4.5 Prioritization of Objectives

The Partnership agreed at its May 2013 meeting that the objectives would not be prioritized as they believe that all of the objectives have equal weight and they did not want to limit the potential breadth of water management activities or lose stakeholder support.

Section 5: Resource Management Strategies

The strategies presented in this section include those considered within this Integrated Regional Water Management Plan (IRWM Plan) to help achieve the objectives presented in Section 4 (Objectives).

5.1 Resource Management Strategy (RMS) Summary

The RMS considered for this IRWM Plan includes those listed in the California Water Plan (CWP) Update 2013. The CWP Update 2013 lists 30 strategies grouped into six management objectives, including seven strategies that may generally fit into the management objectives but are limited in their feasibility due to long-term planning needs. Table 5-1 summarizes the CWP Management Objectives and RMS organized consistent with the CWP Update 2013. RMS that are italicized and bracketed are considered not applicable to the Tahoe-Sierra Region (Region) at this time.

Table 5-1: Resource Management Strategies Considered for this IRWM Plan

CWP Management Objective	Resource Management Strategies
Reduce Water Demand	Agricultural Water Use Efficiency Urban Water Use Efficiency
Improve Flood Management	Flood Management
Improve Operational Efficiency and Transfers	<i>[Conveyance – Delta]</i> Conveyance – Regional/Local System Reoperation Water Transfers
Increase Water Supply	Conjunctive Management & Groundwater <i>[Desalination (Brackish and Sea Water)]</i> Precipitation Enhancement Municipal Recycled Water <i>[Surface Storage – CALFED/State]</i> Surface Storage – Regional/Local
Improve Water Quality	Drinking Water Treatment and Distribution Groundwater Remediation/Aquifer Remediation Matching Water Quality to Use Pollution Prevention Salt and Salinity Management Urban Stormwater Runoff Management
Practice Resource Stewardship	Agricultural Land Stewardship Ecosystem Restoration Forest Management Land Use Planning and Management Recharge Area Protection Sediment Management Watershed Management
People and Water	Economic Incentives Outreach and Engagement Water and Culture Water-Dependent Recreation

CWP Management Objective	Resource Management Strategies
Other Strategies	Crop Idling for Water Transfers <i>[Dewvaporation or Atmospheric Pressure Desalination]</i> <i>[Fog Collection]</i> Irrigated Land Retirement Rainfed Agriculture Snow Fences <i>[Waterbag Transport/Storage Technology]</i>

[] RMS not applicable to Tahoe-Sierra IRWM Plan

A brief explanation of the reasoning that select RMS are not applicable to the Region follows:

- Conveyance – Delta. The Region does not supply or obtain water to or from the Sacramento-San Joaquin Delta because the watersheds drain to the east to Nevada.
- Desalination. There is no ready source of saline or brackish water for desalination in the Region.
- Surface Storage – CALFED/State. The Region is unlikely to be involved in the five CALFED storage projects because there are no conveyances from CALFED storage to the Region.
- Waterbag Transport/Storage Technology. The Region is not located along the coast to take advantage of this strategy.
- Dewvaporation or Atmospheric Pressure Desalination. The specific process for humidification-dehumidification desalination using brackish water is unlikely to be applicable in the Region.
- Fog Collection. Fog is not prevalent in the Region; therefore, this strategy is of limited feasibility.

5.2 RMS Applicable to the Region

RMS applicable to the Region and those that contribute to achieving the IRWM Plan objectives presented in Section 4 are described in the following subsections. Table 5-2, at the end of this Section, provides an overview of how each RMS that is applicable to the Region relates to Plan objectives.

5.2.1 Reduce Water Use

5.2.1.1 Agricultural Water Use Efficiency

The agricultural water use efficiency strategy involves measures that reduce the amount of water used for agricultural irrigation while maintaining agricultural productivity. This strategy includes improvements in irrigation technology and water management practices that result in direct improvements in water use efficiency as well as education and training efforts that lead to improved water management.

This strategy has limited applicability to the Region due to small size of the agricultural sector in the Region as described in Section 2 (Region Description). However, in the Carson River valley where most of the Region's agriculture is centered, and where water storage to mitigate the

potential effects of changes in runoff volume and timing due to climate change is limited largely to groundwater, this strategy aligns with the Water Supply and Groundwater Management IRWM Plan Objectives, particularly WS3 and GWM3.

5.2.1.2 Urban Water Use Efficiency

The urban water use efficiency strategy addresses indoor and outdoor residential, commercial, industrial and institutional water uses. This strategy is a key component of the Water Conservation Act of 2009 (Senate Bill x7-7 [SBx7-7]) which requires all urban water suppliers (more than 3,000 connections or supply more than 3,000 acre-feet per year) to increase water use efficiency in an effort to meet the statewide goal of achieving a 20% reduction in per capita water use by 2020. This strategy includes improvements in technology or water management that lower water use or increase beneficial uses from existing water quantities. This strategy also includes educational programs and other measures that result in the adoption of technological improvements or behavioral changes that reduce water demand.

This strategy is applicable to the larger water suppliers that must comply with SBx7-7 as well as the many smaller water suppliers across the Region even though they do not face a regulatory requirement for efficiency. Due to the climate change vulnerabilities in the Region, this strategy can help all water suppliers to adapt to the potential effects of climate change, especially increased water supply variability. This strategy aligns with the Water Supply and Groundwater Management IRWM Plan Objectives, especially WS3 and GWM3.

5.2.2 Improve Flood Management

5.2.2.1 Flood Management

The flood risk management strategy involves both structural and non-structural measures to reduce overall flood risk, manage flood flows and programs that improve flood preparedness, response and recovery. Structural approaches to flood management include dams and reservoirs, levees, channel modifications and diversions. Non-structural measures focus on land use management such as floodplain restoration and development policies.

While flooding is not a major concern within the Region, natural systems and flood management infrastructure in the Region are vital for downstream communities' flood risk management. Changes to precipitation patterns and runoff due to climate change may exacerbate existing flood risks in the Region and downstream. This strategy aligns with the Integrated Water Management IRWM Plan Objective IWM4.

5.2.3 Improve Operational Efficiency and Transfers

5.2.3.1 Conveyance – Regional/Local

Regional/local conveyance refers to the use of both natural waterways and built infrastructure to move water to areas where it is needed or to move water



Trout Creek Restoration Project
(Photo courtesy of the Town of Truckee)

away from areas to protect existing resources. The regional/local conveyance strategy covers the distribution and conveyance of local sources of water and imported water for the purposes of improving water supply, water quality, recreation, habitat, and flood management.

This strategy is applicable within the Region for both the extensive network of natural creeks that collect stormwater and snowmelt, and the water distribution infrastructure constructed and maintained by small and large water suppliers in the Region. A resilient local conveyance strategy may be important in adapting to changes in precipitation patterns and runoff due to climate change. Within the Region there are several projects underway considering energy recapture such as the hydro-generation unit on the recycled water pipeline in Alpine County, feasibility studies for other hydroelectric generation opportunities and a community wide evaluation of green energy generation with the Tahoe Basin and Alpine County. This strategy aligns with the Water Quality, Water Supply, Ecosystem Restoration, and Integrated Water Management IRWM Plan Objectives, especially WQ4, WQ5, WS2, ER1, IWM4, IWM5, and IWM6.

5.2.3.2 System Reoperation

System reoperation involves changes to the existing operation of water systems to address existing problems, to increase water supply reliability or to adapt to future changes. The system reoperation strategy includes reoperation of surface water storage facilities, groundwater sourced water systems and associated conveyance infrastructure. These resources may be related to the Conjunctive Management and Groundwater Storage RMS depending upon location.

In the Region, reoperation has limited applicability as the surface water flows have been adjudicated and the operation of most dams is based on the needs of downstream water users in Nevada. However, reoperation of surface water infrastructure related to California users' water rights and infrastructure for groundwater extraction may provide benefits to water suppliers and water users in the Region. This strategy may support adaptation to the effects of climate change by providing additional flood protection and water storage behind the Martis Creek Dam, which is currently operating with open spillways due to poor dam condition. This strategy aligns with the Water Supply, Ecosystem Restoration, and Integrated Water Management IRWM Plan Objectives, especially WS2, GWM3, IWM5, and IWM6.

5.2.3.3 Water Transfers

Water transfers are voluntary exchanges of water or water rights among water users. A water transfer can be a change in point of diversion, place of use or type of use. Water transfers typically occur using one of the following: transfer of water from reservoirs that would otherwise have been carried over to the following year, use of groundwater instead of surface water deliveries and transfer of the surface water rights, transfer of previously banked groundwater, reduction of existing consumptive use and transfer of the resulting water savings, and reduction of water losses and transfer of the recovered water.

Water transfers have not frequently been pursued internally within the Region; however, there may be current or future situations in which this strategy may benefit water users in the Region. As such, this strategy aligns with Water Supply, and Integrated Water Management IRWM Plan Objectives, especially WS-1, WS-2 IWM 1, and IWM5.

5.2.4 Increase Water Supply

5.2.4.1 Conjunctive Management and Groundwater

Conjunctive management is the coordinated planning and use of surface water and groundwater to maximize the water available to a region. The conjunctive management and groundwater storage strategy involves intentional recharge of groundwater basins to provide water storage when excess surface water is available. Groundwater management, project construction, and capacity building are the three fundamental elements of conjunctive management.

There are several defined groundwater basins within the Region, and most water users rely primarily on groundwater for their water supply. Conjunctive management may improve the reliability of source water for water suppliers that rely on groundwater or surface water, especially with future uncertainties due to climate change and the heavily adjudicated surface water rights with much of the surface water in the Region allocated to downstream users. This strategy aligns with Water Supply, Groundwater Management, and Integrated Water Management IRWM Plan Objectives, especially WS1, WS2, GWM1, GWM3, IWM1, IWM2, IWM5, and IWM6.

5.2.4.2 Precipitation Enhancement

Precipitation enhancement, commonly called “cloud seeding,” artificially stimulates clouds to produce more rainfall or snowfall than they would naturally. Cloud seeding injects special substances into the clouds that enable snowflakes and raindrops to form more easily. Precipitation enhancement is the one form of weather modification done in California.

Nevada’s Desert Research Institute has a Cloud Seeding Project ongoing in the Lake Tahoe Basin, and Truckee and Carson River valleys. Cloud seeding in the Sierra and the Tahoe area has been conducted since the 1960s largely to benefit water users in Nevada and California’s Central Valley, which are outside the Region. Local ski areas could potentially benefit from cloud seeding activities, but this strategy is not being implemented or considered for the Region, at this time.

5.2.4.3 Municipal Recycled Water

Water recycling is the treatment and reuse of wastewater. The recycled municipal water strategy applies specifically to the application of municipal wastewater with the intention of putting the water to a beneficial use that would not occur through discharge of the wastewater.

As described in Section 2, recycled water from South Tahoe PUD is currently used in Alpine County, primarily for irrigation of ranchlands. There may be other opportunities for production and use of recycled water in the Region in the future, although use of recycled water within the Lake Tahoe Basin is prohibited with few exceptions by the Porter-Cologne Act, and water supplies are generally adequate and the need for recycled water is limited. This strategy aligns with Water Supply IRWM Plan Objectives, especially WS1.

5.2.4.4 Surface Storage – Regional/Local

Surface storage consists of the collection and storage of water within on-stream or off-stream reservoirs for later release. This strategy includes the use surface storage for water supply as well as flood management.

There are currently several reservoirs in the Region. Operation of the dam on the outlet of Lake Tahoe as well as operation of three of the largest reservoirs: Boca, Stampede, and Prosser Creek, are governed by interstate agreements and are generally operated for the fisheries and agricultural users in Nevada. Reservoirs that are operated for the benefit of water users in the Region include Martis Creek Lake in the Truckee River HU that is designated for recreational use and water supply, as well as the Indian Creek and Harvey Place Reservoirs in the West Fork Carson River HU that are storage reservoirs for the recycled wastewater from South Tahoe PUD used for agriculture in Alpine County. This strategy aligns with the Water Quality, Water Supply, and Integrated Water Management IRWM Plan Objectives, especially WQ5, WQ6, WS1, WS2, IWM4, IWM5, and IWM6.

5.2.5 Improve Water Quality

5.2.5.1 Drinking Water Treatment and Distribution

The drinking water treatment and distribution strategy is focused on ensuring that water provided for human consumption is safe for drinking. Drinking water treatment includes processes that treat, blend or condition water to meet potable standards, and drinking water distribution includes the storage, pumping and delivery of potable water to customers. This strategy includes measures both within the treatment processes and distribution system that are necessary to produce and maintain safe drinking quality.

Ensuring that drinking water in the Region meets water quality standards is a high priority in the Region. Delivery of drinking water may involve improvements to the distribution systems or to the water treatment systems. Managing sources of pollution is also seen as an important means for facilitating compliance with water quality regulations and increasing the reliability and safety for drinking water users in the Region. This strategy aligns with the Water Quality, Water Supply, and Groundwater Management IRWM Plan Objectives, especially WQ4, WS2, and GWM2.

5.2.5.2 Groundwater Remediation/Aquifer Remediation

Groundwater and aquifer remediation is the improvement of groundwater quality to meet intended beneficial uses. Groundwater impairment may be the result of naturally occurring constituents or anthropogenic contamination. The groundwater and aquifer remediation strategy includes both passive techniques which allow for in-situ degradation or dispersion of contaminants and active treatment which remove the contaminants through chemical, biological or physical processes.

Within the Region concerns with regard to groundwater quality include naturally occurring substances like arsenic in the Martis Valley groundwater basin and anthropogenic contamination largely from fueling stations and dry cleaners throughout the Region but especially in the Tahoe Valley – South groundwater basin. Drinking water quality is managed through treatment and/or blending prior to delivery to customers. This strategy aligns with the Water Quality, Water Supply, and Groundwater Management IRWM Plan Objectives, especially WQ4, GWM1, and GWM2.

5.2.5.3 Matching Water Quality to Use

The strategy of matching water quality to use aims to optimize water resources by directing higher quality sources of water to end uses that require that higher quality, such as drinking

water or certain industrial processes, and using sources of water with lower quality in applications where the lower quality is adequate. This strategy reduces the treatment costs associated with water supply.

This strategy has somewhat limited applicability in the Region due to restrictions on the use of recycled water in the Lake Tahoe Basin, however a small amount of recycled water is used for agricultural in Alpine County. In some cases, raw water is currently used where higher quality water is not needed, such as golf course irrigation and snow-making. This strategy aligns with the Water Quality and Groundwater Management IRWM Plan Objectives, especially WQ4 and GWM3.

5.2.5.4 Pollution Prevention

The pollution prevention strategy addresses both point sources, such as wastewater treatment plants, and nonpoint sources, such as most stormwater discharges from urbanized areas, road erosion especially unpaved roads in steep forest areas, agricultural runoff and unauthorized land uses. This strategy includes efforts to identify sources of pollutant load, reduce pollution causing activities and capture pollutants before they enter waterways.

Generally, the quality of surface water and groundwater in the Region meets drinking water standards, however, there are concerns with both point source and nonpoint source discharges. Point source discharges include leaking underground storage tanks and chemical spills impacting groundwater, treated wastewater, and historical mine locations in the Carson River HUs. Nonpoint source discharges include stormwater runoff especially from urban areas, post-wildfire areas, and other disturbed land. This strategy is a priority to the IRWM Plan participants and aligns with the Water Quality, Groundwater Management, Ecosystem Restoration IRWM, and Integrated Water Management Plan Objectives, especially WQ1, WQ2, WQ5, WQ6, GWM2, ER1, ER3, ER4, and IWM3.



Storm Drain Outlet
(Photo courtesy of Tahoe Resource Conservation District)

5.2.5.5 Salt and Salinity Management

Salt and salinity management requires an understanding of how salts enter a region, often from irrigated agriculture and large scale wastewater discharge, and how they are diluted and displaced within the region. As such, this strategy necessitates studies to improve the understanding of regional salt loading and the extent and magnitude of a region's salt problems. It also includes steps that reduce salt inputs and sequester or dispose of salts.

This strategy has limited applicability to the Region as there is little irrigated agriculture or industrial discharges, and few municipal or domestic wastewater discharges. Salt management from application of recycled water in Alpine County is regulated by the Regional Water Quality Control Board.

5.2.5.6 Urban Stormwater Runoff Management

The urban stormwater runoff management strategy involves the capture, conveyance and treatment of stormwater and dry weather runoff for purposes of

improving flood management, water quality or water supply.

Management of urban runoff is a priority in the Region, especially in the Lake Tahoe Basin where sediments and nutrients in runoff affect the clarity of Lake Tahoe. Changes to precipitation patterns and runoff due to climate change may stress existing runoff management systems. This strategy is a priority to the IRWM Plan participants and aligns with the Water Quality, Ecosystem Restoration, and Integrated Water Management IRWM Plan Objectives, especially WQ1, WQ2, ER4, and IWM5.

5.2.6 Practice Resource Stewardship

5.2.6.1 Agricultural Land Stewardship

The agricultural lands stewardship strategy includes measures that promote the continued use of agricultural lands and the protection of natural resources through the maintenance of agricultural lands. Erosion control measures are an example of agricultural land stewardship practices that support the viability of croplands while offering water resource and water quality benefits. Other agricultural land stewardship practices such as wetlands restoration and the use of agricultural lands for nonstructural flood management preserve the open space characteristics of agricultural lands that can offer water resources and environmental benefits.

This strategy has limited applicability to the Region due to small size of the agricultural sector. In the Carson River valley where most of the Region's agriculture is centered, this strategy aligns with the Integrated Water Management IRWM Plan Objectives, especially IRWM4.

5.2.6.2 Ecosystem Restoration

Ecosystem restoration addresses natural landscapes and biological communities that have been modified by past activities. The ecosystem restoration strategy aims to increase the diversity of native species and biological communities and the abundance and connectivity of habitats, particularly in aquatic, riparian and floodplain ecosystems. This strategy includes protection and recovery of at-risk species, wetlands restoration and construction, floodplain reconnection and invasive species removal.

This strategy is a priority in the Region, especially wetland and meadow restoration, invasive species management, wildfire risk management, and other restoration activities that improve habitat and ecosystem functions such as infiltration and nutrient removal. Resilient habitats are important for adapting to potential changes in precipitation patterns and runoff due to climate change. This strategy aligns with the Water Quality and Ecosystem Restoration IRWM Plan Objectives, especially WQ5, and ER1 through ER4.

5.2.6.3 Forest Management

The forest management strategy focuses on forest management activities that are designed to improve the availability and quality of water for downstream users, on both publicly and privately owned forest lands as part of a broader effort to maintain a sustainable, resilient forest ecosystem.

Due to the large percentage of land area in the Region that is forest land and the vulnerability of forest land to increased wildfire and other potential effects of climate change (i.e. impaired forest health and increase of invasive species), this strategy is very applicable in the Region. Forest management in the Region focuses on fuel reduction; post wildfire restoration; management of

aquatic, riparian, and meadow ecosystems; and management of invasive species. This strategy aligns with the Water Quality and Ecosystem Restoration IRWM Plan Objectives, especially WQ5, and ER1 through ER3.

5.2.6.4 Land Use Planning and Management

The land use planning and management strategy incorporates the availability of water supplies, water quality requirements and flooding and drainage considerations into land use decisions. Improved coordination of land use and water planning has been identified as a need in the State.

Coordination of land use and water planning is applicable in the Region because it encompasses multiple local and regional jurisdictions. Water quality is one of the main water-related topics to land use and management. This strategy aligns with the Water Quality, Water Supply, Ecosystem Restoration and Integrated Water Management IRWM Plan Objectives, especially WQ2, WQ6, WS1, ER4, IWM1, and IWM2.

5.2.6.5 Recharge Area Protection

The recharge areas protection strategy includes the protection and enhancement of groundwater recharge areas. The strategy includes methods such as low impact development and land conservation to ensure areas suitable for recharge remain accessible. It also includes measures to protect groundwater recharge areas from contamination.

This strategy is applicable in the Region as groundwater is the source for most water users and all groundwater in the Region originates from infiltration. In addition, low impact development measures have been used for decades as a means of achieving surface water quality improvement with commensurate recharge benefits. This strategy aligns with the Water Quality and Groundwater Management IRWM Plan Objectives, especially WQ5 and GWM2.

5.2.6.6 Sediment Management

The sediment management strategy acknowledges both the benefits and impacts of sediments. Sediments are beneficial when of appropriate size and in the correct location such as for spawning gravels as well as floodplain and beach replenishment. The negative attributes of sediment occur when it accumulates in reservoirs and flood channels and/or causes clouding in water with associated impacts to fish and invertebrate life.

Sediment impacts are a priority in many waterbodies in the Region, including Lake Tahoe, which has a TMDL for sediment and nutrients, which are often associated with sediments. Management of sediments in the Region includes restoration of riparian areas and meadows, management of wildfire risk, and post-wildfire restoration and erosion prevention. Changes to precipitation patterns and runoff due to climate change may exacerbate existing sediment impacts. This strategy aligns with the Water Quality and Ecosystem Restoration IRWM Plan Objectives, especially WQ1, WQ2, WQ5, ER1, and ER3.

5.2.6.7 Watershed Management

The watershed management strategy uses watershed boundaries as the basis for managing natural resources. Watershed management is the process of creating and implementing plans, programs, projects, and activities to restore, sustain, and enhance functions on a watershed level.

Management using watershed boundaries has long been a practice in the Region, especially given the mountainous topography and the need to transcend political jurisdiction boundaries around Lake Tahoe. This strategy aligns with nearly all of the IRWM Plan Objectives, especially the Water Quality, Ecosystem Restoration, and Integrated Water Management Objectives, WQ1, WQ2, WQ3, WQ5, ER1, ER2, ER3, ER4, IWM1, IWM4, and IWM5.

5.2.7 People and Water

5.2.7.1 Economic Incentives

Economic incentives is the use of financial tools such as grants, loans, rebates and water pricing to influence water management. Financial assistance incentives in the form of grants, loans and rebates can be used to promote implementation of projects that improve water management and protect water resources. Water rate incentives can be used to promote more efficient use of water.

Economic incentives for water users such as implementation of water metering and rebate programs have already been shown to promote water use efficiency and reductions. Further application of similar incentives will be important to achieve the objectives of this IRWM Plan. In addition, the small population of the Region makes it essential to identify and pursue external funding sources in order to provide the resources to implement the IRWM Plan. This strategy aligns with Water Supply and Integrated Water Management IRWM Plan Objectives, especially WS2, WS3, and IWM1.

5.2.7.2 Outreach and Engagement

The outreach and engagement strategy describes the shifts in early water management decision-making from strictly technically-based decisions that, over time, have resulted in unintended consequences such as degraded ecosystems and/or social injustices. The strategy acknowledges the need for improved outreach and engagement so that citizens can be more knowledgeable and participate more effectively in debates regarding water which can, in turn, gain valuable support for a range of water management programs.

Public outreach activities conducted as part of the development of this IRWM Plan are discussed in Section 1. Continued engagement and education of the public will be important for the implementation of this IRWM Plan. This strategy aligns with the Groundwater Management, Ecosystem Restoration and Integrated Water Management IRWM Plan Objectives, especially GWM2, ER3, and IWM3.

5.2.7.3 Water and Culture

The water and culture strategy recognizes the inherent role and value of water in many cultures whether they are Native American, agriculture and ranching, fishing or environmental cultures. The cultural considerations in water management can include subsistence activities such as traditional hunting, fishing and plant collecting; recreation activities such as swimming, boating, wildlife viewing or hiking; spiritual activities that acknowledge the cleansing and renewing properties of water; and historic preservation of artifacts, buildings, flumes, mills, and other significant sites.

Water and other aquatic resources are a vital component of the cultural life within the Region. The Region is partly defined by the cultural connection to water through aquatic recreation

activities, fishing, aesthetic values, and other water-dependent activities such as skiing. These uses depend highly on adequate water quality and water supplies, as well as source protection. This strategy aligns with Water Quality, Water Supply, Ecosystem Restoration, and Integrated Water Management IRWM Plan Objectives, especially WQ1, WQ2, ER1, and IWM3.

5.2.7.4 Water-Dependent Recreation

The water-dependent recreation strategy includes recreational activities that are dependent on water, including skiing, fishing, swimming, waterfowl hunting and birding, boating, canoeing, and kayaking, as well as activities that do not require water but are enhanced by water, including wildlife viewing, picnicking, camping, and hiking, biking, and riding on trails.

This strategy is very applicable to the Region as the economy of the Region is largely reliant on water-dependent recreation. Water quality, ecosystem enhancement, and watershed management are primary factors contributing to continued recreational uses. As such, this strategy aligns with Water Quality, Ecosystem Restoration, and Integrated Water Management IRWM Plan Objectives, especially WQ1, WQ2, ER1, ER3, ER4, IWM3, IWM5.

5.2.8 Other Strategies

Three of the Other Strategies included in CWP 2013 are not applicable to the Region as noted in Section 5.2, and the remaining four are of marginal consideration or not being considered as described below.

5.2.8.1 Crop Idling for Water Transfers

The crop idling for water transfers strategy is a specific water transfer strategy in which irrigated lands are removed from production or dry farmed in order to make water available for transfer.

This strategy is not being considered in the Region as there is very little irrigated agricultural land in the Region, and no formal programs in place for crop idling.

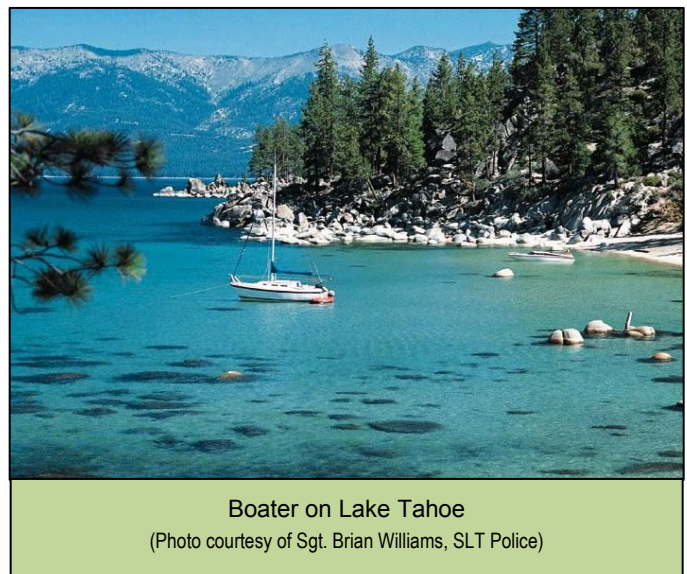
5.2.8.2 Irrigated Land Retirement

The irrigated land retirement strategy permanently removes farmland from irrigated agriculture.

This strategy is not being considered in the Region as there is very little irrigated agricultural land in the Region, and most irrigated farmland is located in the Carson River HU where some of the water demand is met by recycled water and where there is little other demand for recycled water.

5.2.8.3 Rainfed Agriculture

Rainfed agriculture relies solely on rainfall to provide all crop consumptive water use. In California where little precipitation occurs during the spring and summer growing seasons, the use of the rainfed agriculture strategy is very limited. Implementation of rainfed agriculture would



require matching cropping patterns to precipitation patterns likely resulting in single cropping, most likely of low value products like hay.

Although agriculture is not a large sector in the Region, this strategy is potentially applicable within the Region. The main form of agriculture in the Region has currently and historically been dry farming of pasture grass used for cattle grazing. Some lands in the Carson River HU are irrigated with recycled water.

5.2.8.4 Snow Fences

Strategic placement of snow fences has the potential to improve watershed management by creating a snow sedimentation basin and extend water delivery for supply and power generation.

This strategy may be considered in the future as more data on its effectiveness and feasibility become available, but it is not currently implemented.

Table 5-2: Overview of Resource Management Strategies Applicable to the Region

Resource Management Strategies	IRWM Plan Objective																						
	WQ1	WQ2	WQ3	WQ4	WQ5	WQ6	WS1	WS2	WS3	GWM1	GWM2	GWM3	ER1	ER2	ER3	ER4	IWM1	IWM2	IWM3	IWM4	IWM5	IWM6	
Agricultural Water Use Efficiency									✓			✓											
Urban Water Use Efficiency									✓			✓											
Flood Management																					✓		
Conveyance – Regional/Local System Reoperation				✓	✓			✓				✓		✓							✓	✓	✓
Water Transfers							✓	✓									✓				✓	✓	✓
Conjunctive Management & Groundwater							✓	✓		✓		✓					✓	✓			✓	✓	✓
Precipitation Enhancement	Ongoing by stakeholders outside of the Region																						
Municipal Recycled Water							✓																
Surface Storage – Regional/Local					✓	✓	✓	✓													✓	✓	✓
Drinking Water Treatment and Distribution				✓				✓			✓												
Groundwater Remediation/ Aquifer Remediation				✓						✓	✓												
Matching Water Quality to Use				✓								✓											
Pollution Prevention	✓	✓			✓	✓					✓		✓	✓	✓	✓			✓				
Salt and Salinity Management	Limited applicability in the Region																						
Urban Stormwater Runoff Management	✓	✓														✓						✓	
Agricultural Land Stewardship																					✓		
Ecosystem Restoration					✓								✓	✓	✓	✓							
Forest Management				✓									✓	✓	✓								
Land Use Planning and Management		✓				✓	✓									✓	✓	✓					

IRWM Plan Objective

Resource Management Strategies	<u>WQ1</u>	<u>WQ2</u>	<u>WQ3</u>	<u>WQ4</u>	<u>WQ5</u>	<u>WQ6</u>	<u>WS1</u>	<u>WS2</u>	<u>WS3</u>	<u>GWM1</u>	<u>GWM2</u>	<u>GWM3</u>	<u>ER1</u>	<u>ER2</u>	<u>ER3</u>	<u>ER4</u>	<u>IWM1</u>	<u>IWM2</u>	<u>IWM3</u>	<u>IWM4</u>	<u>IWM5</u>	<u>IWM6</u>
Recharge Area Protection					✓						✓											
Sediment Management	✓	✓			✓								✓		✓							
Watershed Management	✓	✓	✓		✓	✓							✓	✓	✓	✓	✓			✓	✓	
Economic Incentives								✓	✓								✓					
Outreach and Engagement											✓				✓					✓		
Water and Culture	✓	✓											✓							✓		
Water-Dependent Recreation	✓	✓											✓		✓	✓				✓	✓	
Crop Idling for Water Transfers	Limited applicability in the Region																					
Irrigated Land Retirement	Limited applicability in the Region																					
Rainfed Agriculture	Limited applicability in the Region																					
Snow Fences	Potential future strategy																					

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Section 6: Project Review Process

The following processes for the solicitation and submittal of projects for inclusion in the Tahoe-Sierra IRWM Plan, and the project scoring method are described in this section. This section also includes summaries of the submitted projects with more detailed project information to be found in Appendices 6-B and 6-C. During the 2013/2014 call for projects, the Partnership received a total of sixty projects. During the 2018 call for projects, a total of 101 projects were received, including those submitted as part of the Storm Water Resource Plan for the Tahoe-Sierra Region as presented in Section 3.

6.1 Project Solicitation and Submittal Process

The project solicitation process began with a sub-committee review of previous IRWM Plan project submittals and evaluation followed by a discussion of how potential project submittals would be evaluated and considered for inclusion into the IRWM Plan Update. A draft list of project scoring criteria was discussed and made available for comment to the Partnership at the time the draft Project Information Form was distributed prior to the September 24, 2013 Partnership meeting. The potential project scoring criteria were chosen to facilitate project comparison, review, selection, and prioritization. The next step of the process was to collect, evaluate, and review all project submittals. A list of projects was created, project scoring conducted and all scored projects were included in the IRWM Plan. The final step of the process was to discuss the recommendations made with project proponents and stakeholders at a Partnership Meeting to formally accept the projects into the Plan.

Following agreement on the process, the 2013/2014 call for projects was initiated through an email to the Partnership on October 21, 2013 and also posted on the IRWM Plan website. A list containing over eighty-five names and agencies, developed during the planning grant application process, was used as the list for solicitation for the call for projects. The Project Information Form was provided as an Adobe Acrobat fillable form (.pdf format). A copy of the Project Information Form is included in Appendix 6-A. The call for projects was open for approximately 3 months from October 24, 2013 through January 17, 2014. Periodic email reminders were sent out to the Partnership and two webcasts were conducted; one on December 16th and the other on January 8th to assist project proponents with completion of the form. During the webcasts the following topics were completed: review of instructions for completing the Project Information Form, questions individuals had on the project review process, review of the types of projects to be submitted, and examples of a completed Project Information Form. Completed Project Information Forms were returned by email.

A subsequent call for projects was conducted as part of the 2018 IRWM Plan Update process. Completed project forms were solicited, similar to the 2013/2014 call for projects, with a specific request that all project sponsors submit a new project form. If no new form was submitted for a project that was previously included in the 2014 Plan, the project was removed from the updated project list. Projects that were submitted as part of the Stormwater Resources Plan were not required to complete a project form, but were instead entered directly into the Lake Tahoe Environmental Improvement Program (EIP) Project Tracker.

The list of the IRWM projects is intended to grow and change as projects are completed and new project concepts added.

6.1.1 Special Circumstances for Project Submittal

There may be special circumstances that prompt the need for project proponents to submit new projects for inclusion into the IRWM Plan who previously did not submit during the call for projects or update process. As each situation arises the Partnership will call a meeting to invite the interested project proponents to discuss the need and circumstances. During this meeting the Partnership will decide whether the projects should be included in an amendment to the Plan. In this instance, it is the responsibility of the project proponent to communicate sufficient project detail, complete the Project Information Form, and provide project information to the Partnership in an expedited manner for inclusion into the Plan amendment. The project proponent is also expected to become an active participating member of the Tahoe-Sierra IRWM Partnership. The projects submitted under special circumstances will be listed separately in their own table in Appendix 6-B.

6.2 Project Scoring Process

After the close of the project solicitation period, the projects were compiled for scoring and review. All submitted projects were determined to be eligible for inclusion in the IRWM Plan for the following reasons: they are located within the Region limits and they address at least one of the Plan objectives.

The information in the individual completed Project Information Forms was exported from the pdf form into a master spreadsheet for compiling and scoring. The information exported was checked to ensure data was not lost or altered during the transfer; however, information provided by the project proponent was not reviewed to consider to what extent the information provided was accurate.

Projects were scored using the system presented in Table 6-1 primarily using the information provided on the Project Information Form. The overall score was not intended to be the basis for final decisions of project prioritization, but was intended to provide a method for understanding the overall set of projects and to provide one indicator of how the projects compare to one another.

All projects submitted to the Partnership were categorized by project proponents into at least one of the following three categories: water supply/wastewater, restoration, and stormwater/flood control. Some projects requested scoring in up to three categories. Separate project scoring meetings with conference calls capability for those who could not attend in person were held for each project category. The scoring teams were led by a member of the sub-committee who volunteered to lead the discussion and record the scores with the input of the project proponents who had submitted projects within each category. The project scoring meetings were conducted in a discussion format and relied on the information entered on the Project Information Form and clarification as necessary provided by the project proponent



Tank Construction
(Photo courtesy of North Tahoe PUD)

during the scoring meeting. After the scoring meetings, the final project score sheets were shared with the Partnership and project proponents.

Having the project scoring meetings by project category encouraged project proponents to share information and identify opportunities for possible integration. Several organizations submitted projects for water conservation efforts; which were combined into a single regional effort. In some cases projects that are listed separately are parts of a larger effort or are cooperative efforts with different organizations.

6.2.1 Scoring Criteria

Scoring criteria used during the 2007 Plan development were used as the foundation for the project scoring; however, updates were made to the criteria based on the 2016 Proposition 1 Integrated Regional Water Management Grant Program Guidelines. Ten scoring criteria and one leveling criteria were developed, although not all criteria were applied in each category. In each category, three point levels were established. The point scores for the ten scoring criteria were summed for the total project score. The scoring points for the leveling criteria were not included in the total score, but were for use prioritizing the projects to ensure geographic and proponent diversity that could be used in the future for an individual grant solicitation. Eligibility for specific grant programs was not considered during the project scoring, nor was the status of Plan adoption, although both will be considered in the future for individual grant solicitations. Project proponents will be required to adopt the IRWM Plan for inclusion of their project in an IRWM program grant application. The scoring and leveling criteria are summarized in Table 6-1 and described in greater detail below.

The possible scores for projects in the water/wastewater category ranged from 0 to 28 points. The possible scores for projects in the restoration category ranged from 10 to 25, and the possible scores for projects in the stormwater/flood control category ranged from 0 to 18 points. The total scores for all 60 projects are presented in Tables 6-2 through 6-4 and Appendix 6-B. The total scores for all of the projects ranged from 0 to 28 points with an average score of 14 points.

- **Shovel Ready/ Readiness to Proceed.** (Applied to all categories) The current status of the project, and whether the project could be implemented within 2 years, within 3-5 years, or in more than 5 years. For phased projects, the scoring considered whether any of the phases could be completed within the time limit. Completion within the time limit was considered to include completion of construction for construction-type projects or the start/continuation of monitoring-type projects.
- **Relevance to Plan.** (Applied to all categories) Whether the project contributes to achieving Plan objectives or is related to the Resource Management Strategies (RMS) included in the IRWM Plan. The scoring was based on the number of Plan objectives and RMS identified by the project proponent in the Project Information Form. Additionally, project proponents are asked to describe the relation of the project to selected Plan objectives and RMS.
- **Other Funds.** (Applied to all categories) The amount of matching funds that has been secured for the project as a percentage of the total project cost provided on the Project Information Form. Only match funds characterized as “secure” on the Project Information Form were considered in this criteria, and past matching money was excluded. Scoring

was based on the amounts and characterization of funding provided in the Project Information Form, and did not consider changes to the funding status that may have occurred since the submittal of the Project Information Form.

- **Partners.** (Applied to all categories) Whether a project involves multiple organizations for implementation. Formal partners were considered to be organizations or agencies with which the project proponent has a formal relationship such as a memorandum of understanding, funding, or agreements such as property ownership, or organizations that are otherwise jointly implementing the project. Informal partners were considered to include partners such as technical advisory councils or stakeholder groups that are not actively participating or funding the project.
- **Green Technology.** (Applied to all categories) The extent to which the project contributes to the reduction of greenhouse gases, conserves energy and/or water, uses other green technologies such as improved best management practices, or contributes to adapting to the effects of climate change. Projects with a direct contribution to reduction of greenhouse gases, energy and/or water conservation, or improved best management practices for water quality or infiltration received full points. Projects that contribute to climate change adaptation or support other green technologies received 2 points.
- **Relevance to State Water Plan, Other Plans.** (Applied to all categories) Whether the project incorporates Resource Management Strategies (RMS) from the California Water Plan, or other plans. The scoring criteria in Table 6-1 specifies that for full points the project template must list and describe the relevance to RMS or other plans, but as the Project Information Form did not specifically ask for a description of the relevance, full points were assigned for all projects that listed applicable RMS or other plans.
- **Impact if not Funded.** (Applied to all categories) Importance of the project. Projects that would benefit safety, public health, impaired water bodies, flooding, or threatened and endangered species received full points. Benefit to impaired water bodies was considered to include only direct discharges into the impaired water body and not upstream benefits. Impaired water bodies included not only water bodies with a TMDL, but also aquatic invasive species concerns.
- **Scientific Backing.** (Applied to all categories) The technical feasibility of the project. Projects that have project-specific assessments, studies, or pilot tests, and that referenced equivalent projects consisting of similar procedures or technology. Equivalent projects did not have to include projects that have been completed by the project proponent, rather any similar projects with demonstrated effectiveness.
- **Community Benefits.** (Applied to water/wastewater category) Projects that would provide a tangible community benefit such as water conservation, water supply/reliability, fire protection, reduced wastewater contamination or consolidation would receive one point for each applicable benefit.
- **Disadvantaged Community.** (Applied to all categories) Whether the project is located in or directly benefits a DAC or tribal community with respect to water supply and water quality needs. Projects that are located within or will have improvements to serve DAC or tribal communities received 3 points.

- **Number of Projects Submitted per Proponent.** (Leveling criteria; applied to all categories) The total number of projects submitted by agency was considered as a weighting for projects from proponents with fewer projects.

In addition to the above-described criteria, project proponents are requested to summarize project benefits and impacts on the following:

- Native American Tribal Community considerations
- Disadvantaged Community considerations
- Environmental Justice considerations
- Assist the Region in adapting to effects of climate change
- Generation or reduction of greenhouse gas emissions (e.g. green technology)
- Other expected impacts or benefits that are not already mentioned elsewhere

Further, on the Project Information Form, information is collected on project cost and financing, including estimated capital costs, estimated operations and maintenance costs and anticipated plan for financing such costs, as well as proposed sources of funding. This information helps assess economic feasibility of the project and potential opportunities for grant funding. While not directly scored, these items are taken into consideration during project evaluations.

Table 6-1: Project Scoring Criteria

Criteria	Points		
	3	2	1
Shovel Ready/ Readiness to Proceed	Implement/construct within 2 years	Implement/construct within 3-5 years	Implement/construct in more than 5 years
Relevance to Plan	Meets 3 objectives or strategies	Meets 2 objectives or strategies	Meets 1 objective or strategy
Other Funds	25% Match	10%-25% Match	<10% Match
Partners	Formal Partners	Informal partners	No partners
Green Technology	Uses many forms of alternative energy, or other green technology, or significantly reduces GHG production	Uses some forms of alternative energy, or other green technology, or reduces GHG production	Uses minimal or no forms of alternative energy, or other green technology, or has no reduction of GHG production
Relevance to State Water Plan, Other Plans	Yes, and describes how the project is relevant	Yes, only list	No relevant plans listed
Impact if not funded	Safety, public health, impaired water bodies, flood or threatened & endangered species risk	Lose matching funds	Missed opportunity
Scientific Backing	Assessment and equivalent project	Assessment or equivalent project	No assessment or equivalent project
Community Benefits	One point for each – Water conservation, Water supply/Reliability, Fire protection, Consolidation		
Disadvantaged Community	Yes	Partial	No
Leveling Criteria to ensure project prioritization is evenly dispersed.			
Number of Projects Submitted per proponent	Only one project	Two or three projects	Four or more projects

6.3 Summary of Projects Included in the IRWM Plan

The projects submitted for inclusion in the IRWM Plan demonstrate the breadth of activities needed to meet the water management objectives in the Region. A total of 101 projects were submitted from 19 organizations, with 41 projects categorized as restoration projects, 50 as stormwater/flood control projects, and 25 as water supply/wastewater projects. All Plan objectives are addressed at least in part, and almost all RMS are included. Of these projects, 35 involve multiple agencies or organizations, and 43 are located, at least in part, in a DAC.

The projects included in the IRWM Plan are summarized in Table 6-2 through Table 6-4 with their total score and total capital cost as entered in the Project Information Forms. Figure 6-1 shows the geographic distribution of the projects. It should be noted that Tables 6-2 through 6-4 represent a “snapshot” for this particular edition of the IRWM Plan.

Additional ways to sort and group the projects are included in Appendix 6-B in order to present the projects through multiple perspectives. Stakeholders can study the lists to compare projects and possibly find opportunities for future projects, future collaboration, or other enhancements to existing projects. Copies of the completed Project Information Forms for each project are included in Appendix 6-C.

6.3.1 Summary of DAC and Tribal Community Projects

Of the 101 projects submitted, 52 identified themselves to provide DAC or Tribal benefits either directly or through downstream water quality/water supply improvement. Table 6B-8 in Appendix 6B provides a list of the 52 projects including the specific DAC or Tribal benefit or impact explanation for each. Also, Figure 6-4 shows the DAC and tribal communities along with the location of the projects providing benefit to them.

Table 6-2: Restoration Projects Sorted by Total Score

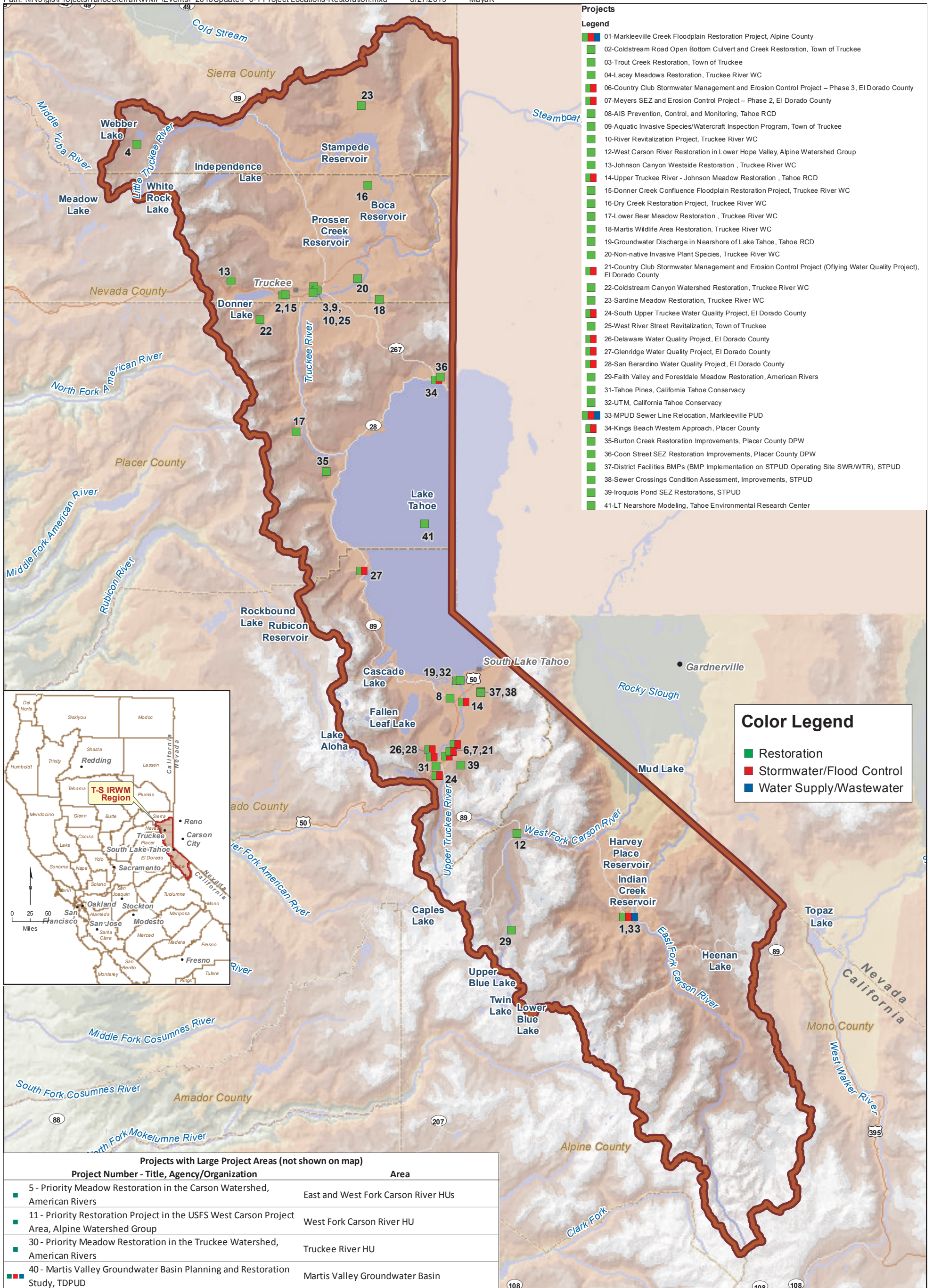
Project Number	Agency/ Organization	Project Title	Total Score	Total Cost (Capital)
1	Alpine County	Markleeville Creek Restoration	25	\$ 1,800,000
2	Town of Truckee	Coldstream Road Open Bottom Culvert and Creek Restoration	24	\$ 2,500,000
3	Town of Truckee	Trout Creek Restoration	24	\$ 13,000,000
4	Truckee River Watershed Council	Lacey Meadows Restoration	24	\$ 1,125,000
5	American Rivers	Priority Meadow Restoration in the Carson Watershed	23	\$ 265,000
6	El Dorado County	Country Club Stormwater Management and Erosion Control Project – Phase 3	23	\$ 580,000
7	El Dorado County	Meyers Water Quality Project	23	\$ 550,000
8	Tahoe RCD	AIS Prevention, Control, and Monitoring	23	\$ 2,600,000
9	Town of Truckee	Aquatic Invasive Species/Watercraft Inspection Program	23	\$ 1,000,000
10	Truckee River Watershed Council	River Revitalization Project	23	\$ 2,232,500
11	Alpine Watershed Group	Priority Restoration Project in the USFS West Carson Project Area	22	\$ 475,000
12	Alpine Watershed Group	West Carson River Restoration in Lower Hope Valley	22	\$ 425,000
13	Truckee River Watershed Council	Johnson Canyon Westside Restoration	22	\$ 440,000
14	Tahoe RCD	Upper Truckee River - Johnson Meadow Restoration	21	\$ 12,165,000
15	Truckee River Watershed Council	Donner Creek Confluence Floodplain Restoration Project	21	\$ 750,000
16	Truckee River Watershed Council	Dry Creek Restoration Project	21	\$ 700,000
17	Truckee River Watershed Council	Lower Bear Meadow Restoration	21	\$ 875,000
18	Truckee River Watershed Council	Martis Wildlife Area Restoration	21	\$ 3,750,000
19	Tahoe RCD	Groundwater Discharge in Nearshore of Lake Tahoe	20	\$ 237,500
20	Truckee River Watershed Council	Non-native Invasive Plant Species	20	\$ 210,000
21	El Dorado County	Country Club Stormwater Management and Erosion Control Project (Oflying Water Quality Project)	19	\$ 492,500
22	Truckee River Watershed Council	Coldstream Canyon Watershed Restoration	19	\$ 1,825,000
23	Truckee River Watershed Council	Sardine Meadow Restoration	19	\$ 950,000
24	El Dorado County	South Upper Truckee Water Quality Project	18	\$ 300,000
25	Town of Truckee	West River Street Revitalization	18	\$ 2,232,500
26	El Dorado County	Delaware Water Quality Project	13	\$ 250,000
27	El Dorado County	Glenridge Water Quality Project	13	\$ 250,000
28	El Dorado County	San Bernardino Water Quality Project	13	\$ 250,000
29	American Rivers	Faith Valley and Forestdale Meadow Restoration	10	\$ 526,000
30	American Rivers	Priority Meadow Restoration in the Truckee Watershed	10	\$ 355,000
31	California Tahoe Conservancy	Tahoe Pines	10	\$ 1,216,000
32	California Tahoe Conservancy	Upper Truckee River and Marsh Restoration	10	\$ 9,049,000
33	Markleeville PUD	MPUD Sewer Line Relocation	10	\$ 1,800,000
34	Placer County	Kings Beach Western Approach	10	\$ 2,000,000
35	Placer County DPW	Burton Creek Restoration Improvements	10	\$ 1,090,000
36	Placer County DPW	Coon Street SEZ Restoration Improvements	10	\$ 1,250,000
37	South Tahoe PUD	District Facilities BMPs (BMP Implementation on STPUD Operating Site SWR/WTR)	10	\$ 60,000
38	South Tahoe PUD	Sewer Crossings Condition Assessment, Improvements	10	\$ 600,000
39	South Tahoe PUD	Iroquois Pond SEZ Restorations	10	\$ 350,000
40	Truckee Donner PUD	Martis Valley Groundwater Basin Planning and Restoration Study	10	\$ 125,000
41	University of California, Davis-Tahoe Environmental Research Center	LT Nearshore Modeling	10	\$ 180,000

Table 6-3: Stormwater/Flood Control Projects Sorted by Total Score

Project Number	Agency/ Organization	Project Title	Total Score	Total Cost (Capital)
72	City of South Lake Tahoe	Tahoe Valley Greenbelt	18	\$ 6,000,000
68	City of South Lake Tahoe	Bijou Park Creek Watershed and SEZ Restoration Project	16	\$ 7,000,000
21	El Dorado County	Country Club Stormwater Management and Erosion Control Project (Offlying Water Quality Project)	15	\$ 1,200,000
83	Placer County	Kings Beach Commercial Core Improvement Project	14	\$ 29,000,000
7	El Dorado County	Meyers SEZ and Erosion Control Project – Phase 2	13	\$ 2,994,454
64	Alpine Watershed Group	Grover Hot Springs State Park Meadow Restoration	13	\$ 133,700
76	El Dorado County	CSA #5 Erosion Control Project	13	\$ 1,542,443
24	El Dorado County	South Upper Truckee Water Quality Project	12	\$ 1,500,000
101	Truckee River Watershed Council	donner - lower mobile home/rr culvert	12	\$ 180,000
34	Placer County	Kings Beach Western Approach	12	\$ 5,750,000
3	Town of Truckee	Trout Creek Restoration	11	\$ 243,073
26	El Dorado County	Delaware Water Quality/Erosion Control Project	11	\$ 1,000,000
80	El Dorado County	Meyers Corridor Operational Improvement Project	11	\$ 12,807,903
96	Tahoe Resource Conservation District	Regional Landscape Conservation Measures for Lake Tahoe 1	10	\$ 400,000
6	El Dorado County	Country Club Stormwater Management and Erosion Control Project – Phase 3	9	\$ 1,774,746
2	Town of Truckee	Coldstream Road Open Bottom Culvert and Creek Restoration	9	\$ 2,500,000
29	Alpine County (American Rivers)	Faith Valley and Forestdale Meadow Restoration	9	\$ 526,000
66	Alpine Watershed Group	Markleeville Creek Floodplain Restoration Project	9	\$ 2,300,000
67	City of South Lake Tahoe	Bijou Area Water Quality Improvement Project, Phases 2 (Upper Glenwood)	8	\$ 1,000,000
65	Alpine Watershed Group	Hope Valley Restoration and Aquatic Habitat Enhancement Project	8	\$ 458,550
87	Placer County	North Tahoe Regional Trail	8	\$ 12,000,000
90	Placer County	Tahoe City Complete Streets Highway Improvements	8	\$ 1,600,000
91	Placer County	Tahoe City Downtown Access Improvements	8	\$ 3,000,000
95	Tahoe Regional Planning Agency	BMP implementation, inspection and maintenance	8	\$ 160,000
74	El Dorado County	Chiapa Water Quality Project	7	\$ 2,083,600
84	Placer County	Kings Beach Watershed Improvement Project	7	\$ 8,040,000
25	Town of Truckee	West River Street Revitalization	7	\$ 2,232,500
69	City of South Lake Tahoe	Osgood Basin Expansion	7	\$ 2,000,000
82	Placer County	Flick Point Erosion Control Project - Phase II	6	\$ 2,000,000
92	Placer County	Tahoe Vista Tamarack Erosion Control Project	6	\$ 1,500,000
93	Placer County	Tahoma Roads Water Quality Improvement Project	6	\$ 400,000
98	Town of Truckee	Permenant BMP Implementation, Inspection, and Maintenance	6	\$ 15,000
99	Town of Truckee	Town of Truckee Stormwater Management and Retrofits	6	\$ 150,000
100	Town of Truckee	Truckee River Legacy Trail	6	\$ 10,619,230
88	Placer County	Placer County Urban Upland TMDL Implementation	6	\$ 1,500,000
70	City of South Lake Tahoe	Ruby Way Overlook Ct.	5	\$ 700,000
78	El Dorado County	El Dorado County Urban Upland TMDL Implementation	5	\$ 20,000,000
27	El Dorado County	Glenridge Water Quality/Erosion Control Project	5	\$ 800,000
89	Placer County	Streets & Roads Operations and Maintenance	4	\$ 14,666,611
71	City of South Lake Tahoe	Sierra Boulevard	4	\$ 6,827,972
73	City of South Lake Tahoe	Upper Keller Canyon Drainage and Erosion Control Project	4	\$ 4,000,000
79	El Dorado County	Hwy 89 Class I Trail	4	\$ 4,250,000
75	El Dorado County	Cold Creek Fisheries Enhancement Project	3	\$ 1,844,917
77	El Dorado County	East San Bernardino Bike Trail	3	\$ 2,518,504
63	Alpine County	Alpine County Woodfords Complex Stormwater Retrofit	2	\$ 75,000
81	Placer County	Emigrant Trail Extension on Donner Summit	2	\$ 1,100,000
85	Placer County	Legacy Trail - Truckee River Trail	2	\$ 8,000,000
86	Placer County	Martis Valley Trail	2	\$ 2,200,000
94	Placer County	Truckee River Recreational Access Plan	2	\$ 1,700,000
97	Tahoe Resource Conservation District	Regional Stormwater Monitoring Program	0	\$ 7,000,000

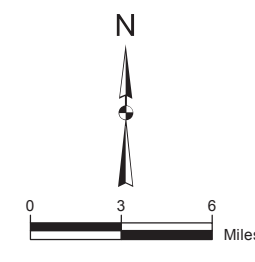
Table 6-4: Water Supply/Wastewater Projects Sorted by Total Score

Project Number	Agency/ Organization	Project Title	Total Score	Total Cost (Capital)
47	South Tahoe PUD	Regional Water Conservation Programs	28	\$ 800,000
46	Markleeville Water Company	Markleeville Pipeline Replacement, Meter and Hydrant Installation	26	\$ 5,678,237
56	Tahoe City PUD	West Lake Tahoe Regional Water Treatment Plant	26	\$ 9,465,592
58	Truckee Donner PUD	Water Pipeline Replacement Project	25	\$ 2,250,000
50	South Tahoe PUD	STPUD Waterline Replacement Projects	24	\$ 8,000,000
55	Tahoe City PUD	Westshore Regional Water Storage Tanks	24	\$ 4,253,850
63	Washoe Tribe of Nevada and California – Washoe Environmental Protection Department (WEPD)	Woodfords Community Water Infrastructure Upgrades	24	\$ 365,000
1	Alpine County	Markleeville Creek Floodplain Restoration Project	23	\$ 1,800,000
9	Town of Truckee	Aquatic Invasive Species/Watercraft Inspection Program	23	\$ 1,000,000
33	Markleeville PUD	MPUD Sewer Line Relocation	23	\$ 1,800,000
44	Lukins Brothers Water Company	Waterline Replacement 7a	23	\$ 740,000
48	South Tahoe PUD	Keller-Heavenly Zone Improvements	23	\$ 3,384,000
52	South Tahoe PUD	H-Street Zone Booster, Fire Pump Improvements	23	\$ 400,000
54	Tahoe City PUD	Tahoe City Emergency Water Supply	23	\$ 850,337
43	Lukins Brothers Water Company	Meter Conversion	22	\$ 3,300,000
60	Truckee River WC	Aquatic Invasive Species (AIS) Prevention- Middle Truckee River Watershed	22	\$ 30,000
51	South Tahoe PUD	Upper Montgomery Booster, Zone Improvements	21	\$ 1,300,000
53	South Tahoe PUD	Wastewater Force Main Bypass Projects	21	\$ 975,000
57	Truckee Donner PUD	Potable Groundwater Well Discharge	21	\$ 720,000
59	South Tahoe PUD	SCADA Upgrades	20	\$ 600,000
62	Washoe Tribe of Nevada and California – Washoe Environmental Protection Department (WEPD)	Woodfords Community Wastewater Infrastructure Upgrades	20	\$ 588,000
45	Lukins Brothers Water Company	Well #4 replacement and treatment project	19	\$ 5,500,000
42	City of South Lake Tahoe	City of South Lake Tahoe Landscape Irrigation Efficiency Upgrades	17	\$ 1,000,000
40	Truckee Donner PUD	Martis Valley Groundwater Basin Planning and Restoration Study	0	\$ 125,000
61	Truckee River Watershed Council	Truckee River Operating Agreement – Instream flow enhancement	0	\$ 387,000



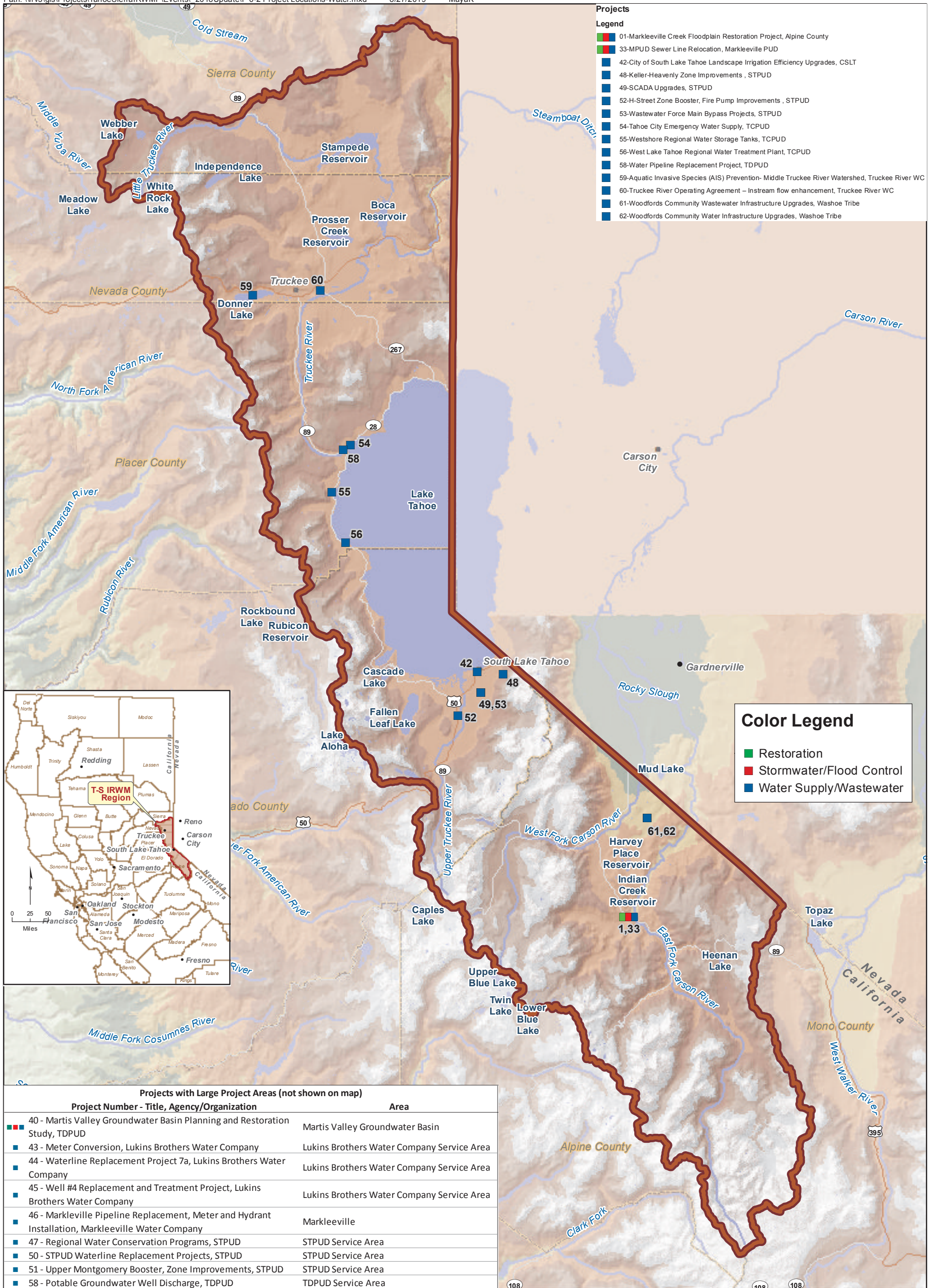
Legend

- Tahoe-Sierra IRWM Boundary
- California Counties



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Tahoe-Sierra IRWMP

Project Location Map, Restoration Projects



- Projects Legend**
- 01-Markleeville Creek Floodplain Restoration Project, Alpine County
 - 33-MPUD Sewer Line Relocation, Markleeville PUD
 - 42-City of South Lake Tahoe Landscape Irrigation Efficiency Upgrades, CSLT
 - 48-Keller-Heavenly Zone Improvements , STPUD
 - 49-SCADA Upgrades, STPUD
 - 52-H-Street Zone Booster, Fire Pump Improvements , STPUD
 - 53-Wastewater Force Main Bypass Projects, STPUD
 - 54-Tahoe City Emergency Water Supply, TCPUD
 - 55-Westshore Regional Water Storage Tanks, TCPUD
 - 56-West Lake Tahoe Regional Water Treatment Plant, TCPUD
 - 58-Water Pipeline Replacement Project, TDPUD
 - 59-Aquatic Invasive Species (AIS) Prevention- Middle Truckee River Watershed, Truckee River WC
 - 60-Truckee River Operating Agreement – Instream flow enhancement, Truckee River WC
 - 61-Woodfords Community Wastewater Infrastructure Upgrades, Washoe Tribe
 - 62-Woodfords Community Water Infrastructure Upgrades, Washoe Tribe

Color Legend

- Restoration
- Stormwater/Flood Control
- Water Supply/Wastewater

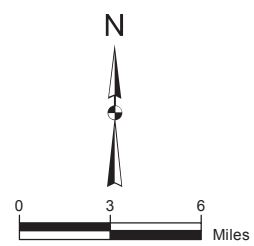


Projects with Large Project Areas (not shown on map)

Project Number - Title, Agency/Organization	Area
40 - Martis Valley Groundwater Basin Planning and Restoration Study, TDPUD	Martis Valley Groundwater Basin
43 - Meter Conversion, Lukins Brothers Water Company	Lukins Brothers Water Company Service Area
44 - Waterline Replacement Project 7a, Lukins Brothers Water Company	Lukins Brothers Water Company Service Area
45 - Well #4 Replacement and Treatment Project, Lukins Brothers Water Company	Lukins Brothers Water Company Service Area
46 - Markleeville Pipeline Replacement, Meter and Hydrant Installation, Markleeville Water Company	Markleeville
47 - Regional Water Conservation Programs, STPUD	STPUD Service Area
50 - STPUD Waterline Replacement Projects, STPUD	STPUD Service Area
51 - Upper Montgomery Booster, Zone Improvements, STPUD	STPUD Service Area
58 - Potable Groundwater Well Discharge, TDPUD	TDPUD Service Area

Legend

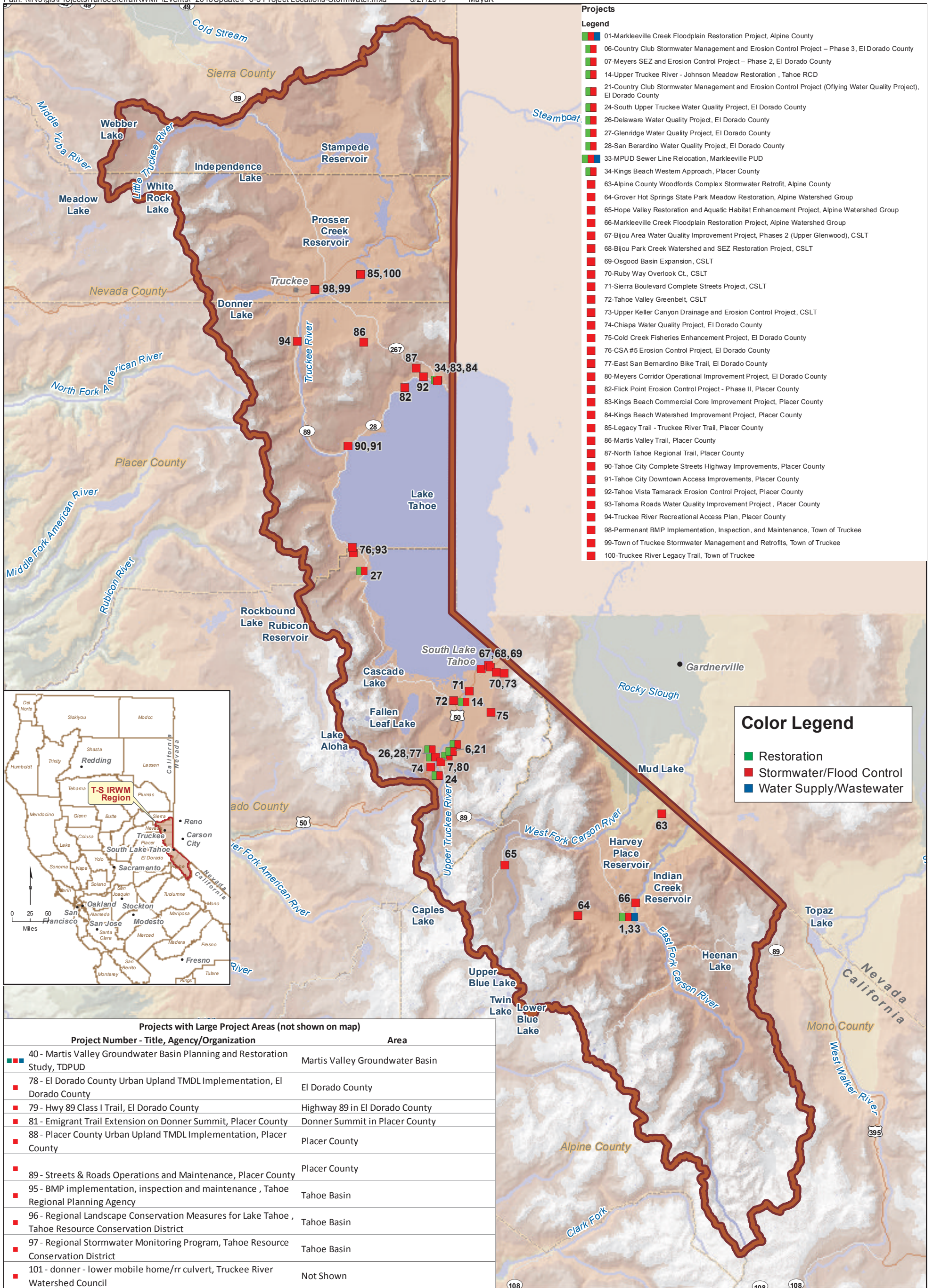
- Tahoe-Sierra IRWM Boundary
- California Counties



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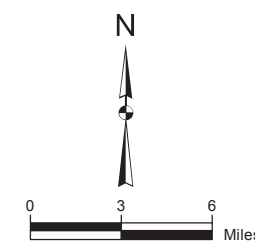
Project Location Map, Water Supply/Wastewater Projects

KJ 1870012.00
Figure 6-2



Legend

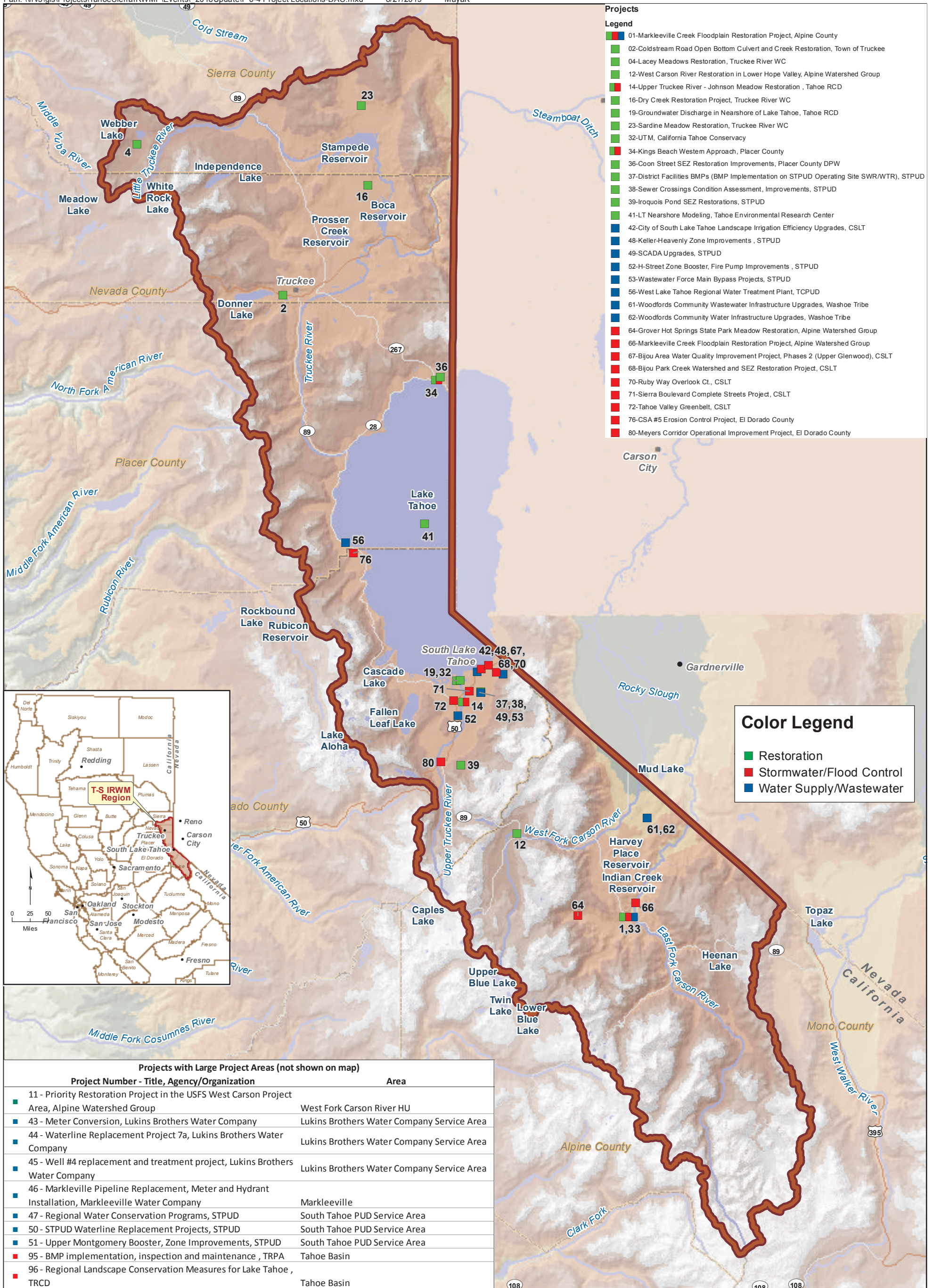
- Tahoe-Sierra IRWM Boundary
- California Counties



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Tahoe-Sierra IRWMP

**Project Location Map,
Stormwater/Flood Control Projects**

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Figure 6-3



- Projects Legend**
- 01-Markleeville Creek Floodplain Restoration Project, Alpine County
 - 02-Coldstream Road Open Bottom Culvert and Creek Restoration, Town of Truckee
 - 04-Lacey Meadows Restoration, Truckee River WC
 - 12-West Carson River Restoration in Lower Hope Valley, Alpine Watershed Group
 - 14-Upper Truckee River - Johnson Meadow Restoration , Tahoe RCD
 - 16-Dry Creek Restoration Project, Truckee River WC
 - 19-Groundwater Discharge in Nearshore of Lake Tahoe, Tahoe RCD
 - 23-Sardine Meadow Restoration, Truckee River WC
 - 32-UTM, California Tahoe Conservancy
 - 34-Kings Beach Western Approach, Placer County
 - 36-Coon Street SEZ Restoration Improvements, Placer County DPW
 - 37-District Facilities BMPs (BMP Implementation on STPUD Operating Site SWR/WTR), STPUD
 - 38-Sewer Crossings Condition Assessment, Improvements, STPUD
 - 39-Iroquois Pond SEZ Restorations, STPUD
 - 41-LT Nearshore Modeling, Tahoe Environmental Research Center
 - 42-City of South Lake Tahoe Landscape Irrigation Efficiency Upgrades, CSLT
 - 48-Keller-Heavenly Zone Improvements , STPUD
 - 49-SCADA Upgrades, STPUD
 - 52-H-Street Zone Booster, Fire Pump Improvements , STPUD
 - 53-Wastewater Force Main Bypass Projects, STPUD
 - 56-West Lake Tahoe Regional Water Treatment Plant, TCPUD
 - 61-Woodfords Community Wastewater Infrastructure Upgrades, Washoe Tribe
 - 62-Woodfords Community Water Infrastructure Upgrades, Washoe Tribe
 - 64-Grover Hot Springs State Park Meadow Restoration, Alpine Watershed Group
 - 66-Markleeville Creek Floodplain Restoration Project, Alpine Watershed Group
 - 67-Bijou Area Water Quality Improvement Project, Phases 2 (Upper Glenwood), CSLT
 - 68-Bijou Park Creek Watershed and SEZ Restoration Project, CSLT
 - 70-Ruby Way Overlook Ct., CSLT
 - 71-Sierra Boulevard Complete Streets Project, CSLT
 - 72-Tahoe Valley Greenbelt, CSLT
 - 76-CSA #5 Erosion Control Project, El Dorado County
 - 80-Meyers Corridor Operational Improvement Project, El Dorado County

Color Legend

- Restoration
- Stormwater/Flood Control
- Water Supply/Wastewater

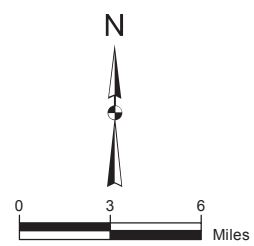


Projects with Large Project Areas (not shown on map)

Project Number - Title, Agency/Organization	Area
11 - Priority Restoration Project in the USFS West Carson Project Area, Alpine Watershed Group	West Fork Carson River HU
43 - Meter Conversion, Lukins Brothers Water Company	Lukins Brothers Water Company Service Area
44 - Waterline Replacement Project 7a, Lukins Brothers Water Company	Lukins Brothers Water Company Service Area
45 - Well #4 replacement and treatment project, Lukins Brothers Water Company	Lukins Brothers Water Company Service Area
46 - Markleeville Pipeline Replacement, Meter and Hydrant Installation, Markleeville Water Company	Markleeville
47 - Regional Water Conservation Programs, STPUD	South Tahoe PUD Service Area
50 - STPUD Waterline Replacement Projects, STPUD	South Tahoe PUD Service Area
51 - Upper Montgomery Booster, Zone Improvements, STPUD	South Tahoe PUD Service Area
95 - BMP implementation, inspection and maintenance , TRPA	Tahoe Basin
96 - Regional Landscape Conservation Measures for Lake Tahoe , TRCD	Tahoe Basin

Legend

- Tahoe-Sierra IRWM Boundary
- California Counties



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**Project Location Map,
DAC and Tribal Community**

Section 7: Impacts and Benefits

This section provides an overview of the potential impacts and benefits associated with the implementation of the Tahoe-Sierra Region IRWM Plan. This is a preliminary screening level assessment of potential impacts and benefits. Due to the nature of the IRWM planning process, it is not intended to be a complete list. More extensive and project-specific evaluations of impacts and benefits will occur through the project implementation process. This overview of potential impacts and benefits may be used as a benchmark for future evaluation throughout IRWM Plan implementation to understand if the potential benefits have been realized or if unanticipated impacts have occurred.

7.1 Benefits of Plan Implementation

The primary benefit of this IRWM Plan is the development of a shared vision and objectives for regional water management and planning among the stakeholders in the Region and a framework for maintaining that into the future. The process of developing and updating this IRWM Plan has fostered improved coordination, collaboration, and communication among stakeholders, and a greater awareness of concerns throughout the Region.

7.1.1 Plan Benefits

The 101 projects included in this IRWM Plan address at least in part all of the Plan objectives presented in Section 4 (Objectives). Over the 20-year planning horizon of this IRWM Plan, implementation of these projects will produce benefits as described in the following overview by Plan goal. Table 7-1 also provides a summary of the benefits by goal while Table 7-2 provides a summary of plan benefits by project type. In addition to benefits related to the Plan objectives, other anticipated benefits of implementation of this IRWM Plan include improved recreation and tourism, a greater quality and quantity of pedestrian and bike trails for residents and visitors, and improved roadway aesthetics.

- **Protect and Improve Water Quality.** Projects that contribute to the goal of protecting and improving the water quality in the Region include such actions as implementing best management practices (BMPs) and erosion control to reduce non-point source pollution and sedimentation of waterbodies; restoring meadows, riparian areas, and stream environment zones (SEZs) to improve filtration of runoff and removal of nutrients from surface and groundwater; preventing the spread of aquatic invasive species; conducting monitoring to support progress meeting Total Maximum Daily Loads (TMDLs); conducting public education about stormwater and pollution prevention; replacing aging wastewater infrastructure to reduce leakage; implementing wellhead protection for groundwater resources; and improving drinking water treatment. The primary benefit of implementation of these projects is improved ambient water quality for ecological benefit and meeting TMDLs, as well as the reduced potential for human exposure to potentially harmful substances. These projects would also improve the efficiency of water and wastewater treatment processes, help meet established regulatory requirements, support water-based recreation, help to address increased water quality vulnerabilities associated with climate change, and reduce the spread of aquatic invasive species.

- Protect the Community Water Supply and Treatment/Delivery System. Projects that contribute to the goal of protecting water supply and treatment/delivery include replacing aging water lines and rehabilitating groundwater wells, installing water meters to promote water conservation, improving water treatment capabilities, constructing interties to support redundancy and provide emergency supply, promoting low-water use landscaping and other water conservation strategies, and restoring meadows and wetlands to improve water quality, storage and groundwater infiltration. The benefits of implementation of these projects are reduced water demand and water loss, increased water production and treatment capacity, increased subsurface water storage and infiltration, and preparation for increased water supply variability associated with climate change. These projects would also improve fire protection capabilities.
- Manage Groundwater for Sustainable Yield. Projects that contribute to the goal of managing groundwater include such actions as restoring meadows and wetlands or constructing infiltration basins to improve infiltration of stormwater; promoting water conservation to reduce groundwater pumping; constructing additional interconnections or treatment facilities to reduce the reliance on groundwater supply; rehabilitating aging groundwater wells and improving wellhead protection; and monitoring groundwater flow, nutrient content, and pumping rates. The primary benefit of implementation of these projects is protection of recharge zones and improved infiltration for groundwater recharge. Other benefits include reduced groundwater pumping, wellhead protection and improved quality of stormwater for infiltration, and continued monitoring of groundwater and groundwater flow.
- Contribute to Ecosystem Restoration. Projects that contribute to the goal of ecosystem restoration include such actions as restoring SEZs, stream channels and floodplains, wetlands, and meadows to their natural functions; reconnecting fragmented drainages and wetlands to improve function; implementing best management practices for stormwater runoff in areas with disturbed ground surfaces and other areas prone to erosion to reduce sedimentation of water bodies; implementing programs to prevent the introduction and spread of aquatic invasive species, and control and monitor existing populations; removing terrestrial invasive species; and relocating wastewater pipelines to provide protection from overflows. The primary benefit of implementation of these projects is improved habitat function and water quality, including Lake Tahoe's clarity, as well as reduced impacts caused by development. These projects would also contribute to the prevention, control, and monitoring of aquatic and terrestrial invasive species; improve water supply; and improve fire protection capabilities.
- Implement Integrated Watershed Management Throughout the Region. Aspects of projects that contribute to the goal of implementing integrated watershed management include inter-agency coordination and multi-organization efforts, public engagement, and public education; as well as monitoring and implementation of new concepts supporting advances in watershed science. The primary benefits of efforts in support of this goal are increased coordination and cooperation between organizations throughout the Region and improved public education and awareness. Other benefits include improved adaptability to climate change, reductions in greenhouse gas emissions, reduced flood risk, and continuous improvements to watershed science.

Table 7-1: Potential Benefits and Impacts from Plan Implementation Organized by Goal

Goal	Within IRWM Region		Inter-Regional	
	Potential Benefits	Potential Impacts	Potential Benefits	Potential Impacts
Protect and Improve Water Quality	<ul style="list-style-type: none"> • Meet regulatory requirements • Reduced human and ecological exposure to pollutants • Preservation of aquatic habitat • Improvement of water-based recreation • Improved efficiency of drinking water supply and wastewater treatment • Benefits extend to broad Region, including DACs 	<ul style="list-style-type: none"> • Projects that involve construction could result in temporary impacts to aesthetics, air quality, biological resources, cultural resources, noise, soils, and transportation systems • No environmental justice nor DAC impacts are anticipated 	<ul style="list-style-type: none"> • Improved water quality in the Region would also benefit the downstream water users in the State of Nevada • Control of aquatic invasive species would reduce the potential for transport and deposition into other regions 	No inter-regional impacts anticipated
Protect the Community Water Supply and Treatment/Delivery System	<ul style="list-style-type: none"> • Reduced water demands • Reduced water loss • Enhanced supply reliability • Increased quantity of available water for beneficial uses • Less energy usage for treatment and delivery of water • Increased water storage • Improved fire protection capabilities • Benefits extend to broad Region, including DACs 	<ul style="list-style-type: none"> • Development of water supply projects could result in ground disturbance and have temporary impacts to aesthetics, air quality, biological resources, cultural resources, noise, soils, and transportation systems. • No environmental justice nor DAC impacts are anticipated 	No inter-regional benefits anticipated	No inter-regional impacts anticipated

Table 7-1 (cont.): Potential Benefits and Impacts from Plan Implementation Organized by Goal

Goal	Within IRWM Region		Inter-Regional	
	Potential Benefits	Potential Impacts	Potential Benefits	Potential Impacts
Manage Groundwater for Sustainable Yield	<ul style="list-style-type: none"> • Protection of recharge zones and improved groundwater recharge • Reduced water demands and/or groundwater pumping • Improved wellhead protection • Improved quality of recharge water • Public education • Continued monitoring of groundwater and groundwater flow • Benefits extend to broad Region, including DACs 	<ul style="list-style-type: none"> • Projects that involve construction could result in temporary impacts to aesthetics, air quality, biological resources, cultural resources, noise, soils, and transportation systems • No environmental justice nor DAC impacts are anticipated 	No inter-regional benefits anticipated	No inter-regional impacts anticipated
Contribute to Ecosystem Restoration	<ul style="list-style-type: none"> • Improved habitat function and quality • Reduced risk to native species from invasive species • Reducing peak flow • Reduced erosion and sedimentation, and improved water quality • Improved water supply • Improved fire protection capabilities • Benefits extend to broad Region, including DACs 	<ul style="list-style-type: none"> • Projects could have temporary negative impacts to aesthetics, biological resources, cultural resources, and soils. • No environmental justice nor DAC impacts are anticipated 	<ul style="list-style-type: none"> • Improved habitat function in the Region would benefit the downstream water users in the State of Nevada through improved water quality and flood control • Control of aquatic invasive species would reduce the potential for transport and deposition into other regions 	No inter-regional impacts anticipated

Table 7-1 (cont.): Potential Benefits and Impacts from Plan Implementation Organized by Goal

Goal	Within IRWM Region		Inter-Regional	
	<i>Potential Benefits</i>	<i>Potential Impacts</i>	<i>Potential Benefits</i>	<i>Potential Impacts</i>
Implement Integrated Watershed Management Throughout the Region	<ul style="list-style-type: none"> • Increased cooperation and coordination between organizations • Increased public education and engagement • Reduced flood risks • Improvements to watershed science for future benefits • Benefits extend to broad Region, including DACs 	No environmental justice nor DAC impacts are anticipated	<ul style="list-style-type: none"> • Increased cooperation and coordination with neighboring jurisdictions and jurisdictions that overlap with other regions, and with neighboring regions • Reduced flood risk for downstream water users in the State of Nevada • Improvements to watershed science for future benefits 	No inter-regional impacts anticipated
Actions to Adapt to Climate Change	Actions to improve adaptability to climate change are incorporated in the other types of projects described above, as appropriate.			
Actions to Reduce Greenhouse Gas Emissions	Actions to reduce greenhouse gas emissions are incorporated in the other types of projects described above, as appropriate.			

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Table 7-2: Potential Benefits and Impacts from Plan Implementation Organized by Project

Project Category	Within IRWM Region		Inter-Regional	
	<i>Potential Benefits</i>	<i>Potential Impacts</i>	<i>Potential Benefits</i>	<i>Potential Impacts</i>
Water Supply and Wastewater Projects	<ul style="list-style-type: none"> Enhanced supply reliability Increased quantity of available water for beneficial uses Reduced water demands Less energy usage for treatment and delivery of water Benefits extend to broad Region, including disadvantaged communities 	<ul style="list-style-type: none"> Development of water supply projects could result in ground disturbance and have temporary impacts to aesthetics, air quality, biological resources, cultural resources, noise, soils, and transportation systems. No environmental justice or DAC impacts are anticipated. 	<ul style="list-style-type: none"> Improved water supply reliability and reduced water demands within Region could impact regional and state-wide water supply reliability. 	No inter-regional impacts anticipated.
Stormwater and Flood Control Projects	<ul style="list-style-type: none"> Reduced human and ecological exposure to pollutants Improved efficiency of drinking water supply and wastewater treatment Preservation of aquatic habitat Improvement to agricultural users Improvement of water-based recreation Benefits extend to broad Region, including any disadvantaged communities 	<ul style="list-style-type: none"> Projects to improve water quality that involve construction could result in temporary impacts to aesthetics, air quality, biological resources, cultural resources, noise, soils, and transportation systems. No environmental justice or DAC impacts anticipated. 	<ul style="list-style-type: none"> Improved water quality in the Region would also benefit the downstream water users in the State of Nevada Reduced flood risk for downstream water users in the State of Nevada 	No inter-regional impacts anticipated

Table 7-2 (cont.): Potential Benefits and Impacts from Plan Implementation Organized by Project

Project Category	Within IRWM Region		Inter-Regional	
	<i>Potential Benefits</i>	<i>Potential Impacts</i>	<i>Potential Benefits</i>	<i>Potential Impacts</i>
Restoration Projects	<ul style="list-style-type: none"> • Improved habitat quality • Reduced risk to native species from invasive species • Improved water supply • Improved water quality • Benefits extend to broad Region, including any disadvantaged community • Potentially improved air quality • Improved efficiency of existing infrastructure • Reduced need for new infrastructure • Maximize beneficial use of resources • Benefits extend to broad Region, including any disadvantaged communities 	<ul style="list-style-type: none"> • Projects to remove invasive species could have temporary negative impacts to aesthetics, biological resources, cultural resources, and soils. • No environmental justice or DAC impacts anticipated. 	<ul style="list-style-type: none"> • Control of aquatic invasive species would reduce the potential for transport and deposition into other regions. 	No inter-regional impacts anticipated
Actions to Adapt to Climate Change	Actions to incorporate climate change will occur in conjunction with other types of projects described above, as appropriate.			
Actions to Reduce Greenhouse Gas Emissions	Actions to incorporate greenhouse gas emissions reduction will occur in conjunction with other types of projects described above, as appropriate.			

- Actions to Adapt to Climate Change. Projects that contribute to climate change adaptation include stormwater management, groundwater recharge, ecosystem resiliency, water conservation.
- Actions to Reduce Greenhouse Gas Emissions. Projects that contribute to greenhouse gas emissions include construction and improvement of bike trails, water conservation, energy efficiency, and increased vegetation for carbon sequestration.

In addition to the above benefits, implementation of the IRWM Plan and projects align with the strategies of the AB 32 Scoping Plan adopted by the California Air Resources Board (CARB) in 2017, including, but not limited to Integrated Systems, Increasing Carbon Sequestration in Natural and Working Lands, Improving Public Health, and Environmental Justice (CARB, 2017).

7.1.2 Plan Beneficiaries

Beneficiaries of this IRWM Plan are anticipated to include residents of the Region, businesses, water suppliers, wildlife and habitats, downstream water users, and local, regional, State and Federal agencies. Benefits from many of the projects will extend beyond the immediate vicinity of the projects to include the entire Region, larger portions of the Region, and in some cases people and habitats outside of the Region.

Forty-three (43) of the 101 projects are located within disadvantaged communities (DACs) or were identified by the project proponents as benefiting DACs in the Region. Projects benefiting DACs include implementing BMPs, improving erosion control, and improving trails and roadway shoulders to improve stormwater management and water quality and also improve aesthetics; replacing aging infrastructure and treatment facilities, and rehabilitating groundwater wells; installing water meters; controlling terrestrial and aquatic invasive species; supporting water conservation programs; and restoring meadows and SEZs.

The Washoe Tribe has been actively involved in the development of this IRWM Plan, and several projects will benefit them directly, such as through replacement of aging infrastructure, or indirectly such as through improved water supply and water quality along the West Fork Carson River. In addition to benefits for the Washoe Tribe, the Pyramid Lake Paiute are also anticipated to benefit through sediment reductions and control of aquatic invasive species in the Truckee River, which discharges to Pyramid Lake and supports the Lahontan and Paiute Cutthroat Trout populations.

7.1.3 Interregional Benefits

Implementation of this IRWM Plan is anticipated to have limited benefits to other regions in California as downstream water users are in Nevada and not California, and the Region is separated from other regions in California by mountain peaks. Some of the projects in the Lake Tahoe Basin are anticipated to benefit the entire Basin, including the Nevada side, and water users in Nevada may see benefits of plan implementation including water quality improvements, and reductions in peak flow.

Projects for the control and prevention of aquatic invasive species provide interregional benefits in both California and Nevada as they reduce the spread of these species to other waterbodies through water flow or inadvertent transport by visitors.

7.2 Impacts of Plan Implementation

Negative impacts that may be associated with the IRWM Plan projects include short-term, site specific impacts from construction or site grading; and long-term impacts associated with project operation. Tables 7-1 and 7-2 identify potential impacts of Plan Implementation as well.

Individual projects will evaluate the significance of any impacts through project-specific and/or programmatic environmental compliance processes that are consistent with the California Environmental Quality Act (CEQA) and, if applicable, the National Environmental Policy Act (NEPA). Under CEQA, impacts determined to be significant must be mitigated to a level of non-significance unless the lead agency makes findings of overriding consideration. As the IRWM Plan itself does not lead to the implementation of any specific projects, it is exempt from CEQA. The following provisions of the State CEQA Guidelines apply to IRWM Plans:

- Statutory Exemption (15262 for Feasibility and Planning Studies)
- Categorical Exemption (15306 for Information Collection)

For the purposes of this Plan, impacts are discussed at a screening level in this subsection. CEQA reviews performed for specific projects will evaluate impacts in the following topic areas in much greater detail.

- Aesthetics – Project-related construction activities and new infrastructure may affect aesthetics. However, it is likely that these activities would be in areas that are already disturbed or would include mitigation measures that would return disturbed areas to their pre-construction conditions at a minimum.
- Air Quality – Short-term air quality impacts could result from construction of Plan projects. However, through the CEQA process potential air emissions would be minimized through application of BMPs identified by local air districts or other mitigation measures.
- Biological Resources – Short-term biological impacts could result from construction activities of Plan projects, as well as from non-native plant removal. These negative effects would be largely avoided or minimized through mitigation efforts related to CEQA. The IRWM Plan includes preservation and restoration of ecosystem health as one of the Plan goals, and therefore many projects would result in overall long-term benefits to biological resources despite any short-term impacts.
- Cultural Resources – Impacts to cultural resources (including historical, archeological, and paleontological resources) could result from construction activities from Plan projects. As part of the CEQA process for each project, mitigation measures will be developed to avoid or minimize these potential impacts.
- Geology and Soils – Plan projects with the potential to impact geologic resources would undergo geological feasibility studies, which would specify the appropriate engineering

standards the contractor would have to comply with during construction. Compliance with these standards would mitigate project site geological and soil impacts.

- Hydrology and Water Quality – It is anticipated that impacts to hydrology and water quality would be generally beneficial because in the long-term, Plan projects are intended to improve water supply reliability and water quality. For short-term erosion or sedimentation, project-specific BMPs would be identified as part of the National Pollutant Discharge Elimination System (NPDES) permitting process.
- Land Use and Planning – The IRWM Plan was developed in coordination with other planning documents for the Region, including local and regional General Plans. Therefore, no significant land use changes or inconsistencies with policies are anticipated. It is hoped that the IRWM process will facilitate improvement of land and water use planning in the Region.
- Noise – Noise impacts could result from construction activities from some of the proposed Plan projects. However, through the CEQA process most of these activities would be minimized through mitigation efforts and no long-term noise impacts are expected.
- Population and Housing – No adverse impacts to population and housing are anticipated. IRWM Plan implementation would help to meet the water demands of the existing and anticipated future population.
- Public Services and Utilities – No adverse impacts to utilities are anticipated. Many of the Plan projects are intended to enhance water supply, water quality, and improve stormwater management and flood control. These types of projects would benefit the utilities and service systems in the Region.
- Recreation – Many of the Plan projects are intended to improve water quality and watershed health, and thereby indirectly improve recreational opportunities. However, some reduction in recreational opportunities may result from implementation of habitat restoration/improvement projects.
- Transportation and Circulation – Transportation and circulation could be temporarily impacted during construction of some of the Plan projects. Construction of projects located near roadways can result in temporary lane closures and detours. Traffic congestion may also temporarily increase due to transportation of equipment and workers. However, through the CEQA process most of



Installation of New Waterline in the Street
(Photo courtesy of North Tahoe PUD)

these activities would be minimized and no long-term transportation and circulation impacts are expected.

NEPA has similar environmental review topics and if NEPA compliance is necessary, appropriate mitigations to address NEPA-specific concerns will be included during environmental document preparation.

Section 8: Implementation Framework

8.1 Introduction

This section documents the relationships and decision-making structure recommended for use during the continued development and implementation of the Tahoe-Sierra Integrated Regional Water Management Plan (IRWM Plan or Plan) over the next 20 years. It also sets forward a proposed framework for Plan implementation and guidelines for performance monitoring to track progress, and it offers suggested initial Plan implementation activities. This section is intended to define the entity (or entities) that will implement the Plan, the responsibilities for Plan implementation and therefore serve as the cornerstone of actions the Region must take to continue the IRWM program into the future.

The governance structure recommendations included in this section are intended to be consistent with the Integrated Regional Water Management Guidelines for Proposition 84 and Proposition 1E (Guidelines) published by the California Department of Water Resources (DWR) in November 2012 and updated in 2016. The Guidelines require that the governance structure address the following:

- Public outreach and involvement processes
- Effective decision making
- Balanced access and opportunity for participation in the IRWM process
- Effective communication – both internal and external to the IRWM Region
- Long-term implementation of the IRWM Plan
- Coordination with neighboring IRWM efforts and state and federal agencies
- The collaborative process(es) used to establish plan objectives (discussed in Section 4)
- How interim changes and formal changes to the IRWM Plan will be performed
- Updating or amending the IRWM Plan

The Guidelines also describe that the IRWM Plan must also include:

“The name of the Regional Water Management Group (RWMG) responsible for development and implementation of the Plan.” A RWMG must meet the definition of the California Water Code (CWC) §10539, which states:

“RWMG means a group in which three or more local agencies, at least two of which have statutory authority over water supply or water management, as well as those persons who may be necessary for the development and implementation of a plan that meets the requirements of CWC §10540 and §10541, participates by means of a joint powers agreement, Memorandum of Understanding (MOU), or other written agreement, as appropriate, that is approved by the governing bodies of those local agencies”

During the 2014 update of the Plan, the RWMG was refined to be at least three entities, two of which have statutory authority for water management. The Tahoe-Sierra Partnership (Partnership) will decide on the composition of the Tahoe-Sierra RWMG annually at the Partnership meeting and/or on an as-needed basis. However, both in spirit and in practice, the Tahoe-Sierra IRWM operates functionally using the concept of a Partnership by having worked together to write, on a volunteer basis, the first IRWM Plan. Therefore the term Partnership, which includes the smaller RWMG, is the term used from this point forward. Both the Tahoe Resource Conservation District and the South Tahoe Public Utility District have provided leadership to the Partnership and acted as the lead agency, designated applicant for, and executing grant agreements as grantee for the Proposition 50 IRWMP Funding Round 1 Application, Proposition 50 IRWMP Funding Supplemental Round, and Proposition 84, Round 2 Planning.



Trout Creek Restoration Project
(Photo courtesy of the Town of Truckee)

8.2 Recommended Governance Structure

Once the Tahoe-Sierra IRWM Plan has been adopted, the focus of the Partnership, who are the signatories to the MOU provided in Appendix 1-A, and stakeholders will change significantly. Some of the activities conducted during Plan development will continue, but the emphasis will shift from planning toward implementation and tracking of progress. Implementation of the Tahoe-Sierra IRWM Plan will rely on actions taken by existing agencies and organizations within the Region. In order to implement the Plan in an open and definitive way, each Region is required to develop a governance structure consistent with the Propositions 84 and 1E IRWM Guidelines. The guidelines state:

“The IRWM Plan must document a governance structure that ensures the IRWM Plan will be updated and implemented beyond existing State grant programs.”

The proposed governance structure was developed to reflect the discussions of the Partnership and stakeholders to provide a means for the Region to maintain functionality, encourage open participation in the Plan, and help assure Plan longevity and stability.

8.2.1 Organizational Structure and Function

The following provides the proposed governance model for consideration to include in the Tahoe-Sierra IRWM Implementation Framework section. The recommendations in this section are not binding, but are intended to provide guidance to the Partnership and other Plan stakeholders and participants.

8.2.2 Roles and Responsibilities

The stakeholders and Partnership need to work together to ensure successful Plan implementation and each of the following groups will have varying roles and responsibilities:

- Tahoe Sierra Regional Water Management Group (three entities, two of whom have water management authority and are required to adopt the Plan for grant application acceptance)
- Tahoe-Sierra Partnership who are also MOU Signatories
 - Leadership Team (LT) – a group of volunteer individuals (typically 3-5) from the Partnership who rotate through the responsibilities of IRWM implementation
- Stakeholders or IRWM Participants (non-MOU signatories)
- Project Proponents (must sign the MOU to be included in a grant application and participate on Partnership Leadership Team)
- As-needed Subcommittee(s)

It should be noted that individuals may participate in more than one group fulfilling different roles as needed.

While individual agencies within the Tahoe-Sierra Region are responsible for implementing the projects that accomplish the objectives of the IRWM Plan, individuals within the Partnership will provide leadership for fostering cooperation, continuing coordination, tracking of Plan performance, and updating of the IRWM Plan through the development of a Leadership Team (LT). This is similar to how the Partnership has been functioning since its inception. The LT will be comprised of up to 5 volunteers from the Partnership who will generally serve in overlapping terms to implement the IRWM activities which are focused on communication and implementation and summarized in Table 8-1. Generally, volunteers on the LT do not have a set term to serve as has happened in practice with this small group, some members have continued for over seven years especially to administer an implementation grant. However, it is recommended that a minimum two-year term be considered. With a two-year term, the terms will overlap to ensure continuity between the LT members by always having an experienced LT member finishing his/her second year that can orient the new first year members. Stakeholders can also support the activities of the LT members.

On an as-needed basis, Subcommittees may be formed to help focus collaboration and progress on specific topics or objectives such as preparation of a specific grant application, integration of projects, or coordination of related activities. Some of the Subcommittees may be “ad hoc” and only exist for a few meetings to accomplish a specific task, while others may be long lasting with regular reporting responsibilities to the broader Partnership.

The subsections that follow describe some of the specific roles and responsibilities of various participants involved in Plan implementation. Table 8-1 summarizes the overall activities of IRWM Plan implementation with the identification of the LT member that would lead the activity. IRWM Plan implementation is not intended to interfere with or supersede actions taken by local agencies to fulfill the local agencies’ authorized duties.

Table 8-1: Activities, Participants, and Roles for Implementing the Tahoe-Sierra IRWM Plan

Potential Roles: Lead and Support

IRWM Activities	Leadership Team Role	Stakeholder/ Participant Role	Project Proponents Role	Other/Notes
1. Public outreach and involvement processes -				
a. Establish Point of Contact for IRWM Program	Lead			
b. Maintain e-mail list	Lead			both internal and external to the Region
c. Schedule and Announce meetings	Lead			both internal and external to the Region
d. Prepare agendas and content	Lead	Support		
e. Facilitate meetings	Lead			
f. Prepare meeting summaries	Lead	Support		
g. Administer website, and update content with meeting materials, and other relevant information	Lead			both internal and external to the Region
2. Balanced access and opportunity for participation in the IRWM process				
a. Monitor and maintain DAC and Tribal Contacts list through Notification Prior to Partnership Meetings	Lead	Support		
3. Effective Communications External to the Region				
a. Communication External to the Region	Lead	Support		See also 1
b. Coordination with neighboring IRWM efforts - Sierra Water Work Group and Lahontan Region IRWMs,	Lead	Support		See also 1
c. Coordination with state and federal agencies (e.g., RWQCB)		Lead and Report to LT		
4. Long-term implementation of the IRWM Plan				
a. Evaluate Plan Performance and Monitoring for Meeting Objectives	Lead	Support		
b. Review and act on objectives/targets not accounted for in projects	Lead			
c. Gather and synthesize data related to Plan projects, impacts, and benefits; and report to stakeholders	Lead	Support		
d. Manage and share-related data and information (also could be Data Management System)	Lead			
5. Update Tahoe-Sierra IRWM Plan				
a. Review and update objectives	Lead	Support		
b. Solicit new or revised/integrated projects, provide project evaluation/scoring and regularly revise project and update project priorities, as needed or at a minimum of every 2 years	Lead	Support	Support	
c. Revise Plan content at least every 5 years	Lead	Support	Support	LT to determine if Subcommittee should be convened

IRWM Activities	Leadership Team Role	Stakeholder/ Participant Role	Project Proponents Role	Other/Notes
6. Financing Plan Implementation				
a. Evaluate IRWM Plan Implementation Administration (e.g. Local Staff in-kind contributions, and/or grants, or other financial sources)	Lead	Support		
b. Communicate information on upcoming funding	Lead	Support		See also 1
c. Improve project integration and select projects for inclusion in grant applications	Lead	Support	Support	
d. Prepare and submit grant applications	Support		Lead	

8.2.2.1 Partnership

The primary function of the Partnership will be to act on all matters necessary for IRWM Plan implementation. The Partnership requires signing the MOU and represent a spectrum of public agencies, a Federally Recognized Native American Tribe, special districts, non-profit organizations and education institutions throughout the Region. All project proponents who apply for grants through the IRWM process are required to become signatories to the MOU. The LT, which has been described earlier, provides the core leadership for IRWM Plan implementation.

8.2.2.2 Regional Water Management Group (RWMG)

The RWMG is a group of three or more local agencies, at least two of which have statutory authority over water supply or water management. Within the Tahoe-Sierra Partnership, South Tahoe PUD, Tahoe City PUD, North Tahoe PUD, Tahoe Donner PUD and Squaw Valley PSD all have statutory authority over water supply or water management and would be eligible to fulfill this requirement. As noted earlier, the Partnership will decide the composition of the RWMG annually at the Partnership meeting and/or on an as-needed basis. The RWMG does not have additional authority and is considered part of the Partnership.

8.2.2.3 IRWM Stakeholders/Participants

Tahoe-Sierra IRWM Plan participants include the Partnership and any stakeholders interested in water related issues in the Region who choose to participate in the Tahoe-Sierra implementation activities.

8.2.2.4 Project Proponents

Agencies or organizations who are implementing projects (including feasibility studies, data collection and analysis, etc.) are project proponents of the Plan. Projects included and tracked by the Tahoe-Sierra IRWM Plan may include projects funded (in whole or in part) by IRWM grant funds, as well as projects and programs funded independently. Project proponents will be responsible for implementing the projects contained in the Tahoe-Sierra IRWM Plan, must become MOU signatories if they become IRWM fund applicants, formally adopt the IRWM Plan, and, if funded by IRWM grant funds, will be required to submit project-specific monitoring information to inform progress towards achieving Plan objectives.

It is envisioned that the project proponents will have the following roles and responsibilities:

1. Provide project-specific information for the regional project list maintained by the LT that may aid in advancing the Plan's regional objectives.
2. Seek opportunities to integrate, and where possible and practical, develop Plan projects in the list to most efficiently achieve the regional objectives. This process may be initiated and facilitated at stakeholder meetings, but it is expected that project proponents will further develop these opportunities outside of that forum.
3. Provide updated project-specific information for the regional project list as necessary to reflect major project milestones (e.g., CEQA completion, 100% design, construction underway, construction complete, and project completion). This particular role is a critical element of Plan implementation and is in the best interest of the project proponents, since having updated information available will help projects when applying for financial assistance. This can also include adding or removing projects from the list and will occur at least every two years.
4. Identify a point person for each project who will provide, in a timely manner, requested information for projects for inclusion in a grant application.
5. Identify a point person for each project who will provide, in a timely manner, to the potential grantee, requested information for projects selected for funding through a funding agency.
6. Comply with grant requirements, as identified by the funding agency, to qualify for grant funding, including and not limited to formally adopting the IRWM Plan.

8.2.2.5 As-Needed Subcommittee

The Subcommittee, should it be decided one is needed, is a smaller group of stakeholders/participants or project proponents who provide leadership and focus on a more detailed project/program level toward coordination and cooperation on behalf of the Partnership. Any member of the Partnership is welcome to join a Subcommittee. The primary roles of a Subcommittee could include:

- Coordinate preparation of grant funding applications.
- Conduct meetings to provide opportunities for discussion regarding Plan implementation and future updates or revisions to the Tahoe-Sierra IRWM Plan.
- Improve collaboration efforts to support development of integrated, regionally focused projects.
- Foster continued communication among stakeholders within the Region that support implementation of the Tahoe-Sierra IRWM Plan.
- Assist project proponents in pursuit of grant funds to help implement projects included in the IRWM Plan.
- Promote, track and report on progress toward meeting the Plan objectives.
- Recommend process for formal updates or amendments of the Tahoe-Sierra IRWM Plan, including public notification and public participation.

8.2.3 Access and Opportunity for Participation

One of the most important aspects of Plan implementation is processes to ensure that the public and interested stakeholders continue to be involved. This will be accomplished through multiple avenues of communication and engagement among the Partnership and IRWM participants, including, at minimum, the following:

- The Partnership will conduct outreach, create content and facilitate at annual (minimum frequency) Partnership meetings. In addition, the Partnership will support any Subcommittees that may be formed on separate topics. During the meetings, all MOU signatories are invited to participate as equals in the interaction to reach consensus on the implementation of the Plan.
- The Partnership will continue to foster dialog with Tribes and representatives of the Disadvantaged Communities (DAC) and environmental justice communities within the Region as needed to support meeting the objectives of the Plan. Extra contacts will be made prior to meetings to notify Tribal and DAC representatives of topics of interest. It is recognized that Tribes are sovereign nations, and as such coordination with Tribes is conducted on a government-to-government basis.

The Partnership will e-mail and will post meeting materials and other relevant information to the project website and invite review and comment from any interested person or organization

8.2.3.1 Internal and External Communication

As summarized in Table 8-1, multiple avenues of internal and external communication will be facilitated by the Partnership including:

- Prepare communication materials for distribution, posting on the project website, and for use in meetings with governing boards and other interested parties.
- Conduct meetings at least annually that are announced and open to any stakeholder.
- Ensure that individuals are assigned to meet and coordinate with neighboring IRWM planning efforts, other local, state, and federal agencies as they relate to accomplishing the objectives in the Tahoe-Sierra IRWM Plan.
- Ensure that engagement occurs with neighboring IRWM efforts and other state and federal agencies that have interests or could impact meeting the objectives of the Plan. The Partnership will continue to communicate with DWR regional representatives.

8.2.3.2 Public Involvement Processes

All organizations and individuals with an interest in improving water management in the Region are invited to participate in Plan implementation. The Partnership recognizes that a committed public outreach and notification process is a necessary task to ensure the public is aware that there are multiple opportunities to become involved in the program. DACs and Tribes will continue to be an important aspect of outreach in the Region. The public involvement processes to be completed by the Partnership include:

- Coordinate Partnership Input meetings at least once per year to discuss relevant topics of progress on implementation of the Tahoe-Sierra IRWM Plan. The Partnership may convene additional meetings as desired to support fulfilling the objectives of the Plan.
- Maintain and update content to the Tahoe-Sierra IRWM Plan website.
- Maintain a contact e-mail and phone number for people to send comments or ask questions about the Tahoe-Sierra IRWM Plan.
- Maintain the Tahoe-Sierra stakeholder e-mail list and send updates and meeting invitations as appropriate.

8.2.4 Decision Making

Decisions during implementation will continue to be made using consensus based agreement, as during Plan development with matters first considered by the LT for consideration and then by the entire Partnership. If for some reason broad agreement cannot be reached related to specific items within a reasonable amount of time and effort, the Partnership will discuss such items(s) and then decide by majority vote how to proceed.

8.3 Plan Financing

Implementation of an IRWM Plan is an enormous undertaking and requires the financial contributions and attention of local, state, and federal agencies to ensure success. Financing of this Tahoe-Sierra IRWM Plan involves two distinct tracks: funding of IRWM Plan administration through local in-kind staff time and coordination and funding of project implementation. This section highlights the anticipated funding needs for both tracks, identifies potential funding sources, and documents some of the activities that the Partnership and others could employ to secure additional funding.



South Tahoe Greenway
(Photo courtesy of California Tahoe Conservancy)

8.3.1 Funding Needs

8.3.1.1 Implementation Administration Funding

Development of the IRWM Plan was funded by the Partnership and an IRWM Planning grant from the DWR. However, these funds cannot be spent on implementation activities, so one of the first steps to implement the IRWM Plan is to establish a mechanism to support implementation coordination. This could include activities undertaken by the Partnership to plan and conduct stakeholder input meetings, track plan implementation (including progress towards completing plan objectives and projects), and conduct ongoing public outreach and engagement as described in the governance sections.

Following the update of the IRWM Plan, the Tahoe-Sierra IRWM anticipates continuing as a volunteer-led organization using the LT as the focus for IRWM Plan implementation.

- Members of the Partnership (and potentially other agencies/organizations within the Region) may provide in-kind services to fulfill the roles of the LT and administrative support.
- The Partnership may seek additional local and/or other funding to fulfill the activities required for Plan implementation.

8.3.1.2 Project Implementation Funding

As of August 2019, 101 projects are included in the IRWM Plan. All of the projects provided funding information, with a total estimated funding need of \$302 million. Of the 101 projects, several are projects currently at the early planning or feasibility study stage, which is an indicator that the overall funding needs will likely increase as these projects progress and are developed into implementable projects, programs, or actions, and as other projects are added to the IRWM Plan. Table 8-2 summarizes financing needs and the availability of capital and operations and maintenance funding sources based on information provided by project proponents. It is recommended that this table be updated at a minimum every two years or as needed.

8.3.2 Potential Funding Sources

8.3.2.1 Stakeholder Funding

Funding sources are rarely assured far in advance of project implementation. Additionally, many agencies have encountered challenges to securing project funding as grant programs have become more competitive and agency budgets have become significantly constrained during the recent economic downturn. It is understood that funding is required to implement (that is, to construct) projects, as well as operate and maintain the project after initial construction is completed. In most cases, it will be the responsibility of the project proponents to ensure that initial construction and operations and maintenance funding needs are met for specific projects. Despite limited funds, most agencies do have a variety of funding tools available including:

- Ratepayers
- Operating funds
- Water enterprise funds
- Special taxes, assessments, and fees
- State or federal grants and loans
- Private loans
- Local bonds

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Table 8-2: Project Financing Summary

Project No.	Project Title	Agency/Organization	Total Capital Cost	Secured Sources of Funding for Project Cost and % of Total Cost	How O&M costs will be Financed
1	Markleeville Creek Floodplain Restoration Project	Alpine County	\$ 1,800,000.00	District Attorney Trust Fund - 1.5%	Grant funding and Project Partners
2	Coldstream Road Open Bottom Culvert and Creek Restoration	Town of Truckee	\$ 2,500,000.00	Teichert, Town of Truckee - 20%	
3	Trout Creek Restoration	Town of Truckee	\$ 13,000,000.00		
4	Lacey Meadows Restoration	Truckee River Watershed Council	\$ 1,125,000.00	CA Department of Fish and Wildlife - 35.6%	US Forest Service operations budgets
5	Priority Meadow Restoration in the Carson Watershed	American Rivers	\$ 265,000.00	National Fish and Wildlife Foundation - 9.4%	Humboldt-Toiyabe National Forest, CA Department of Fish and Wildlife
6	Country Club Stormwater Management and Erosion Control Project – Phase 3	El Dorado County	\$ 580,000.00	Southern Nevada Public Land Management Act - 44.3%	Street Maintenance Division, County Road Fund
7	Meyers SEZ and Erosion Control Project – Phase 2	El Dorado County	\$ 550,000.00		Street Maintenance Division, County Road Fund
8	AIS Prevention, Control, and Monitoring	Tahoe RCD	\$ 2,600,000.00	User Fees - 19.2%	Landowner/Manager
9	Aquatic Invasive Species/Watercraft Inspection Program	Town of Truckee	\$ 1,000,000.00	Boat inspection and decontamination fees - 2.5%	In-kind, inspection and permit fees
10	River Revitalization Project	Truckee River Watershed Council	\$ 2,232,500.00	319(h) Funds - 13.4%	
11	Priority Restoration Project in the USFS West Carson Project Area	Alpine Watershed Group	\$ 475,000.00	Carson Water Subconservancy District - 1.1%	US Forest Service
12	West Carson River Restoration in Lower Hope Valley	Alpine Watershed Group	\$ 425,000.00	Carson Water Subconservancy District and American Rivers sub-grant - 2.4%	
13	Johnson Canyon Westside Restoration	Truckee River Watershed Council	\$ 440,000.00	Nonprofit Finance Fund, Placer Nevada Resource Advisory Council, US Forest Service (In-Kind), Truckee River Fund - 43.2%	US Forest Service operations budgets
14	Upper Truckee River - Johnson Meadow Restoration	Tahoe RCD	\$ 12,165,000.00	CA Department of Fish and Wildlife, CA Tahoe Conservancy, Tahoe Fund - 14.5%	General Funds
15	Donner Creek Confluence Floodplain Restoration Project	Truckee River Watershed Council	\$ 750,000.00		Land owners, Stakeholders
16	Dry Creek Restoration Project	Truckee River Watershed Council	\$ 700,000.00	US Forest Service (in-kind) - 10%	
17	Lower Bear Meadow Restoration	Truckee River Watershed Council	\$ 875,000.00	Martis Fund, US Forest Service (in-kind) - 25.7%	US Forest Service operations budgets
18	Martis Wildlife Area Restoration	Truckee River Watershed Council	\$ 3,750,000.00	Martis Fund Bella Vista Foundation - 9.3%	
19	Groundwater Discharge in Nearshore of Lake Tahoe	Tahoe RCD	\$ 237,500.00		SB 630
20	Non-Native Invasive Plant Species	Truckee River Watershed Council	\$ 210,000.00	Martis Fund - 28.6%	Landowners
21	Country Club Stormwater Management and Erosion Control Project (Ofying Water Quality Project)	El Dorado County	\$ 492,500.00	SWRCB Proposition 1, TRPA Mitigation Funds - 60.9%	Street Maintenance Division, County Road Fund
22	Coldstream Canyon Watershed Restoration	Truckee River Watershed Council	\$ 1,825,000.00	Martis Fund - 9.6%	
23	Sardine Meadow Restoration	Truckee River Watershed Council	\$ 950,000.00	National Fish and Wildlife Foundation - 15.8%	
24	South Upper Truckee Water Quality Project	El Dorado County	\$ 300,000.00		Street Maintenance Division, County Road Fund
25	West River Street Revitalization	Town of Truckee	\$ 2,232,500.00		General Fund
26	Delaware Water Quality Project	El Dorado County	\$ 250,000.00		Street Maintenance Division, County Road Fund
27	Glenridge Water Quality Project	El Dorado County	\$ 250,000.00		Street Maintenance Division, County Road Fund
28	San Bernardino Water Quality Project	El Dorado County	\$ 250,000.00		Street Maintenance Division, County Road Fund
29	Faith Valley and Forestdale Meadow Restoration	American Rivers	\$ 526,000.00	National Fish and Wildlife Foundation, CA Department of Fish and Wildlife Proposition 1, Alpine Watershed Group (in-kind) - 44.9%	Humboldt-Toiyabe National Forest, CA Department of Fish and Wildlife

Table 8-2: Project Financing Summary

Project No.	Project Title	Agency/Organization	Total Capital Cost	Secured Sources of Funding for Project Cost and % of Total Cost	How O&M costs will be Financed
30	Priority Meadow Restoration in the Truckee Watershed	American Rivers	\$ 355,000.00	National Fish and Wildlife Foundation - 7%	US Forest Service
31	Tahoe Pines	California Tahoe Conservancy	\$ 1,216,000.00		Annual support budget
32	Upper Truckee River and Marsh Restoration	California Tahoe Conservancy	\$ 9,049,000.00	State of California Bond Funds, US Army Corps of Engineers 108 Funds - 30.4%	Annual support budget
33	MPUD Sewer Line Relocation	Markleeville PUD	\$ 1,800,000.00	District Attorney Trust Fund - 1.5%	Grant funding and Project Partners
34	Kings Beach Western Approach	Placer County	\$ 2,000,000.00		
35	Burton Creek Restoration Improvements	Placer County DPW	\$ 1,090,000.00	North Lake Tahoe Resort Association, Placer County - 2.3%	Cost share, Existing Assessment District monies
36	Coon Street SEZ Restoration Improvements	Placer County DPW	\$ 1,250,000.00	US Forest Service - 4%	Cost share, Existing Assessment District monies
37	District Facilities BMPs (BMP Implementation on STPUD Operating Site SWR/WTR)	South Tahoe PUD	\$ 60,000.00	Capital Improvement Funding - 16.7%	General Funds
38	Sewer Crossings Condition Assessment, Improvements	South Tahoe PUD	\$ 600,000.00	Capital Improvement Funding - 25%	General Funds
39	Iroquois Pond SEZ Restorations	South Tahoe PUD	\$ 350,000.00		General Funds
40	Martis Valley Groundwater Basin Planning and Restoration Study	Truckee Donner PUD	\$ 125,000.00		
41	LT Nearshore Modeling	University of California, Davis-Tahoe Environmental Research Center	\$ 180,000.00		
42	City of South Lake Tahoe Landscape Irrigation Efficiency Upgrades	City of South Lake Tahoe	\$ 1,000,000.00		Current maintenance General Funds and water savings
43	Meter Conversion	Lukins Brothers Water Company, Inc.	\$ 3,300,000.00		General O&M budget
44	Waterline Replacement Project 7a	Lukins Brothers Water Company, Inc.	\$ 740,000.00		General O&M budget
45	Well #4 replacement and treatment project	Lukins Brothers Water Company, Inc.	\$ 5,500,000.00		General O&M budget
46	Markleeville Pipeline Replacement, Meter and Hydrant Installation	Markleeville Water Company	\$ 5,678,237.00		General revenue budget
47	Regional Water Conservation Programs	South Tahoe PUD	\$ 800,000.00	General Funds - 25%	Landowner/Homeowner
48	Keller-Heavenly Zone Improvements	South Tahoe PUD	\$ 3,384,000.00	STPUD Capital Improvement Funding - 25%	General Funds
49	SCADA Upgrades	South Tahoe PUD	\$ 600,000.00	STPUD Capital Improvement Funding - 25%	
50	STPUD Waterline Replacement Projects	South Tahoe PUD	\$ 8,000,000.00	STPUD Capital Improvement Funding - 0%	General Funds
51	Upper Montgomery Booster, Zone Improvements	South Tahoe PUD	\$ 1,300,000.00	STPUD Capital Improvement Funding - 25%	General Funds
52	H-Street Zone Booster, Fire Pump Improvements	South Tahoe PUD	\$ 400,000.00	STPUD Capital Improvement Funding - 25%	General Funds
53	Wastewater Force Main Bypass Projects	South Tahoe PUD	\$ 975,000.00	STPUD Capital Improvement Funding - 25%	General Funds
54	Tahoe City Emergency Water Supply	Tahoe City PUD	\$ 850,337.00		Water Utility operating budget
55	Westshore Regional Water Storage Tanks	Tahoe City PUD	\$ 4,253,850.00		Water Utility operating budget
56	West Lake Tahoe Regional Water Treatment Plant	Tahoe City PUD	\$ 9,465,592.00	PCWA, SRF - 5.6%	Water Utility operating budget
57	Potable Groundwater Well Discharge	Truckee Donner PUD	\$ 720,000.00	Water General Fund - 16.7%	Groundwater well facility management budget
58	Water Pipeline Replacement Project	Truckee Donner PUD	\$ 2,250,000.00	Water Operating Reserve Fund - 61.1%	O&M Budget
59	Aquatic Invasive Species (AIS) Prevention- Middle Truckee River Watershed	Truckee River Watershed Council	\$ 30,000.00		
60	Truckee River Operating Agreement – Instream flow enhancement	Truckee River Watershed Council	\$ 387,000.00	In-Kind contributions from stakeholders - 7%	Grants and private contribution income

Table 8-2: Project Financing Summary

Project No.	Project Title	Agency/Organization	Total Capital Cost	Secured Sources of Funding for Project Cost and % of Total Cost	How O&M costs will be Financed
61	Woodfords Community Wastewater Infrastructure Upgrades	Washoe Tribe of Nevada and California – Washoe Environmental Protection Department (WEPD)	\$ 588,000.00		Water Utility Management Authority annual budget
62	Woodfords Community Water Infrastructure Upgrades	Washoe Tribe of Nevada and California – Washoe Environmental Protection Department (WEPD)	\$ 365,000.00		Water Utility Management Authority annual budget
63	Alpine County Woodfords Complex Stormwater Retrofit	Alpine County	\$ 75,000.00		
64	Grover Hot Springs State Park Meadow Restoration	Alpine Watershed Group	\$ 133,700.00		
65	Hope Valley Restoration and Aquatic Habitat Enhancement Project	Alpine Watershed Group	\$ 458,550.00		
66	Markleeville Creek Floodplain Restoration Project	Alpine Watershed Group	\$ 2,300,000.00		
67	Bijou Area Water Quality Improvement Project, Phases 2 (Upper Glenwood)	City of South Lake Tahoe	\$ 1,000,000.00		
68	Bijou Park Creek Watershed and SEZ Restoration Project	City of South Lake Tahoe	\$ 7,000,000.00	City of South Lake Tahoe General Fund, TRPA Stream Environment Zone Mitigation Funds - 6.6%	
69	Osgood Basin Expansion	City of South Lake Tahoe	\$ 2,000,000.00		
70	Ruby Way Overlook Ct.	City of South Lake Tahoe	\$ 700,000.00	SWRCB Proposition 1 - 27.8%	
71	Sierra Boulevard Complete Streets Project	City of South Lake Tahoe	\$ 6,827,972.00	City of South Lake Tahoe General Fund, US Federal Highway Administration Congestion Mitigation and Air Quality Program, CA Department of Transportation Greenhouse Gas Reduction Fund, STPUD, US Federal Highway Administration Surface Transportation Block Grant - 100%	
72	Tahoe Valley Greenbelt	City of South Lake Tahoe	\$ 6,000,000.00	TRPA Air Quality Mitigation Funds, City of South Lake Tahoe General Fund, State Water Resources Control Board Proposition 1, TRPA Stream Environment Zone Mitigation Funds, Southern Nevada Public Land Management Act - 17.3%	
73	Upper Keller Canyon Drainage and Erosion Control Project	City of South Lake Tahoe	\$ 4,000,000.00		
74	Chiapa Water Quality Project	El Dorado County	\$ 2,083,600.00	TRPA Water Quality Mitigation Funds - 1.2%	
75	Cold Creek Fisheries Enhancement Project	El Dorado County	\$ 1,844,917.00	California Tahoe Conservancy - 14.9%	
76	CSA #5 Erosion Control Project	El Dorado County	\$ 1,542,443.00	El Dorado County Local Assessment Funds, Southern Nevada Public Land Management Act, TRPA Water Quality Mitigation Funds - 100%	
77	East San Bernardino Bike Trail	El Dorado County	\$ 2,518,504.00	Unknown or Unassigned - 76.1%	
78	El Dorado County Urban Upland TMDL Implementation	El Dorado County	\$ 20,000,000.00		
79	Hwy 89 Class I Trail	El Dorado County	\$ 4,250,000.00		
80	Meyers Corridor Operational Improvement Project	El Dorado County	\$ 12,807,903.00	Unknown or Unassigned - 65.5%	
81	Emigrant Trail Extension on Donner Summit	Placer County	\$ 1,100,000.00		
82	Flick Point Erosion Control Project - Phase II	Placer County	\$ 2,000,000.00		
83	Kings Beach Commercial Core Improvement Project	Placer County	\$ 29,000,000.00	Unknown or Unassigned - 100%	

Table 8-2: Project Financing Summary

Project No.	Project Title	Agency/Organization	Total Capital Cost	Secured Sources of Funding for Project Cost and % of Total Cost	How O&M costs will be Financed
84	Kings Beach Watershed Improvement Project	Placer County	\$ 8,040,000.00	Placer County General Fund, US Forest Service Lake Tahoe Basin Management Unit, Unknown or Unassigned - 100%	
85	Legacy Trail - Truckee River Trail	Placer County	\$ 8,000,000.00		
86	Martis Valley Trail	Placer County	\$ 2,200,000.00		
87	North Tahoe Regional Trail	Placer County	\$ 12,000,000.00	Caltrans California Active Transportation Program Funds, North Lake Tahoe Resort Association, US Federal Highway Administration California Surface Transportation Block Grant - 7.5%	
88	Placer County Urban Upland TMDL Implementation	Placer County	\$ 1,500,000.00		
89	Streets & Roads Operations and Maintenance	Placer County	\$ 14,666,611.00		Placer County General Fund, TRPA Operation & Maintenance Funds
90	Tahoe City Complete Streets Highway Improvements	Placer County	\$ 1,600,000.00	North Lake Tahoe Resort Association, Placer County General Fund - 4.1%	
91	Tahoe City Downtown Access Improvements	Placer County	\$ 3,000,000.00	North Lake Tahoe Resort Association, US Federal Highway Administration California Surface Transportation Block Grant - 26.7%	
92	Tahoe Vista Tamarack Erosion Control Project	Placer County	\$ 1,500,000.00		
93	Tahoma Roads Water Quality Improvement Project	Placer County	\$ 400,000.00	North Lake Tahoe Resort Association, Placer County General Fund, US Forest Service Lake Tahoe Basin Management Unit - 100%	
94	Truckee River Recreational Access Plan	Placer County	\$ 1,700,000.00		
95	BMP implementation, inspection and maintenance	Tahoe Regional Planning Agency	\$ 160,000.00		
96	Regional Landscape Conservation Measures for Lake Tahoe	Tahoe Resource Conservation District	\$ 400,000.00		
97	Regional Stormwater Monitoring Program	Tahoe Resource Conservation District	\$ 7,000,000.00	City of South Lake Tahoe General Fund, Douglas County General Fund, El Dorado County General Fund, Nevada Department of Transportation, Placer County General Fund, SWRCB Proposition 84, Southern Nevada Public Land Management Act, Washoe County General Fund - 43.6%	
98	Permenant BMP Implementation, Inspection, and Maintenance	Town of Truckee	\$ 15,000.00		
99	Town of Truckee Stormwater Management and Retrofits	Town of Truckee	\$ 150,000.00		
100	Truckee River Legacy Trail	Town of Truckee	\$ 10,619,230.00		
101	donner - lower mobile home/rr culvert	Truckee River Watershed Council	\$ 180,000.00		

8.3.2.2 Grants and Other Sources

The Partnership will research, identify and pursue grant funds that could help implement the projects and meet the objectives included in the Tahoe-Sierra IRWM Plan. The Partnership will not serve as a fiscal agent for grant funds, but rather will identify a willing agency or organization with the appropriate authority and financial management capacity to serve as a fiscal agent on behalf of the Region, as necessary, for each specific grant opportunity that is pursued. Some grant programs may require a single grantee for the Region while others may be applied for by individual member agencies.

The fiscal agent(s) may distribute grant funds to other project proponents within the Region according to the specific terms of the grant program that provides funds. The project proponents who receive grant funds will be responsible to complete their project(s) as described in the relevant grant application and/or grant agreement. The fiscal agent will not be responsible to fund or complete projects for other project proponents outside of the specific commitments made in a particular grant agreement.

The Partnership will track the amount of grant funds brought into the Region to support implementation of the IRWM Plan and the specific projects being funded (or partially funded) with grant funds. The Partnership will include this information in their annual report of Plan performance.

8.4 Plan Performance and Monitoring

Another important element of successful Plan implementation is a well-developed approach to performance and monitoring. This section describes such an approach, including monitoring, adjustments, and data sharing in order to meet the 2012 and 2016 IRWM Guidelines. The key elements of plan performance and monitoring involve tracking of project implementation and progress towards achieving objectives and the individual measurable planning targets (MPTs). This tracking will be monitored in a Data Management System described in the following section and will provide key information to inform the Partnership and stakeholders as to whether the Plan is being implemented as intended, or whether updates or other changes are needed to keep the Plan on track.

The tracking and monitoring of plan performance does not replace required regulatory reporting by specific agencies within the Region. Plan performance tracking is being done to monitor progress on Plan implementation and provide information that will be useful for continuing implementation of, updating, or amending the Plan. Projects proponents and grantees are responsible for complying with all applicable rules, laws, and permit requirements.

8.4.1 Project-Focused Performance Monitoring

Project implementation will be tracked as part of the IRWM Plan Implementation activities included in the topic area: Update Tahoe – Sierra IRWM Plan and Manage and Share Related Data and Information. It is expected that project implementation tracking will include:

- Every two-years (minimum) call for new/revised projects.
- Update of status of the existing project list including project archival following completion of projects every two years.

- Monitoring of in-progress project performance including project status, data results, budget, schedule, impacts, and benefits.
- Consideration of opportunities to integrate or enhance existing projects.

Information about projects will be maintained in a spreadsheet or on the Data Management System described further in Section 8.4.2. It is anticipated that the Partnership will have primary responsibility for maintaining information regarding project focused monitoring sufficient for the IRWM Plan and will periodically request current project status information from proponents.

Table 8-3 outlines several considerations for monitoring efforts as articulated in the Proposition 84/1E guidelines (required for Proposition 84/1E grant-funded projects and recommended for all other projects in the Plan) for purposes of this Plan:

Table 8-3: Project Specific Monitoring Plans

Category	Description
Responsibility for developing project specific monitoring plans and monitoring activities	Project proponent responsibilities include development of project-specific monitoring plans and monitoring of project performance after implementation. Project proponents shall report this information to the Partnership and to any lead agency responsible for grant or loan funding contributions.
Stage of project development when a project-specific monitoring plan will be prepared	Project-specific monitoring plans will be developed by the project proponent before the start of project implementation.
Typical project-specific monitoring plan requirements	Monitoring plans will include delineation of the following components: <ul style="list-style-type: none"> ▪ Description of what will be monitored for each project, ▪ Methods for monitoring problems that occur during project implementation and their correction, ▪ Monitoring location(s), ▪ Monitoring frequency, ▪ Monitoring protocols, procedures, and responsibilities, ▪ Reporting of data collected to the data management system (DMS) described in Section 8.4.2 for sharing with project stakeholders as well as to statewide databases, and ▪ Procedures and funding assurances to document that the monitoring will take place as intended during the entire monitoring period.

Lessons learned will be applied to future project implementation by evaluating the extent to which the Plan objectives and targets are accomplished, and reviewing and refining the types of projects or targets themselves based on the various experiences. For example, technical information and data collected will contribute to a greater body of understanding about certain challenges faced by the Region. Likewise, financial performance and reporting experiences will help inform more efficient ways of planning and implementing important projects. These experiences will be shared through the (at minimum annual) interactions with the Partnership and stakeholders, and through project reporting mechanisms.

8.4.2 Objectives Focused Performance Monitoring

For the Partnership, the tracking of Plan Objectives WQ1 – IWM6 and the associated MPT will require more effort and coordination than tracking of IRWM Plan projects. The Objectives Tracking table found in Appendix 8-A focuses on individual MPTs. The table identifies the projects that can contribute to meeting the MPT, and where appropriate, identifies specific activities or projects that may be needed to achieve the MPTs. The table is sorted by MPT. The activities and dates are suggested and should be periodically reviewed and updated by the Partnership. The data associated with this table could also be maintained in the Data Management System.

8.4.3 Data Management

The Partnership developed a Management System (DMS) to help retain, organize and process key Plan performance and monitoring data. The data management system linkage and tracking of information will feed into the Region’s understanding of the success of Plan implementation, and whether adjustments to objectives, projects, or strategies may be needed in the future.

As data are collected, whether linked to implementation grant programs or other funding mechanisms, there are typically reporting requirements. Many water resources linked efforts are also attached to mandatory regulatory reporting requirements to statewide databases. To make data from the Region accessible and compatible with State databases (such as SWAMP, Geotracker, GAMA, CEDEN, the DWR California Water Data Library and many others – links are provided in Appendix 8-B), the Partnership will require implementation projects clearly delineate the nature of the data being collected (parameters, units), the timeframe associated with the data, and the location associated with the data. The Tahoe-Sierra DMS is not intended to supersede or duplicate the statewide data collection efforts, including data validation and quality control, but instead work together with the databases as resources to draw important information. Data validation and quality assurance/quality control will generally follow the reporting requirements for individual funding programs and mechanisms.

8.4.3.1 Data Management Application

The Tahoe-Sierra IRWM Data Management Application was developed by the Sierra Water Workgroup and is a hybrid solution and provides a user friendly ESRI-software based GIS front-end interface that is supported by databases and spreadsheets for specific data. The Data Management Application is linked to the tahoesierrairwm.com website and includes the following features:

- Topographic Base map with layers for water Organization boundaries, watershed boundaries with rivers and lakes, DAC areas, Tribal lands (partial), 303d listed streams and water bodies, watersheds, General Plan and DWR Land Use classifications
- Production of custom maps with available information
- Project Locations and Tables
- IRWM Projects and project information forms
- Flood hazard areas
- Hydrologic and other types of models

The Data Management Application will be updated as projects are added and completed as funding becomes available.

8.4.3.2 Lake Tahoe EIP Project Tracker

The Lake Tahoe EIP was launched in 2007 by the Tahoe Regional Planning Agency (TRPA) to support the Tahoe Regional Plan. The EIP is a web-based GIS application that houses project information within the Tahoe Basin submitted by over 50 funding partners including federal, state, local and private agencies, and the Tahoe-Sierra IRWM RWMG, as projects meet the EIP criteria. The EIP can be accessed through the Lake Tahoe Info website <https://eip.laketahoeinfo.org/Results/EipProjectMap> or through links provided on tahoesierrairwm.com.

The EIP contains the following features:

- Ability to display projects by EIP Priorities and Project Stage
- Filtering of projects by EIP Priorities, TRPA Allowances, Project Stage, Implementing Organization and Funding Organization
- List of Regional Projects
- Maps of jurisdictions, watersheds
- Project Fact Sheets containing a description of the project, key accomplishments and completion dates, expenditures, and project photos

8.4.3.3 Potential Long-Term Data Management Options

At present questions remain regarding the future update, maintenance, hosting, and troubleshooting of the Tahoe-Sierra IRWM Data Management Application. Discussions have been initiated with both the Sierra Water Workgroup (a group consisting of a small group of individuals representing foothill water agencies and Sierra environmental groups to assist in regional efforts to protect and enhance water quality, supply and watershed health) as well as other Sierra IRWMs that may resolve both long-term maintenance concerns and to have the DMS be potentially more broadly available to other IRWMs. These will be resolved and specific actions documented in an appendix to be added to the IRWM Plan. Potential DMS options and opportunities to further enhance the DMS in the future that should be considered are summarized below.

Options under discussion include:

- i. Partnerships with the Sierra Nevada Alliance (an organization of conservation groups in the Sierra Nevada region that work to protect and restore the natural resources) or neighboring IRWM with DMS Hardware and Software or cloud-based DMS hosting
- ii. Partnerships with Sierra Water Work Group (SWWG) for maintenance
- iii. Partnerships with other Sierra IRWM Groups to contribute DMS data for sharing
 - a. Upper Feather IRWM
 - b. Tuolumne-Stanislaus IRWM
 - c. Cosumnes, American, Bear and Yuba IRWM
 - d. Southern Sierra IRWM
 - e. Inyo-Mono IRWM (potential partner for pilot DMS development)
 - f. Yosemite-Mariposa IRWM (potential partner for pilot DMS development)
 - g. Mokelumne/Amador/Calaveras (MAC) IRWM
 - h. Upper Pit River Watershed IRWM
 - i. Madera IRWM

- j. Yuba County IRWM
- k. Lahontan Basins IRWM

In general, the tahosierrairwm.com website will be the primary platform for sharing and publishing IRWM-related data, announcements, and documents. This website is easily accessible by members of the RWMG and other interested parties within and outside the IRWM region, including local, State, and federal agencies.

8.5 Suggested Steps for Plan Implementation

In order to bring focus to the specific implementation action recommendations described in Table 8-2, the following near-term activities and schedules are suggested as shown in Table 8-4.

Table 8-4: IRWM Plan Near-Term Implementation Activities and Schedule

Activity/Action	Lead Entity	Planned Schedule
1. Convene Partnership Plan Implementation Meetings to develop proposed meeting schedules. It is suggested that at a minimum one Plan implementation meeting be held per year.	LT/Partnership	Ongoing - annually
2. Continue to update the Data Management Application and budget for continued update and maintenance.	Partnership/Partner	Ongoing – as-needed
3. Issue a Call for Projects to add, delete, or integrate existing projects and project status updates.	LT	By early 2020 and/or as-needed
4. Prepare for applying for Future DWR Implementation Grant funds and other grant funding opportunities.	Subcommittee	Ongoing - as-needed
5. Coordinate with neighboring IRWM regions and local, state and federal agencies.	Partnership	Ongoing - annually

8.6 Plan Updates and Changes

8.6.1 Making Changes to the IRWM Plan

The Partnership Leadership Team will evaluate the need to convene a Subcommittee to review the Tahoe-Sierra IRWM Plan at least once every five years to determine if the content of the Plan needs to be changed in a significant way other than the periodic updates or amendments of the objectives and projects as described below. If significant changes are needed, the Partnership will publish a Notice of Intent to update the Plan and lead the process for revising the Plan. Once substantial revisions are made, the Partnership will publish a Notice of Intent to adopt the revised Plan and request that Partnership members and project proponents adopt the revised Plan.

8.6.2 Updating and Amending the IRWM Plan

Minor updates or amendments to the IRWM Plan will not require a complete re-adoption of the entire IRWM Plan by individual Partnership members. Instead specific changes will be submitted to the Partnership for consideration to adopt as an amendment to the existing Plan. Updates or amendments specifically include changes to the project lists and refinements to the IRWM Plan objectives.

The Partnership will invite stakeholders and project proponents at least once every two-years to submit additional projects for consideration to be included in the IRWM Plan or provide updates to projects already included in the IRWM Plan. The Partnership will publicize the opportunity and process to submit new projects (or updates) for consideration. The Partnership will present and discuss the potential additions/revisions to the project list within the Tahoe-Sierra IRWM Plan in one or more stakeholder input meetings, and recommend the project list and/or objective refinement for inclusion in the Plan as an amendment. Following acceptance of the addition/revisions to the project list by the Partnership, adoption of IRWM Plan amendment may be required on a case by case basis by individual project proponents to meet requirements of the IRWM Guidelines or individual proposal solicitation packages.

Section 9: Coordination

As described in previous sections of this IRWM Plan, management of water and related resources within the Tahoe-Sierra Region is complex and has many interdependencies. Many different agencies, organizations, and other stakeholders have authorities and responsibilities for managing water and related resources within the Region. This complexity and the distributed network of shared responsibilities create the need for robust and effective coordination. This section describes how the Tahoe Sierra Partnership plans to coordinate with neighboring IRWM regions, local, state, and federal agencies and other stakeholders within the Region to improve integrated water management throughout the Region and neighboring areas.

Coordination is one of the most essential components of integrated regional water management, and consequently is described in several sections of this Plan, summarized below.

- Section 1, “Introduction,” discusses the stakeholder coordination and public outreach activities that were conducted during the development of the Plan, including outreach to tribal entities and disadvantaged communities (DACs).
- Section 3, “Relation to Local Water and Land Use Planning” describes how water management relates to land use planning and ways that planning agencies currently collaborate.
- Section 4, “Objectives” describes Plan objectives that consider coordination such as *Objective IWM2 Ensure collaboration among multiple jurisdictions within the Region for information exchange*, which was developed to ensure continuing communication and collaboration within the Region into the future.
- Section 8, “Implementation Framework,” describes the specific responsibilities of the Partnership, Leadership Team (LT), and other stakeholders during Plan implementation.

9.1 Intra-Regional Coordination

The primary benefit of this IRWM Plan is the development of a shared vision and objectives for regional water management and planning among the stakeholders in the Region and a framework for maintaining that into the future. The process of developing and updating this IRWM Plan has fostered improved coordination, collaboration, and communication among stakeholders, and a greater awareness of concerns throughout the Region.

9.1.1 Coordination by Partnership and Leadership Team

One of the critical ingredients for improving water resources management is to provide multiple opportunities for water managers, community stakeholders, and other organizations with interests related to water resources to be informed about and participate in the IRWM program. A structured approach to coordination helps prevent conflicts and can help provide more effective and efficient management of resources. The Tahoe-Sierra Partnership and LT are committed to fostering improved coordination within the Region through the following activities of the LT:

- Continue to conduct outreach, create and distribute meeting agendas and content by e-mail and web posting, facilitate stakeholder input meetings, and help track and communicate progress toward Plan implementation. During the stakeholder input meetings all people who are interested have been and will continue to be invited to participate in a collaborative approach to implement projects that help meet Plan objectives. Success of the Plan is dependent on the contributions of stakeholders throughout the Region.
- Continue to foster an open dialog with the Washoe Tribe and representatives of the DACs within the Region to help meet Plan objectives. Coordination efforts will continue in order to identify issues and ultimately help develop projects specific to water-related needs of these groups.
- Continue to conduct stakeholder input meetings as needed, which will be announced and open to any interested person or organization. The Partnership and other stakeholders will meet and coordinate with local, state, and federal agencies, in addition to reaching out to those active in neighboring IRWM planning efforts to accomplish the Plan objectives.
- Continue to use the Tahoe-Sierra IRWM Plan webpage (<http://tahoesierrairwm.com/>) to provide ongoing opportunities for stakeholder involvement during Plan implementation. This will include posting the status of proposed projects, providing notice of stakeholder meetings, and providing notices for coordination and evaluation of ongoing and future project needs.



9.1.2 Coordination among Local Agencies and Organizations

A collaborative approach to water management is essential to meeting the Region’s goals. The majority of the projects included in this Plan involve multiple agencies or organizations, which reinforces the need for collaboration to achieve efficient project execution. Many of the local water management agencies within the Region have developed cooperative relationships and processes for coordination with each other and with other local organizations. Some of those relationships have been strengthened during the development of this Plan and through the Partnership activities and meetings, it is anticipated that opportunities for future collaboration and coordination will occur. These strong working relationships serve as a basis for local water managers and other organizations to continue to collaborate in the future. Some examples of existing coordination efforts among local agencies and organizations include the following:

- Truckee River Watershed Council – A Partnership member and collaborative organization with 27 signatory organizations, including agencies, businesses, and non-profit organizations. The Truckee River Watershed Council coordinates and implements efforts for the protection and restoration of the Truckee River.

- Sierra Nevada Alliance – An organization consisting of groups working to protect and restore Sierra Nevada habitats and communities, including members of the Partnership, project proponents of Plan projects, and other stakeholder organizations.
- Tahoe Regional Planning Agency (TRPA) Advisory Planning Commission – A group that assists the TRPA Governing Board and includes representatives of local planning agencies and community members. TRPA is a bi-state agency that leads a cooperative effort to preserve, restore, and enhance the unique natural and human environment of the Lake Tahoe Region.

9.1.3 Coordination with State and Federal Agencies

Coordination with state and federal agencies has occurred during the initial formation of the Region and during Plan preparation. In the future, coordination with these agencies will occur on an as-needed basis for planning and implementation of specific projects and during future Plan updates.

Representatives from the following federal and state organizations received emails and notifications related to Partnership meetings, opportunities to submit projects, and opportunities to review and comment on IRWM Plan sections; and/or are cooperating on a Plan project (indicated by an *).

Federal

- Army Corps of Engineers *
- Bureau of Reclamation *
- Environmental Protection Agency *
- Forest Service – Lake Tahoe Basin Management Unit *
- Forest Service –Tahoe National Forest *
- Forest Service – Humboldt-Toiyabe National Forest *
- U.S. Fish and Wildlife Service
- U.S. Geological Survey *
- Natural Resources Conservation Service

State

- California Tahoe Conservancy *
- Department of Fish and Wildlife *
- Department of Transportation *
- Department of Parks and Recreation *
- Department of Public Health *
- Department of Water Resources (DWR)
- Regional Water Quality Control Board – Lahontan Region *
- State Water Resources Control Board
- University of California, Davis

While the majority of Plan projects were submitted by local entities, the California Tahoe Conservancy, which is a state agency, submitted several projects. Additionally, almost half of the Plan projects listed at least one cooperating state or federal agency. With approximately two-thirds of the Region’s land area located in federally managed lands, coordination with all of these entities is an important component in the IRWM planning process and may improve the

understanding of the interrelationship between water resources, forest, land use, economic and urban objectives.

In addition, meeting Plan objective IWM6 *Monitor water storage, release and exchange activities in order to improve coordination with regional planning* will require communication and coordination with federal entities including the Bureau of Reclamation and Federal Water Master, and state entities in California and Nevada through the Truckee River Operating Agreement discussed in Section 2.

9.2 Interregional Coordination

Beyond the need for internal coordination, the Partnership also recognizes the importance of coordination with other nearby IRWM planning regions. Appropriate coordination among regions and agencies will help leverage shared activities, identify opportunities for cooperative projects, and reduce potential conflicts among IRWM projects. The Tahoe-Sierra Region is bounded by six neighboring IRWM regions, as discussed in Sections 1.1 and 1.3 and shown on Figure 1-2, and is one of five IRWM regions in the North/South Lahontan funding area. The Sacramento River funding area borders the Region to the west and the San Joaquin River funding area borders the Region to the southwest.

Initial outreach efforts have been conducted as part of the IRWM planning process to foster communication and program coordination with the neighboring IRWM regions through discussions, conversations and direct participation. Representatives of most of these adjacent IRWM regions or of organizations that participate in multiple IRWM groups receive e-mail notification of upcoming meetings.

Members of the LT, with support from other stakeholders in the Region, will engage with neighboring IRWM regional water management groups and communicate with DWR on statewide IRWM issues that involve or could impact Plan objectives. The neighboring IRWM regions and associated interregional coordination activities with the Tahoe-Sierra Region are summarized in the paragraphs that follow. Participation in the Sierra Water Workgroup is another means of achieving interregional cooperation and coordination.

Inyo-Mono (<http://inyo-monowater.org/>): Like the Tahoe-Sierra Region, the Inyo-Mono IRWM region lies on the eastern side of the Sierra Nevada and is separated from the Tahoe-Sierra Region by the mountain peaks separating the Carson and Walker River hydrologic units to the south. The Inyo-Mono region is also in the North/South Lahontan funding area. The Inyo-Mono region encompasses a vast area that is sparsely populated with large open spaces and ranges from arid to hyper-arid. The Regional Water Quality Control Board – Lahontan Region and Humboldt-Toiyabe National Forest are the only entities with a jurisdiction that overlaps the Tahoe-Sierra and Inyo-Mono regions. Available surface waters in the region are largely exported to southern California, resulting overall in limited water supplies.

The Inyo-Mono IRWM Plan was recently revised and adopted in late 2012. The Inyo-Mono region is now implementing the Round 2 Planning grant, Round 1 Implementation grant, and a DWR grant for a Rural DAC and Tribal Program. While there is an emphasis on the Inyo-Mono region, the region is focusing on advancing a broader approach to IRWM planning across regional boundaries, with mutual collaboration for addressing issues related to rural headwater and Disadvantaged Communities. Among the region's efforts for cooperative regional work is the active participation in the Sierra Water Workgroup Summit in June of 2013.

Lahontan Basins (<http://honeylakevalleyrcd.us/irwm/>): Like the Tahoe-Sierra Region, the Lahontan Basins IRWM region lies on the eastern side of the Sierra Nevada and is separated from the Tahoe-Sierra Region by the mountain peaks separating the Truckee River and Susanville hydrologic units to the north. The Regional Water Quality Control Board – Lahontan Region and Sierra County are the only entities with a jurisdiction that overlaps the Tahoe-Sierra and Lahontan Basins regions. The Lahontan Basins region is in the North/South Lahontan funding area. The Lahontan Basins region was accepted by DWR in the 2011 region acceptance process, and is currently in the process of developing an IRWM Plan.

Tuolumne-Stanislaus (<http://www.tcrd.org/>): The Tuolumne-Stanislaus region lies along the southern tip of the Tahoe-Sierra Region border in Alpine County. The Tuolumne-Stanislaus region is on the western side of the Sierra Nevada and extends from the crest, through the foothills, and down to the Central Valley. Similar to the Tahoe-Sierra Region, primary sources of water in the Tuolumne-Stanislaus region are large river watersheds fed by snowmelt and rainfall from the Sierra Nevada. Alpine County and the Alpine Watershed Group is the only entity with a jurisdiction that overlaps the Tahoe-Sierra and Tuolumne-Stanislaus regions. The Tuolumne-Stanislaus IRWM Plan was completed in mid-2013 and the Tuolumne-Stanislaus region is now

implementing a Round 2 Implementation grant.



Pond near Donner Summit
(Photo courtesy of Sachi Itagaki)

Mokelumne/Amador/Calaveras (MAC, http://www.umrwa.org/mac_region_irwm_program.html): The MAC region borders the Tahoe-Sierra Region to the southwest, along the crest of the Sierra Nevada in Alpine County. The MAC region is on the western side of the Sierra Nevada and extends from the crest, through the foothills, and down to the Central Valley. Similar to the Tahoe-Sierra Region, primary sources of water in the MAC region are large river watersheds fed by snowmelt and rainfall from the Sierra Nevada. Alpine County and the Alpine Watershed Group is the only entity with a

jurisdiction that overlaps the Tahoe-Sierra and MAC regions. The Updated MAC IRWM Plan was completed in early 2013 and the MAC region is now implementing a Round 2 Planning grant and a Round 2 Implementation grant.

Cosumnes, American, Bear, Yuba (CABY, <http://www.cabyregion.org/>): The CABY region borders the Tahoe-Sierra Region to the west, along the crest of the Sierra Nevada. The CABY region is on the western side of the Sierra Nevada and extends from the crest, through the foothills, and down to edge of the Central Valley. Similar to the Tahoe-Sierra Region, primary sources of water in the CABY region are large river watersheds fed by snowmelt and rainfall from the Sierra Nevada. Alpine County and the Alpine Watershed Group, El Dorado County, Placer County, Nevada County, Sierra County, and the Tahoe National Forest are entities with a jurisdiction that overlaps the Tahoe-Sierra and CABY regions. The CABY IRWM Plan was completed in 2007, with updated amendments adopted in 2009. The CABY region is now implementing a Round 2 Implementation grant.

Upper Feather River Watershed (<http://www.featherriverwater.com/regionalplanningirwm.html>):
The Upper Feather River Watershed region borders the Tahoe-Sierra Region to the northwest, along the crest of the Sierra Nevada in Sierra County. The Upper Feather River Watershed region is on the western side of the Sierra Nevada. Similar to the Tahoe-Sierra Region, primary sources of water in the Upper Feather River Watershed region are large river watersheds fed by snowmelt and rainfall from the Sierra Nevada. Sierra County and the Tahoe National Forest are the only entities with a jurisdiction that overlaps the Tahoe-Sierra and Upper Feather River Watershed regions. The initial Upper Feather River Watershed IRWM Plan was adopted in 2005 and the Upper Feather River Watershed region is currently in the process of updating the IRWM Plan.

Section 10: Abbreviations and Acronyms

<u>Abbreviation</u>	<u>Description</u>
208 Plan	Lake Tahoe Water Quality Management Plan
ABC:WLBC	American Bird Conservancy - U. S. Watch List of Birds of Conservation Concern
AC	Alpine County
AD	Anno Domini
ADA	Americans with Disabilities Act
AFS:EN	American Fisheries Society - Endangered
AFS:TH	American Fisheries Society - Threatened
AFY, afy, or ac-ft/yr	acre-feet per year
amsl	above mean sea level
AR	American Rivers
Basin Plan	Water Quality Control Plan for the Lahontan Region
BG	Block Group
BLM	Bureau of Land Management
BLM:S	Bureau of Land Management - Sensitive
BMP	best management practice
C	community
CA	California
CABY	Consumes, American, Bear, Yuba
CALFED	CALFED Bay-Delta Program
CNPS	California Native Plant Society
CASGEM	California Statewide Groundwater Elevation Monitoring
CCSM3	Community Climate System Model Version 3
CDEC	California Data Exchange Center
CDF:S	California Department of Forestry & Fire Protection - Sensitive
CDF-FRAP	California Department of Forestry and Fire Protection Forest and Resource Assessment Program
CDFW	California Department of Fish and Wildlife
CDPH	California Department of Public Health
CEDEN	California Environmental Data Exchange Network
CEQA	California Environmental Quality Act

<u>Abbreviation</u>	<u>Description</u>
CERCLA or Superfund	Comprehensive Environmental Response, Compensation, and Liability Act
CG	campground
CIMIS	California Irrigation Management Information System
CNDDDB	California Natural Diversity Database
CNPS 1B.1	Seriously threatened in California
CNPS 1B.2	fairly threatened in California
CNPS 1B.3	not very threatened in California
CNPS 2.1	seriously threatened in California
CNPS 2.2	fairly threatened in California
CNPS 2.3	not very threatened in California
CNPS 4.2	plants of limited distribution; fairly threatened in California
CNPS 4.3	plants of limited distribution; not very threatened in California
CNRM	Centre National de Recherches Meteorologiques (National Centre for Meteorological Research)
COOP	Cooperative Observer Network
CSD	Community Services District
CSLT	City of South Lake Tahoe
CTC	California Tahoe Conservancy
CWA	Clean Water Act
CWC	California Water Code
CWD	County Water District
CWHR	California Wildlife Habitat Relationships
CWP	California Water Plan
DAC	disadvantaged community
DFG_FP	California Department of Fish & Game - Fully Protected
DFG_SSC	California Department of Fish & Game - Species of Special Concern
DFG_WL	California Department of Fish & Game - Watch List
DMS	Data Management System
DPS	Distinct Population Segment
DWR	Department of Water Resources
EDC	El Dorado County
EID	El Dorado Irrigation District

<u>Abbreviation</u>	<u>Description</u>
ER	Ecosystem Restoration
FAA	Federal Aviation Administration
FE	Federally listed as Endangered
FEMA	Federal Emergency Management Agency
FPD	Federally Proposed (Delisting)
FPE	Federally Proposed (Endangered)
FPT	Federally Proposed (Threatened)
FSC	Friends of Squaw Creek
FT	Federally listed as Threatened
GAMA	Groundwater Ambient Monitoring and Assessment
General Plan	California General Plan
GFDL	Geophysical Fluid Dynamics Laboratory
GHG	greenhouse gas emissions
GIS	Geographic Information Systems
GW	groundwater
GWM	Groundwater Management
GWMP	Groundwater Management Plans
HOA	Homeowners Association
HU	hydrologic unit
IRWM	Integrated Regional Water Management
IRWM Plan	Integrated Regional Water Management Plan
IUCN:EN	International Union for Conservation of Nature - Endangered
IUCN:LC	International Union for Conservation of Nature - Least Concern
IUCN:NT	International Union for Conservation of Nature - Near Threatened
IWM	Integrated Watershed Management
IWRIS	Integrated Water Resources Information System
LAFCO	Local Agency Formation Commission
Lahontan Regional Board	Regional Water Quality Control Board – Lahontan Region
LBWC	Lukins Brothers Water Company
LID	Low Impact Development
LRMP	Land and Resource Management Plan
LT	Leadership Team
LTBMU	Lake Tahoe Basin Management Unit

<u>Abbreviation</u>	<u>Description</u>
LTSCP	Lake Tahoe Sustainable Communities Program
MAC	Mokelumne, Amador, Calaveras
MCL	maximum contaminant level
MGD or mgd	million gallons per day
MHI	median household income
MOU	Memorandum of Understanding
MPT	Measurable Planning Target
MSR	Municipal Service Review
MTBE	methyl tert-butyl ether
NA	not available/applicable
NC	Transient Non-Community
NGO	Non-governmental Organization
NPDES	National Pollutant Discharge Elimination System
NTNC	Non-Transient Non-Community
NTPUD	North Tahoe Public Utility District
ONRW	Outstanding Natural Resource Water
Partnership	Tahoe-Sierra Partnership
PCB	Polychlorinated Biphenyls
PCM1	Parallel Climate Model
PCWA	Placer County Water Agency
ProUCL	Pro Upper Confidence Level
PSD	Public Service District
PUD	Public Utilities District
R	restoration project
Region	Tahoe-Sierra Region
RMS	Resource Management Strategies
RWMG	Regional Water Management Group
RWQCB	Regional Water Quality Control Board
SB	Senate Bill
SBX7-7	Water Conservation Act 2009
SCD	State Candidate (Delisting)
SCE	State Candidate (Endangered)
SCT	State Candidate (Threatened)
SDWA	Safe Drinking Water Act

<u>Abbreviation</u>	<u>Description</u>
SE	State listed as Endangered
Settlement Act	Truckee-Carson-Pyramid Lake Water Rights Settlement Act
SEZs	stream environment zones
SMART	Smart Measurable Attainable Realistic Timely
sq mi	square mile
SSJDD	Sacramento-San Joaquin Drainage District
ST	State listed as Threatened
St Pk	State Park
STPUD	South Tahoe Public Utilities District
SVPSD	Squaw Valley Public Service District
SW	surface water, or stormwater projects
SWAMP	Surface Water Ambient Monitoring Program
SWRCB	State Water Resources Control Board
SWWG	Sierra Water Work Group
Tahoe Sierra Group	Tahoe Sierra Regional Water Management Group
TCPUD	Tahoe City Public Utility District
TDS	total dissolved solids
TERC	UC Davis Tahoe Environment Research Center
TMDL	total maximum daily load
TNF	Tahoe National Forest
Toiyabe	Toiyabe National Forest
TRCD	Tahoe Resource Conservation District
TROA	Truckee River Operating Agreement
TRPA	Tahoe Regional Planning Agency
TSD	Truckee Sanitation District
T-TSA	Tahoe-Truckee Sanitation Agency
UC	University of California
US	United States
USACE or ACE	United States Army Corps of Engineers
USDA	United States Department of Agriculture
USEPA or EPA	United States Environmental Protection Agency
USFS	United States Forest Service
USFS:S	United States Forest Service - Sensitive USFS_S

<u>Abbreviation</u>	<u>Description</u>
USFWS:BCC	United States Fish and Wildlife Service Birds of Conservation Concern USFWS_BCC
USGS	United States Geological Survey
UST	underground storage tank
UWMP	Urban Water Managements Plans
W	water/wastewater projects
WBWG:H	Western Bat Working Group - High Priority
WBWG:M	Western Bat Working Group - Medium Priority
WQ	water quality
WQMP	Water Quality Management Plan
WQO	water quality objective
WS	water supply

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