



*Tahoe RCD*  
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CONSERVATION!**

## A Comprehensive Analysis of Snapshot Day



## 14 -Year Report (2001-2014)

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## **Acknowledgements**

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## **Snapshot Day Partners**

Thanks to the following organizations for supporting the Snapshot Day Program over the last 14 years whose assistance with funding and technical support made this program possible:

- Alpine Watershed Group
- California State Water Resource Control Board
- California Tahoe Conservancy
- CalTrout
- Citizens of Fallen Leaf Lake
- City of Reno
- Environmental Leadership
- Great Basin AmeriCorps
- High Sierra Water Lab
- Lahontan Regional Water Quality Control Board
- Lake Tahoe Community College
- Lake Tahoe Environmental Education Coalition
- League to Save Lake Tahoe
- Marine Research and Education
- Nevada Conservation Corps
- Nevada Division of Environmental Protection
- Nevada Division of State Lands
- Nevada State Health Laboratory
- Nevada Tahoe Conservation District
- Pyramid Lake Paiute Tribe
- Sierra Nevada College
- Soroptimists Club
- Tahoe Environmental Research Center
- Tahoe Regional Planning Agency
- Tahoe Research Group
- Tahoe Resource Conservation District
- Tahoe Water Suppliers Association
- Truckee River Aquatic Monitors
- Truckee River Watershed Council
- U.S. Environmental Protection Agency
- U.S.D.A Forest Service
- United States Geological Survey
- University of California Berkeley Sagehen Creek Field Station
- University of California Cooperative Extension
- University of California Davis Tahoe Research Group
- University of Nevada Cooperative Extension
- University of Nevada Reno Electrical Engineering Department
- Wahoe-Storey Conservation District
- Washoe County
- Waste Not, Incline Village General Improvement District

## Acronym List

EIP	Environmental Improvement Program
CALTROUT	California Trout
CFU	Colonies of Fecal Units
CWT	Clean Water Team
DIN	Dissolved Inorganic Nitrogen
DO	Dissolved Oxygen
EPA	Environmental Protection Agency
FSP	Fine Sediment Particles
IVGID	Incline Village General Improvement District
LEAGUE	League to Save Lake Tahoe
LTIMP	Lake Tahoe Interagency Monitoring Program
NRCS	National Resource Conservation Survey
NTU	Nephelometric Unit
RSWMP	Regional Stormwater Monitoring Program
SEZ	Stream Environment Zone
SRP	Dissolved Inorganic Phosphorus
STATE BOARD	State Water Resources Control Board
SWAMP	Surface Water Ambient Monitoring Program
TAHOE RCD	Tahoe Resource Conservation District
TDS	Total Dissolved Solids
TIIMS	Tahoe Integrated Information System
TMDL	Total Maximum Daily Load
TRPA	Tahoe Regional Planning Agency
USGS	United States Geological Survey
WATER BOARD	Regional Water Quality Control Board

## **EXECUTIVE SUMMARY**

Snapshot Day is a one-day citizen monitoring event that promotes watershed stewardship, education, and scientific understanding within the Tahoe-Truckee watershed. The purpose of this event is to collect a “snap shot” of water quality data after peak flow each year throughout the watershed. Since 2001, approximately 3,000 volunteers and agency participants have convened annually to contribute their time to collect ambient water quality data for tributaries under the monitoring guidance of the California Clean Water Team and the Nevada Project Wet. The south shore Snapshot Day dataset includes 26 tributaries; 11 monitoring sites in the eastern region, 44 monitoring sites in the southern region, and 13 monitoring sites in the western region. Water quality measurements include temperature, pH, dissolved oxygen, fecal coliform, and nutrient sampling (nitrogen and phosphorus).

Overall, the 14 year dataset supports the idea that Lake Tahoe tributaries are generally of high quality. Specifically, water temperatures and pH values are shown to support aquatic life and beneficial uses during springtime conditions. Dissolved oxygen levels also tended to be adequate with few exceptions at specific sites including Bijou Park Drainage, the Upper Truckee, Taylor Creek, Burke Creek, Edgewood Creek, North Zephyr, and Meeks Creek. Many of these sites with low DO were typically found at the tributary mouths or higher up in the watershed during the drought years of 2012 and 2013. Throughout the watershed turbidity levels are also generally low except in the case of some urban tributaries, particularly Bijou Creek. Fecal Coliform exhibited either no or low detection of coliform at many sites sampled; on occasion, elevated fecal colonies were detected at Burk Creek, McFaul Creek, Timber Cove, Heavenly Valley Creek (At Trout), Edgewood Creek and the Tahoe Keys. Nutrients were also monitored; dissolved nitrogen was fairly low in concentration throughout the watershed with the exception of Bijou Creek, whereas phosphorus levels seem to be elevated in most urban tributaries.

In summary, the data results are not surprising and in fact tend to support the current scientific understandings within our watershed. Although the dataset used for this report initially had many challenges associated with it, going through the comprehensive effort brought many insights to improve future Snapshot Day events. Most specifically the need for prioritizing monitoring sites, ensuring proper quality assurance measures, and finding an organization that can sponsor this event long term. As these program issues are addressed over time the central focus for this “one-of-a-kind” event in Lake Tahoe should be to keep the dataset current and available to the public while encouraging continued stewardship and education in the basin. The complete Snapshot Day dataset for the southern region of Lake Tahoe can be downloaded at [Tahoe RCD.org](http://TahoeRCD.org).

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## I. Introduction

Snapshot Day is a one-day community-monitoring event to promote watershed stewardship, education, and scientific understanding within a watershed. The purpose is to collect a “snap shot” of water quality throughout the watershed after peak flow each year. Snapshot Day monitoring of the Tahoe-Truckee Watershed is conducted within California and Nevada and encouraged by the State Water Board’s Clean Water Team and Nevada’s Project Wet. Locally, many agencies have led the monitoring efforts in South Lake Tahoe including TRPA, Sierra Nevada Alliance, Cal Trout, the Tahoe RCD, and more recently the League to Save Lake Tahoe.

Since 2001, approximately 3000 volunteers and agency participants (Table 1) have contributed their time and effort to collect ambient water quality data for our watershed. Organizations such as the Tahoe Environmental Research Center, Nevada Division of State Lands, Nevada Division of Environmental Protection, the Lahontan Water Board, and South Tahoe PUD have also put extensive resources in ensuring sample analysis over the years. All previous Snapshot Day Annual Reports can be viewed at: [tahoetruckeesnapshotday.org](http://tahoetruckeesnapshotday.org); however no long term report has ever been generated from this dataset until now. The purpose of this report is to provide an overall look at general watershed health for the southern portion of the Lake Tahoe Hydrological Unit. It will also evaluate the Snapshot Day implementation approach and provide recommendations for future data management and analysis, volunteer management, and help establish future monitoring site prioritization.

Table (1). Estimated number of participating agency and community volunteers per year for Snapshot Day.

Year	2001	2002	2003	2004	2005	2006	2007	2009	2010	2011	2012	2013	2014
Volunteers	100 <sup>a</sup>	310 <sup>a</sup>	250	244	227	216	282	183	212	72 <sup>b</sup>	717	390	126

<sup>a</sup> Reported having more than the base number but no exact count was given; <sup>b</sup> Number based on volunteer sign-in sheet, may not be representative; No volunteer data found for 2008.

## II. Snapshot Day Background

The Lake Tahoe watershed embodies over a hundred years of Euro-American interactions with the environment. Vegetation communities and biota of the watershed have been affected by this interaction. Today the decline in lake clarity is largely attributed to increases of nutrients and fine particles generated from the built environment; a phenomenon known as cultural eutrophication. In fact, since the 1960’s Lake Tahoe has lost over thirty feet of clarity due to increased pollutant loads, and is currently listed as an impaired waterbody. Pollutants such as nutrients and sediment threaten not only the pristine cobalt blue waters of Lake Tahoe but also native aquatic and terrestrial species, near shore habitat, recreational access, and drinking water resources.

To ensure the protection and restoration of Lake Tahoe a Basin-wide partnership was formed with support from local, state and federal agencies; through this partnership the Lake Tahoe Environmental Improvement Program (EIP) was created. In collaboration with the Lake Tahoe Total Maximum Daily Load (TMDL) Program a strategy was developed to restore transparency to historic levels of 100 feet. By reducing pollutant loads over several decades. The TMDL science indicates that approximately 72 percent of fine sediment particulates (FSP) affecting Lake Clarity are generated from our roadways (Lahontan and NDEP, 2011). Effectively reducing these pollutant loads to Lake Tahoe will require long-term commitment to address challenges related to (1) Urban stormwater management (2) transportation and infrastructure and, (3) restoration of wetlands and stream environment zone (SEZ).

In order to track water quality status and trends, data provided by the Lake Tahoe Interagency Monitoring Program (LTIMP) and the Regional Stormwater Monitoring Program (RSWMP) are useful for adaptive management decisions related to the restoration of Lake Tahoe. It should also be recognized however, that there is a unique opportunity for community members to collect data that supports scientific findings and advances public understanding of watershed health.

In 2001, with leadership from the State Water Quality Control Board's (State Board) Clean Water Team and Nevada's Project Wet, a community-based partnership was formed to promote stewardship through a citizen volunteer event known as Snapshot Day. Through on-going leadership from local agencies such as the Tahoe Resource Conservation District (Tahoe RCD), Tahoe Regional Planning Agency (TRPA), Regional Water Quality Control Board (Water Board), South Tahoe Environmental Education Coalition, Sierra Nevada Alliance, California Trout, and the League to Save Lake Tahoe, volunteers have convened for the last 14 years to collect water quality data from dozens of tributaries around the south shore of Lake Tahoe. Snapshot Day volunteerism is traditionally a strong component of the program; anywhere from 75 to 200 people participate in the south shore event each year. On a regional scale, the Snapshot Day event is also coordinated with several partners throughout the Truckee Watershed including the Incline Village General Improvement District, the Truckee River Watershed Council, and the Nevada Department of Environmental Protection.

### **III. Water Quality Objectives**

Lake Tahoe is one of only two water bodies in California designated as an Outstanding National Resource Water under the federal Clean Water Act. Special regulations and stringent water quality standards protect Lake Tahoe's uncommon clarity and quality, and require that no long-term degradation be permitted. These established water quality objectives are designed to protect designated beneficial uses and public health.

Water quality objectives also define appropriate levels of environmental quality and control activities that can adversely affect aquatic ecosystems. For California these objectives have been established by the Lahontan Regional Water Quality Control Board and can be found at [http://www.waterboards.ca.gov/lahontan/water\\_issues/programs/basin\\_plan/references.shtml](http://www.waterboards.ca.gov/lahontan/water_issues/programs/basin_plan/references.shtml)

In Nevada, the Nevada Division of Environmental Protection establishes similar requirements found at <http://ndep.nv.gov/bwqp/stdsw.htm>. In addition, water quality standards are used to designate beneficial uses of the waterbody and set criteria to protect those uses. These standards were used in evaluating the water quality information presented in this report. It should be noted however that Snapshot Day data is only collected once per year and is not a good surrogate for an "annual average" or "mean of monthly mean" required for determining regulatory compliance with water quality standards. Therefore, this information should be considered scanning level watershed information, representative of post-peak flow conditions. Water Quality Standards are typically established with natural seasonal variations in mind, and therefore this data should not be considered either *In* or *Out-of* compliance with respect to state standards for water quality. This data rather, is a look at long-term stream concentration trends seen in late spring. Table 2 identifies a list of physical and chemical parameters monitored during the 14 year Snapshot Day program.

#### **3.1 Beneficial Uses**

Watersheds can be designated with multiple beneficial uses and be applied to the entire watershed, a length of a stream, or the temporal condition of the water body. The following is a list of all the beneficial uses given to the Lake Tahoe Hydrological Unit for all water bodies. The most common beneficial uses

include drinking water, recreation, and fisheries. Tributaries may contain all or some of the following beneficial uses:

- Agricultural Supply (AGR)
- Preservation of Biological Habitats of Special Significance (BIOL)
- Cold Freshwater Habitat Support (COLD)
- Commercial and Sporting Fish (COMM)
- Flood Peak Attenuation and Flood Water Storage (FLD)
- Ground Water Recharge (GWR)
- Municipal and Domestic Supply (MUN)
- Rare, Threatened, Endangered Species (RARE)
- REC1-Water Contact Recreation (REC-1)
- REC2-Noncontact Water Recreation (REC-2)
- Spawning, Reproduction, and Development (SPAWN)
- Wildlife Habitat (WLD)
- Water Quality Enhancement (WQE)

*Physical Constituents:*

Water temperature is one of the most important water quality parameters because it is essential for supporting and sustaining aquatic life and maintains chemical properties in the waterbody. Temperature affects the amount of dissolved oxygen in the water, the rate of photosynthesis by aquatic vegetation, metabolic rates and time of reproduction, migration, and aestivation in aquatic organisms. Watersheds in Lake Tahoe are designated as cold freshwater habitat to protect trout spawning, reproduction, and development, which is favored by cooler temperatures. This report will analyze the data based on a narrative objective for water temperature as it relates to trout spawning and reproduction. There is no numeric standard for temperature ranges in California or Nevada, and there is not enough data to determine percent change from background levels. The Tahoe RCD therefore chose the recommended federal EPA range that is known to support salmonid lifecycle needs; specifically 9.0-24.0°C as shown in the result section.

Dissolved Oxygen (DO) is the measure of oxygen concentrations in the waterbody. The amount of oxygen available reflects the suitability of the habitat to support aquatic life. If not enough oxygen is available impacts to fish such as reduction in growth, failure of eggs, larvae and adult survival. Low concentrations are generally the result of warming waters and excess nutrients, leading to algal blooms. In California concentration standards for DO are a minimum of 8mg/L; in Nevada its 6mg/L. When dissolved oxygen concentrations fall below 4mg/L aquatic conditions are generally considered significantly impaired.

Potential Hydrogen (pH) is the degree to which water is either acidic or basic. Measurements are taken on a scale of 0 (basic) to 14 (acidic) and neutral at 7. Suitable habitat for aquatic life typically sustains a pH balance near 7, with plants ranging between 7-13, macro- invertebrates 7-9.5, and mollusk 6.5-9. Fluctuating temperatures effect pH balances; as temperature rises pH becomes more basic and vice-versa. Issues with extreme pH include physical damage to fish and altering non-toxic substances to a more toxic form; for example as pH increases above 8.5 non-toxic ammonia transitions the toxic ammonia form. Optimal ranges for pH are set at 7-8.4 in California and 6.5-9 in Nevada.

Turbidity measures the amount of suspended particles in the watershed. Large organic particles and suspended sediment cloud the water and decrease lake clarity. Suspended particles can impact life cycle

stages of fish and benthic insects; it can also contribute to increases in algal blooms, and reduce light for photosynthesis for aquatic vegetation. Standards are established at  $\leq 3$  NTU in California and  $\leq 10$  NTU for Nevada.

Fecal Coliform Bacteria is found in the feces of warm-blooded animals and is a major concern for water contamination. High concentrations of fecal coliform can be utilized as an indicator for pollution, particularly for popular dog walking recreation areas or leaking sewage pipes. Coliform is measured in Colony Forming Units (CFU) per 100mL. Standards for fecal coliform are  $\leq 20$  CFU per 100 ml in California and  $\leq 126$  CFU per 126 mL in Nevada.

*Chemical Constituents:*

Nutrients occur naturally in our watersheds at low levels. Excess concentrations degrade Lake Tahoe’s oligotrophic nature. Measuring nitrogen and phosphorous concentrations in the watershed helps scientists better understand the trophic status of Lake Tahoe and its tributaries as high nutrient concentrations can lead to algal blooms, unpleasant odors, increased turbidity, and DO reduction. This report will evaluate Dissolved Inorganic Nitrogen, Total Phosphorus, and Dissolved Inorganic Phosphorus (SRP).

Table (2).Water quality standards established by the California Lahontan Quality Control Water Board and Nevada Division of Environmental Protection (NDEP) for each water quality objective for Lake Tahoe.

<b>Parameter</b>	<b>California</b>	<b>Nevada</b>
Temperature	-- <sup>a</sup>	-- <sup>a</sup>
Dissolved Oxygen	> 7.0 mg/L <sup>b</sup>	$\geq 6.0$ mg/L
pH	6.5-8.0 <sup>c</sup>	6.5-9.0
Turbidity	1-3 NTU <sup>d</sup>	$\leq 10$ NTU
Fecal Coliform	20 CFU/100 mL <sup>e</sup>	126 CFU/ 100 mL
Total Nitrogen	0.15-0.19 mg/L	0.5 mg/L
Total Phosphorous	.018mg/L <sup>f</sup>	--
Total Phosphate	--	$\leq 0.5$ mg/L
Dissolved Inorganic Phosphorous (SRP)	.009 mg/L <sup>f</sup>	$\leq 0.5$ mg/L

<sup>a</sup> See EPA ranges provided in Results section; <sup>b</sup> 1 day minimum; <sup>c</sup> Seasonal variant; <sup>d</sup> Narrative objective based on near lake shore standard; <sup>e</sup> 30 day period; <sup>f</sup> Maximum allowable concentration.

## IV. Introduction to Analysis

Sampling protocols for field monitoring are established by the California Surface Water Ambient Monitoring Program (SWAMP) and the United States Geological Survey (USGS) for water quality monitoring. These protocols are described in the links below:

[CWT Guidance Compendium for Watershed Monitoring and Assessment](#)

[USGS National Field Manual for Collection of Water-Quality Data](#)

## 4.1 Monitoring Protocols

Following standard protocols for data collection is an important first step in developing a credible citizen monitoring program. Each year prior to the Snapshot Day event, select Team Leaders undergo a series of trainings led by the agency running the event. Trainings cover basic methodologies for collecting physical and chemical field measurements, reporting visual observations, and photo documentation from established field protocols. Team Leaders are also responsible for supervising volunteers to ensure data accuracy and that volunteers adhere to monitoring protocols while in the field.

Instruments assigned to team leaders for monitoring include: EnviorSAFE thermometers (alcohol filled, 0.5°C), standard pH indicator strips (0.5 pH unit), or handheld Hannah pH meters (0.02 pH unit); handheld Oakton Total Dissolved Solids (TDS) meters (10µS/cm) or Oakton Conductivity Low+ meters (1µS/cm); Chemet dissolved oxygen kits (colorimetric, indigo carmin dye reaction, 1mg/L solution below 6mg/L and 2mg/L resolution above 6mg/L). All instruments were tested and calibrated prior to the event.

Grab samples for fecal coliform were collected in sterile WhirlPaks. Nalgene plastic bottles used for nutrient and turbidity samples were acid rinsed and triple washed with deionized water prior to the event. Samples were chilled with ice or blue ice in coolers until delivered to the lab for analysis. The analysis procedure for fecal coliform was initiated within 6 hours of sampling. Nutrient samples were kept refrigerated and analyzed within appropriate holding times. Turbidity samples were analyzed the day of Snapshot Day.

Water Quality measurements are taken in the thalweg at a depth of 6 inches, unless otherwise noted. In tributaries where depth was less than 6 inches volunteers were instructed to record an estimated sampling depth. Volunteers were also instructed to collect replicate samples for quality assurance as recommended by USGS protocols. Volunteers were instructed to take duplicate samples for temperature, pH, electrical conductivity, and dissolved oxygen for quality control. A minimum of three photos are required: (1) Site ID photo for quality assurance, (2) upstream bed conditions, and (3) downstream bed conditions. Visual observations for defining stream characteristics followed the *California Stream and Shore Walk Visual Assessment Form* developed by the Clean Water Team for odor, color, invasive weeds, clarity, weather, and general condition.

## 4.2 Site Locations

The south shore Snapshot Day dataset includes 26 tributaries; 11 monitoring sites in the eastern region, 44 monitoring sites in the south region, and 13 monitoring sites in the west region (Figure 1). For regional details describing site locations see Appendix A. Samples collected represent water quality as it travels through the watershed (upstream to downstream), and to the lake. Site locations were established for easy public access and the ability to capture water quality related to urban development, restoration, fires, and other watershed conditions. Historically Snapshot Day volunteers monitor tributaries throughout Lake Tahoe in the north, east, south, and west shore regions. This report focuses on the fourteen year data set collected along the southern parts of the east and west shore as well as the south shore of Lake Tahoe. A list of sites can be viewed in Appendix B.

The sites located in the southern regions were separated out due to general differences in urban development, slope, and geology. This also allowed for “tightening” up the ranges typically found in water quality samples collected throughout the southern watershed. Maps presented by the USGS support these general differences and can be viewed in Appendix C.

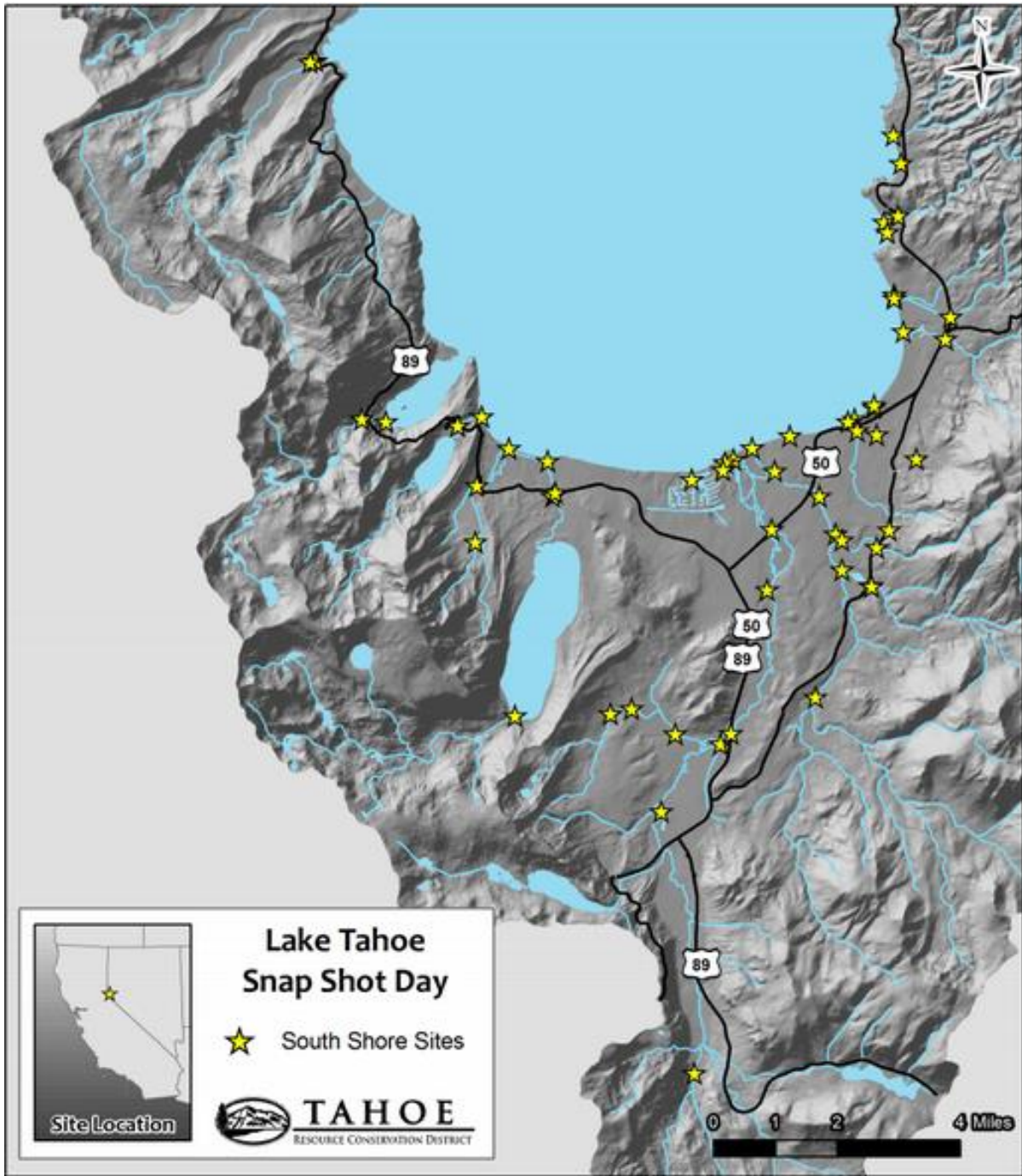


Figure (1). Map of Snapshot Day Sample locations for the southern part of Lake Tahoe.

### 4.3 Data Analysis

One of the biggest challenges related to the data analysis effort for this project was the fact that annual data sets were not all located in one place, and tended not to undergo detailed quality assurance measures. The most useful information came for the annual project folders that were created each year since the

inception of Snapshot Day. All raw field, chemistry and fecal coliform datasheets were stored in hardcopy form; all 14 years are currently located at the Tahoe RCD offices in South Lake Tahoe. Data downloaded from the Tahoe Integrated Information Management System (TIIMS) was also a very useful, as was partner datasets from the Incline Village General Improvement District (IVGID), and California Trout (Caltrout). Additional challenges related to data management involve inconsistencies with site tag IDs (Appendix B) and gaps in the water quality dataset (Appendix D). Because of these inconsistencies data was originally organized by Site Name, which seemed to remain stable throughout the 14 years of this project. Site tags do not represent a specific point, rather a general location as it relates to characteristics within a 500ft stream length. Due to this process many sites monitored had multiple samples collected at different points along a reach per year; these samples were averaged for graphing purposes.

The first level of analysis for this report looks at three different regions within the southern part of Lake Tahoe (Table 3). Data presented show the range of concentrations typical of water quality measured in these different regions over the fourteen years of collection. Data was analyzed using excel box and whisker plots. Whisker ends represent the maximum and minimum values over the 14 years, the lower box represents the percentage of values below the median (the middle line) and the upper box represents the percentage of values above the median (Section 5.1). Data points that were suspect or unreasonable were removed from analysis; outliers are not represented in the graph but will be displayed in the data table.

The second level of analysis looks at average water quality concentrations per tributary, per region, over a 14 year timeframe. This data is presented in bar graph form and indicate those tributaries that tend to meet annual average standards for water quality protection (Section 5.2). Again, this data is based on one or two samples collected in a specific stream reach on the same day; and therefore is not appropriate for regulatory comparison to specific state standards which are typically represented by a monthly or annual mean.

The third level of analysis looks at specific tributary case studies where data analysis seems to identify water quality trends. All data utilized in this report were compared to the California and Nevada water quality standards presented in Table 2 above. Water quality results are presented in Section V below.

Table (1): Southern shore tributaries defined by Region.

<b>East Region</b>	<b>South Region</b>	<b>West Region</b>
Burk Creek	Angora Creek	Cascade
Edgewood Creek	Bijou Creek	Eagle Falls
McFaul Creek	Bijou Drainage	Meeks Creek
North Zephyr Creek	Cold Creek	Tallac Creek
South Zephyr Creek	Heavenly Creek	Taylor Creek
Lake Mouth Nevada Beach*	Keys Marina	Fallen Leaf Lake°
Lake Mouth Kahle Drive*	Trout Creek	Glen Alpine Creek°
Lake Mouth Roundhill Pines*	Upper Truckee River	
	Lake Mouth Ski Run Marina+	
	Lake Mouth Timber Cove+	
	Lake Mouth Reagan Beach+	

\*Nevada Lake Mouths (NV Mouths). + California Lake Mouths (CA Mouths). ° Taylor Creek Watershed.

## V. Results

Results were analyzed three ways: Section 5.1 presents (1) observed ranges per region per constituent, and (2) tributary averages per region per constituent. Section 5.2 presents (3) Lake Tahoe case studies.

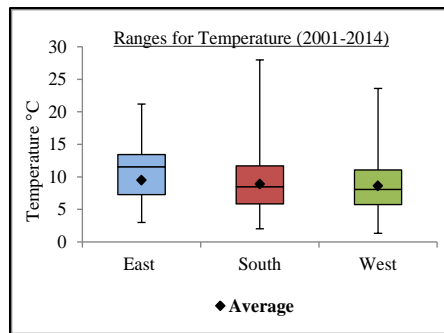
Ranges are color coded for convenience: West Region (Blue), South Region (Red), and West Region (Green).

**5. 1 (A) Observed Ranges per Region, (B) 14-Year Averages per Tributary per Constituent**

Temperature

(A)

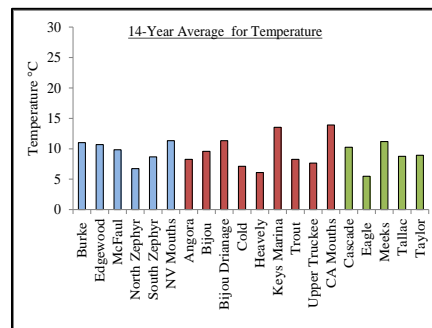
	Minimum	Maximum	Average	Sample Size
<b>East Region</b>	3.0 °C	19.3 °C	9.5 °C	60
<b>South Region</b>	2.0 °C	28.0 °C	8.9 °C	230
<b>West Region</b>	1.3 °C	23.6 °C	8.6 °C	92



(B)

Tributary	Sample Size
Burk	19
Edgewood	6
NV Mouth	9
McFaul	6
North Zephyr	12
South Zephyr	11
Angora	40
Bijou	10
Bijou Drainage	32
Cold	18

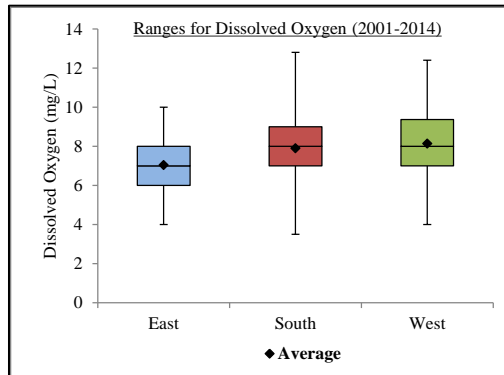
Tributary	Sample Size
Heavenly	21
Keys Marina	22
CA Mouth	18
Trout	23
Upper Truckee	47
Cascade	15
Eagle	10
Meeks	18
Tallac	14
Taylor	37



## Dissolved Oxygen

(A)

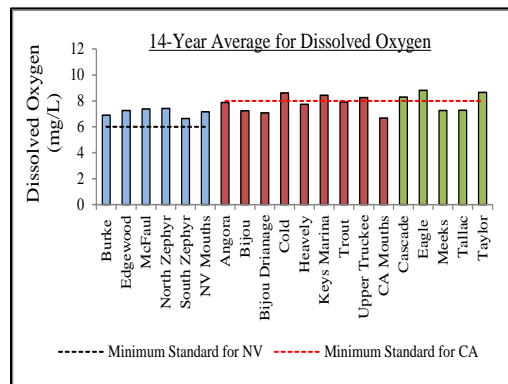
(mg/L)	Minimum	Maximum	Average	Sample Size
<b>East Region</b>	4.0	10.0	7.0	49
<b>South Region</b>	3.5	12.0	7.9	184
<b>West Region</b>	4.0	12.4	8.1	88



(B)

Tributary	Sample Size
Burk	17
Edgewood	4
NV Mouth	6
McFaul	5
North Zephyr	8
South Zephyr	9
Angora	33
Bijou	5
Bijou Drainage	14
Cold	15

Tributary	Sample Size
Heavenly	18
Keys Marina	20
CA Mouth	14
Trout	25
Upper Truckee	40
Cascade	14
Eagle	9
Meeks	16
Tallac	14
Taylor	35

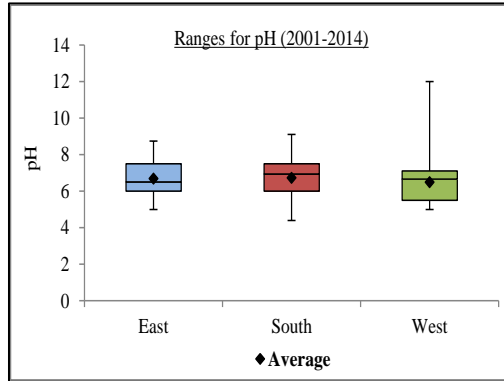


pH

(A)

	Minimum	Maximum	Average	Sample Size
<b>East Region</b>	5.0	15.2*	6.7	59
<b>South Region</b>	4.4	14.2*	6.7	212
<b>West Region</b>	5.0	12.0	6.5	95

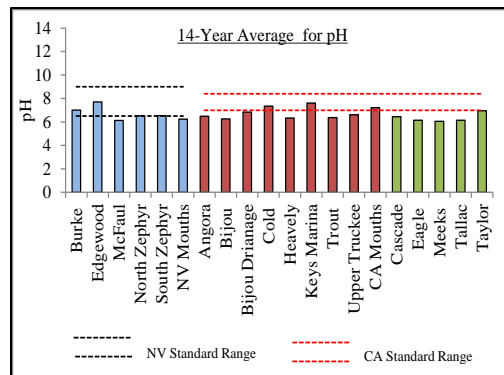
\*Large values not represented in the following box-plot graph.



(B)

Tributary	Sample Size
Burk	18
Edgewood	5
NV Mouth	9
McFaul	11
North Zephyr	10
South Zephyr	39
Angora	10
Bijou	32
Bijou Drainage	12
Cold	20

Tributary	Sample Size
Heavenly	20
Keys Marina	19
CA Mouth	18
Trout	23
Upper Truckee	39
Cascade	14
Eagle	10
Meeks	17
Tallac	14
Taylor	37

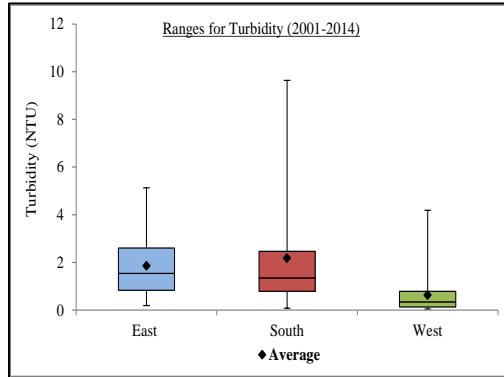


# Turbidity

(A)

(NTU)	Minimum	Maximum	Average	Sample Size
<b>East Region</b>	0.19	5.1	1.9	49
<b>South Region</b>	0.08	19.0 *	2.2	172
<b>West Region</b>	0.04	4.2	0.6	72

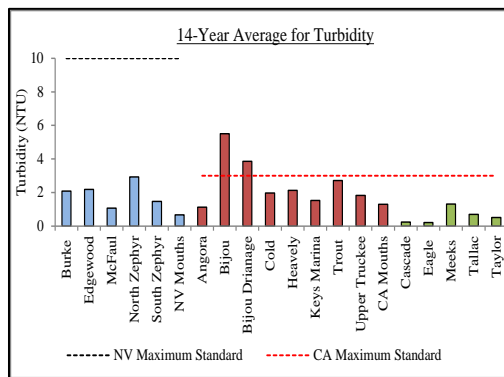
\*Large values not represented in the following box-plot graph.



(B)

Tributary	Sample Size
Burk	15
Edgewood	6
NV Mouth	6
McFaul	4
North Zephyr	8
South Zephyr	10
Angora	32
Bijou	8
Bijou Drainage	19
Cold	14

Tributary	Sample Size
Heavenly	14
Keys Marina	18
CA Mouth	8
Trout	20
Upper Truckee	39
Cascade	12
Eagle	9
Meeks	15
Tallac	11
Taylor	25

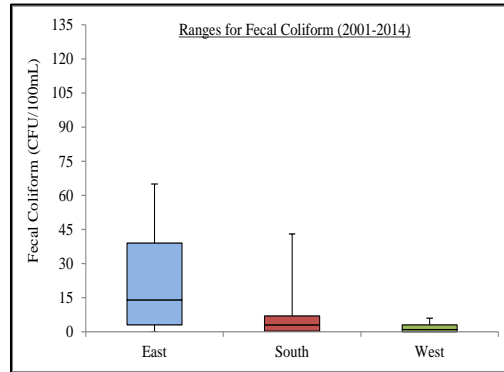


# Coliform

(A)

(CFU/100mL)	Minimum	Maximum	Average	Sample Size
<b>East Region</b>	0	8,000*	468 <sup>+</sup>	42
<b>South Region</b>	0	14,000*	191.2 <sup>+</sup>	115
<b>West Region</b>	0	112*	3.67 <sup>+</sup>	48

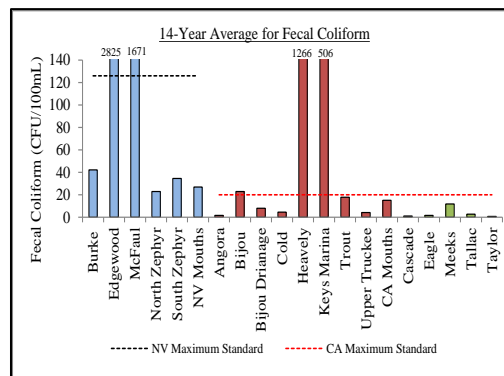
\*Large values not represented in the following box-plot graph.



(B)

Tributary	Sample Size
Burk	14
Edgewood	3
NV Mouth	4
McFaul	6
North Zephyr	5
South Zephyr	10
Angora	18
Bijou	3
Bijou Drainage	13
Cold	10

Tributary	Sample Size
Heavenly	12
Keys Marina	12
CA Mouth	11
Trout	12
Upper Truckee	24
Cascade	10
Eagle	5
Meeks	11
Tallac	6
Taylor	16

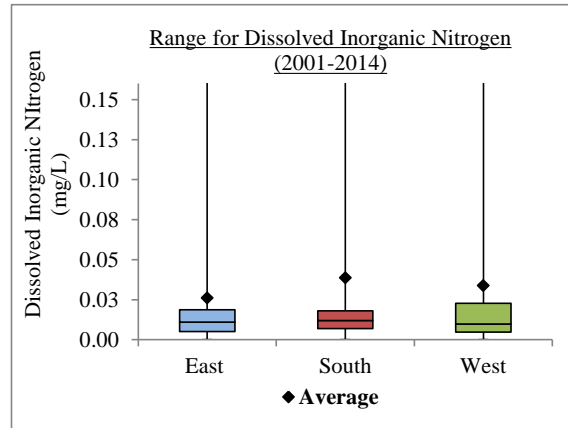


## Dissolved Inorganic Nitrogen

(A)

(mg/L)	Minimum	Maximum	Average	Sample Size
<b>East Region</b>	0.003	0.362*	0.026	47
<b>South Region</b>	0.002	0.952*	0.037	143
<b>West Region</b>	0.002	0.952*	0.031	70

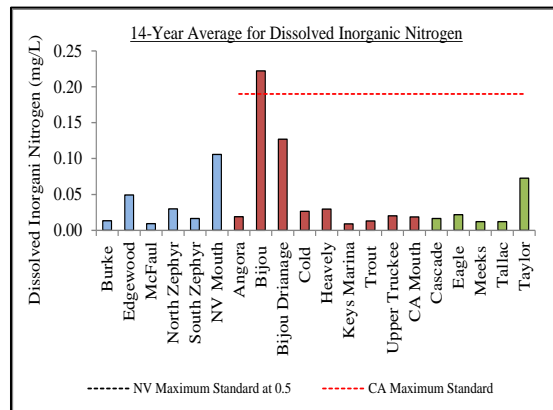
\*Large values not shown in the following box-plot graph.



(B)

Tributary	Sample Size
Burk	15
Edgewood	6
NV Mouth	5
McFaul	6
North Zephyr	4
South Zephyr	11
Angora	24
Bijou	7
Bijou Drainage	19
Cold	12

Tributary	Sample Size
Heavenly	115
Keys Marina	11
CA Mouth	10
Trout	17
Upper Truckee	28
Cascade	8
Eagle	5
Meeks	17
Tallac	12
Taylor	28

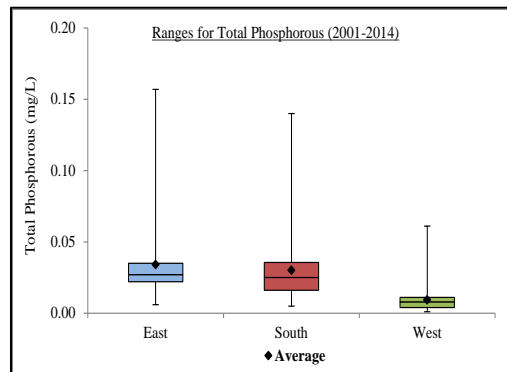


## Total Phosphorous

(A)

(mg/L)	Minimum	Maximum	Average	Sample Size
<b>East Region</b>	0.006	0.16	0.034	41
<b>South Region</b>	0.005	0.24*	0.033	129
<b>West Region</b>	0.001	0.06	0.009	55

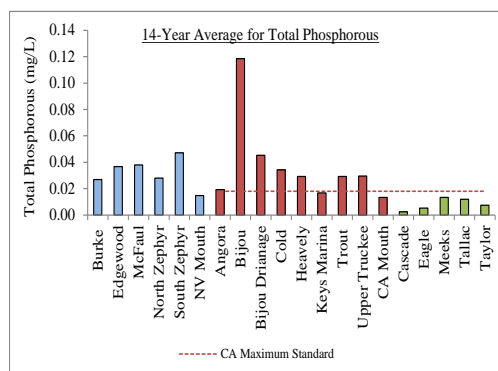
\*Large values not represented in the following box-plot graph.



(B)

Tributary	Sample Size
Burke	13
Edgewood	6
NV Mouth	3
McFaul	6
North Zephyr	3
South Zephyr	10
Angora	21
Bijou	7
Bijou Drainage	18
Cold	10

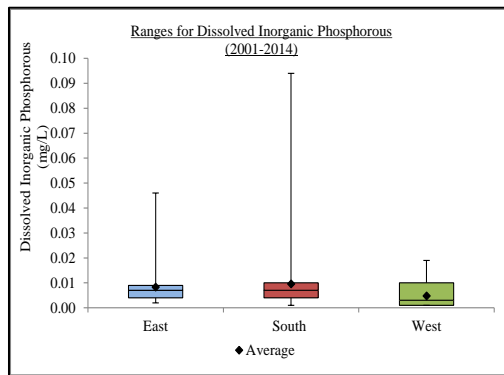
Tributary	Sample Size
Heavenly	14
Keys Marina	11
CA Mouth	8
Trout	15
Upper Truckee	25
Cascade	6
Eagle	4
Meeks	15
Tallac	11
Taylor	19



## Dissolved Inorganic Phosphorous

(A)

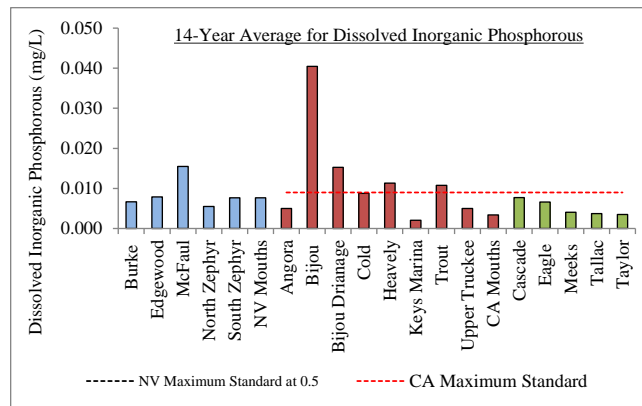
(NTU)	Minimum	Maximum	Average	Sample Size
<b>East Region</b>	0.005	0.046	0.008	45
<b>South Region</b>	0.001	0.094	0.010	141
<b>West Region</b>	0.001	0.019	0.005	59



(B)

Tributary	Sample Size
Burk	15
Edgewood	6
NV Mouth	3
McFaul	6
North Zephyr	4
South Zephyr	11
Angora	24
Bijou	7
Bijou Drainage	19
Cold	12

Tributary	Sample Size
Heavenly	15
Keys Marina	11
CA Mouth	10
Trout	17
Upper Truckee	28
Cascade	8
Eagle	5
Meeks	16
Tallac	12
Taylor	21

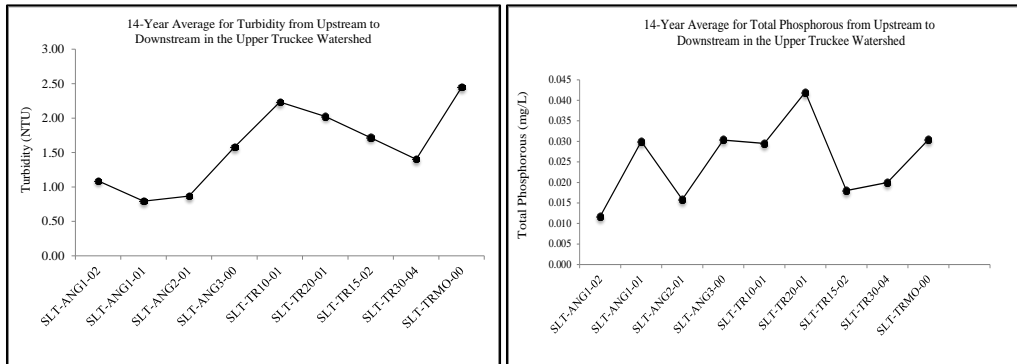


## 5. 2 Case Studies

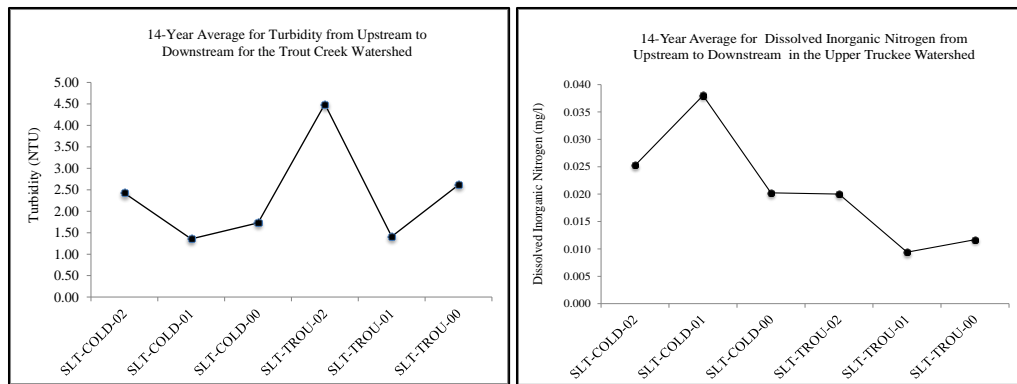
The following case studies are just a sample of how the Snapshot Day dataset can be used to identify trends in the watershed, can help educate the public on the need for restoration, and can also help identify potential health concerns.

(A) Identifies Upstream to Downstream Trends in Tahoe Watersheds:

### Upper Truckee Watershed

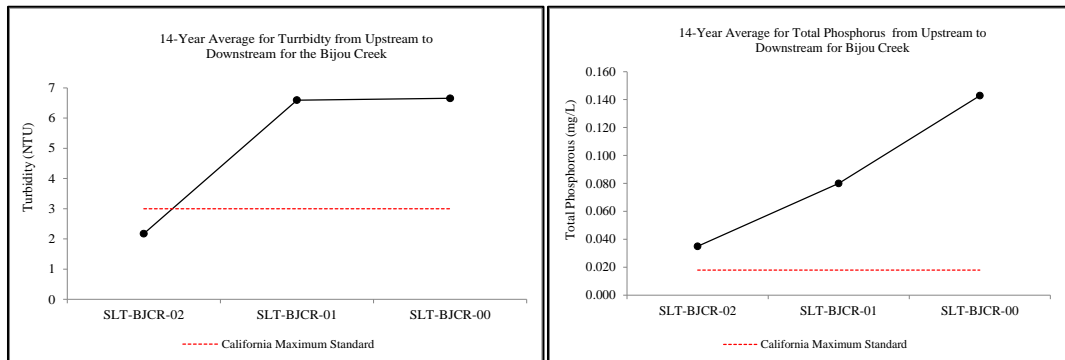


### Trout Creek Watershed



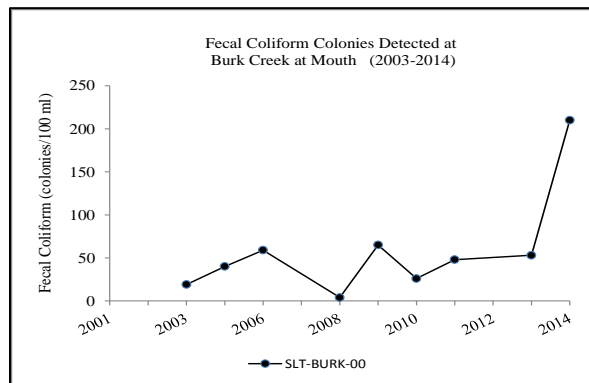
(B) Identifies Potential Problem Areas:

### Bijou Creek

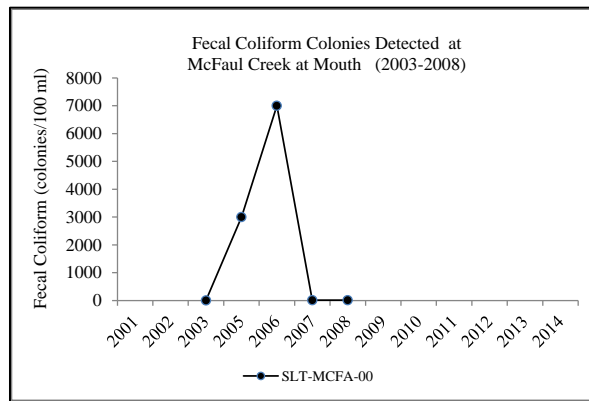


(C) Identifies Potential Health Concerns:

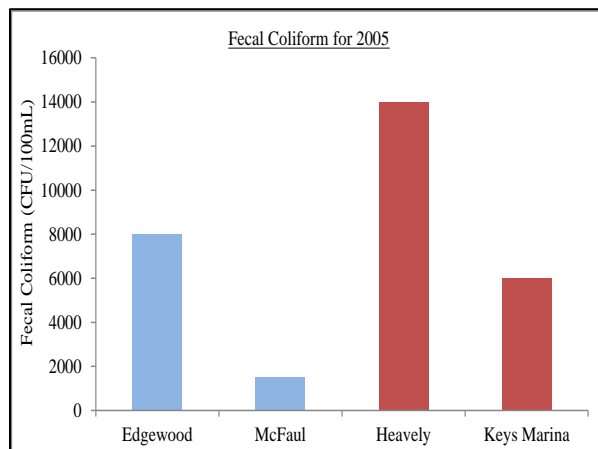
*Burk Creek*



*McFall Creek*



*Annual Status*



## VI. Discussion

The Tahoe-Truckee Snapshot Day event is a one-day annual volunteer-based event designed to collect scanning level water quality information throughout the watershed. Although the Snapshot Day event is executed throughout the greater Tahoe-Truckee Watershed this report specifically focuses on the southern region of Lake Tahoe and includes 26 tributaries; 11 monitoring sites in the eastern region, 44 monitoring sites in the south region, and 13 monitoring sites in the west region (Individual tributaries are depicted in Section 4.3, Table 3).

Three levels of data analysis were evaluated for this report: the first level of analysis looked at the minimum, maximum and average values for all constituents measured over the fourteen year period, the second level of analysis looked at average water quality concentrations per tributary, and the third level of analysis looked at specific tributary case studies where data analysis seems to identify water quality trends or concerns. Specifically, the Tahoe RCD wanted to highlight the benefits of a long-term citizen monitoring program in action, and to provide feedback for future program improvements to ensure its continued success. Through our efforts a few important points rose to the surface: 1) providing proper care and management of the dataset should be a priority, as well as making the data accessible to the public, 2) ensuring effective data quality assurance measures and 3) prioritizing core monitoring sites to improve the user friendliness of the dataset.

Although the dataset had its challenges, hundreds of citizen volunteers and agency staff dedicated their time over the past 14 years and so the Tahoe RCD wanted to - at a minimum - provide a look at some generalities that could be extracted from the dataset. Specific focus will be on temperature, dissolved oxygen, fecal coliform, fine sediment and nutrients.

### Temperature

In many sierra streams, propagation of cold-water fish (i.e. trout or salmon) is a designated beneficial use for waters of the state. Such streams usually require cooler temperatures than water in streams and lakes that do not have a cold-water fishery. Table 4 below provides Federal Environmental Protection Agency (EPA) guidance on temperatures that support cold-water fisheries; because state water quality standards were narrative in nature they were not utilized for this evaluation.

Table (4). General EPA Temperature Ranges for Rainbow Trout (Adapted from EPA's Volunteer Stream Monitoring Methods Manual)

Species	Maximum	Growth	Spawning*	Embryo Survival**
Rainbow Trout	24°C (75°F)	19°C (66 °F)	9°C (48°F)	13°C (55°F)

\*Optimum or mean range of spawning temperatures reported for the species.

\*\*The upper limit of temperature for species successful incubation and hatching reported for the species.

Water temperatures identified in the 14 year dataset averaged between 8.6 and 9.5°C which suggest streams located in the southern region of Lake Tahoe tended to meet requirements for cold water species during spring conditions. Minimum values for each region were between 1.3 and 3.0°C. Maximum values were between 19.3 and 28°C. Some of the highest annual temperatures were identified at select sites including the Tahoe Keys, Ski Run Marina, Timber Cove, Bijou Park drainage, Taylor Creek and the Upper Truckee. Many of these reduced values were either near the mouth of the tributary, or were identified during the 2012 and 2013 drought (as low flow and lack of tree canopy can increase stream temperatures). As with most of the dataset the information compiled for temperature is spotty, however

the general trend seems to support that temperatures are good overall with urban streams exhibiting occasional conditions that maybe less than ideal for supporting cold-water fisheries.

#### Dissolved Oxygen

Cold water holds more oxygen than warm water so it is not surprising that temperature and DO are closely related. Cold, clean water usually has levels of DO averaging 6.0 mg/l or higher, as oxygen is an essential ingredient for the health of fish, invertebrates, and aquatic vegetation. Within the 14 year dataset DO averaged 7.0 and 8.1°C suggesting streams located in the southern region of Lake Tahoe also generally support aquatic life during spring conditions. This trend is not surprising, however it should be noted that DO concentrations usually decrease over the summer and sometimes into the fall months (especially during drought years) which may cause challenges for aquatic life survival.

Minimum DO values identified in the dataset were measured at 3.5 and 4.0°C. These numbers are surprisingly low and if continued long-term would become a problem for aquatic life survival. Specific sites identified over the years include Bijou Park Drainage, the Upper Truckee, Taylor Creek, Burke Creek, Edgewood, North Zephyr, and Meeks Creek. Many of the sites with low DO were found at the tributary mouths or were sites higher up in the watershed during the drought years of 2012 and 2013. This information correlates well with the finding for Temperature. Two tributaries in particular that had consistent low levels of DO were the Bijou Park and the Burke Creek drainages regardless of monitoring location; both are strongly urbanized small meadow systems with confined channels and reduced natural canopy. Maximum DO values in the dataset were between 10 and 12.8°C, overall these values were seen most often at Cold Creek, Angora Creek, Trout Creek, Upper Truckee, Taylor and Eagle Creeks.

#### pH

Extreme pH values, both acid and alkaline, can be harmful to fish and other aquatic life including structural damage to gills, eyes, and skin; interference with metabolism and waste removal can also take place. In general, tributaries and streams of Lake Tahoe are known to be slightly acidic due to native soil and geologic conditions typically ranging between 5.5 and 8.5 on the pH scale.

The minimum values presented in the 14 year dataset range between 4.4 and 5.0; maximum values are between 8.8 and 14. Some of the lowest pH values were identified at select south shore creeks including Angora, Bijou, Heavenly, and Trout. In particular, Angora Creek pH values were observed between 4.4 and 5.5 in 2003, 2004, and 2007. The Upper Truckee River and east shore creeks Tallac, Cascade, Eagle, and Meeks were also noted as having occasional low pH over the 14 years of data collection. The highest pH values were seen in 2014 at Glen Alpine and Meeks Creek with measured values of 12 and 14 respectively, a dubious value of 15 was also identified at south Zephyr Creek. It should be noted that these highly alkaline values are uncommon and do not represent typical conditions found in the southern region from year to year; these measurements may also be suspect as calibration notes indicated some pH strips had reached their expiration date in 2014.

#### Turbidity

Turbidity measures the amount of suspended particles in a waterbody. Throughout the watershed turbidity is generally low. Minimum ranges of 0.04 to 0.19 NTU were seen throughout the west, south and east regions. Maximum ranges were 8.8 to 19 NTU. The highest turbidity reading was measured in 2011 at the Timber Cove site, which also had high readings in 2004 and 2005 with 5.28 and 7.02 respectively. The biggest turbidity issues identified in the data set point to Bijou Creek and the Bijou Park drainage, beyond a few independent measures seen in Trout Creek at the grinding stone, Heavenly Valley Creek above Trout, Angora and Regan Beach. This is especially evident when looking at the 14 year averages.

In the case studies shown for the Upper Truckee and Trout Creek, the turbidity is generally low however the data indicates that turbidity tends to increase from upstream to downstream. The same holds for Bijou Creek except turbidity concentrations tend to be quite elevated.

#### Fecal Coliform

Fecal Coliform is a type of bacteria found in the feces of warm-blooded animals and is a public health concern resulting from ingestion due to recreational contact. The minimum values presented in the 14 year dataset represent an absence or very low level of Fecal Coliform at many sites throughout the southern region of the Lake Tahoe. This data supports the idea that Lake Tahoe Tributaries are generally of high quality. There are however, occasions where Snapshot Day data has identified particular sites with high values of fecal contamination; maximum values seen in the 14 year dataset range anywhere from 112 and 14,000 CFU. In 2001 Ski Run Marina and Edgewood Creek had elevated coliform ranging from 130-474 CFU. Measurements taken in 2005 also indicate several sites with elevated levels of fecal coliform; these sites include Heavenly Valley (At trout), Edgewood and McFall Creeks as well as the Tahoe Keys. Values ranged between 3,000 – 14,000 CFU. These values are significantly high and are worth continued monitoring to help identify a source if possible; ultimately the contamination could be from sewage leaks or even wildlife and domestic animals. Additional detection of elevated fecal coliform were also noted in 2008 at the Tahoe Keys, and between 2009 - 2015 detections were seen at Trout and Burke Creeks, Heavenly Valley (at Trout), Timber Cove and Bijou Park Drainage.

#### Dissolved Inorganic Nitrogen

Measuring nitrogen concentrations in the watershed provides information on the trophic status of Lake Tahoe and its tributaries as high nutrient concentrations can lead to algal blooms, unpleasant odors, increased turbidity, and DO reduction. The most readily consumed portion of nitrogen is the DIN fraction; algae thrive on this form of nitrogen. Lake Tahoe waterbodies are historically low in these constituents as our soils tend to be are poorly formed with relatively little organic matter.

The measures of DIN throughout the southern portion of Lake Tahoe showed minimum levels of 0.002 mg/L to 0.02 mg/L. Maximum levels of DIN were shown at between 0.36 and 0.95 mg/L. The highest level of DIN was seen at Glen Alpine Creek in 2008 (0.95mg/L), in 2009 Glen Alpine Creek was also measured at 0.362 mg/L. Most of the samples within the 14 year dataset collected at Glen Alpine Creek however were in the range of 0.026 to 0.072 mg/L. Bijou Creek at the mouth also showed elevated levels of nitrogen in 2004 and 2005 at 0.952 and 0.362 mg/L respectively. Nitrogen levels seen in Bijou Park drainage below Hansen's Resort (top of Ski Run Blvd) seem to show a trend for consistently higher levels of DIN between 2001 and 2014. The area monitored is located near a groundwater seep which may be a natural source of nitrogen from decomposing plant matter, or possibly there is a discharge resulting from leaky sewage pipes in the area; either way this site is worth following up on in future years.

#### Total and Dissolved Phosphorus

Measuring phosphorus concentrations also provides information on the trophic status of Lake Tahoe and its tributaries as high nutrient concentrations can lead to the same type of algal blooms, unpleasant odors, increased turbidity, and DO reduction that nitrogen can. In fact both types of nutrients are the primary growth factors for algae. As with DIN, SRP or dissolve inorganic phosphorus is also the most available form for algae consumption.

The minimum ranges of phosphorus seen in the Snapshot Day dataset were between 0.001 and 0.006 mg/L. Maximum levels ranged between 0.06 and 0.24 mg/L. The dataset indicates that levels of phosphorus tend to be higher in urbanized areas of both California and Nevada. Occasionally higher levels of phosphorus were seen at the mouth of South Zephyr and Mc Fall Creeks, and the Upper Truckee at Elks Club but by far Bijou Creek was the biggest culprit for contributions of both total and dissolved

phosphorus. This data correlates with the higher turbidity readings seen at Bijou Creek as well, and information gathered from other constituents that seem to identify in general that urban areas are the greatest potential problem for pollutant inputs to Lake Tahoe.

In the case studies shown for the Upper Truckee, Trout Creek, and Bijou Creek the phosphorus concentrations tend to be elevated, and like turbidity, is seen to increase from upstream to downstream.

## **VII. Recommendations**

### **7.1 Lessons Learned**

Developing this report was met by many challenges. It took three interns 1 ½ years to compile, quality check, analyze and reporting on the 14-year data set. Through this comprehensive process many insights were gained on how to improve certain aspects of the Snapshot Day Program. Lessons learned are presented below.

- Data supports TMDL findings that sediment and phosphorus are a focus of concern
- Data supports that “springtime” water quality is generally of high quality in the southern region of Lake Tahoe
- Urban streams and lake sites tend to have higher levels of turbidity, fecal and nutrients
- Improved data quality and management procedures will improve both the credibility and usefulness of the Snapshot Day dataset
- Housing the program with a single organization would improve continuity of the program

### **7.2 Next Steps**

The Tahoe RCD, the League, and the Water Board have been actively working with partners to improve operations related to the Snapshot Day event. Actions to be implemented before the 2015 event include:

- Development of consistent site ID tags and site names (Appendix B)
- Development of a site priority list (Appendix E)
- Improved team leader trainings through the Lake Tahoe Community College
- Maintain and annually update Snapshot Day database
- Compilation of the Snapshot Day annual reports from 2001-2010 loaded to the Tahoe-Truckee website [snapshotday.org](http://snapshotday.org)
- Post Final 14 year Snapshot Day Report on Tahoe RCD’s website [TahoeRCD.org](http://TahoeRCD.org)
- Provide public access to the dataset on Tahoe RCD’s website [TahoeRCD.org](http://TahoeRCD.org)
- Execute the 2015 Snapshot Data Event with our partners on May 16, 2015

## **Resources**

Tahoe Resource Conservation District

<http://tahoercd.org/>

Snapshot Day Database

<http://tahoercd.org/>

Lohantan Basin Plan

[http://www.waterboards.ca.gov/lahontan/water\\_issues/programs/basin\\_plan/references.shtml](http://www.waterboards.ca.gov/lahontan/water_issues/programs/basin_plan/references.shtml)

Lake Tahoe Watershed Assessment Report

[http://www.waterboards.ca.gov/rwqcb6/board\\_info/agenda/2012/jul/ntpud\\_evdnc.pdf](http://www.waterboards.ca.gov/rwqcb6/board_info/agenda/2012/jul/ntpud_evdnc.pdf)

Bijou Area Erosion Control Project- City of South Lake Tahoe

<http://www.cityofslt.us/index.aspx?NID=610>

Keep Tahoe Blue Pipe Keepers Volunteer Opportunity

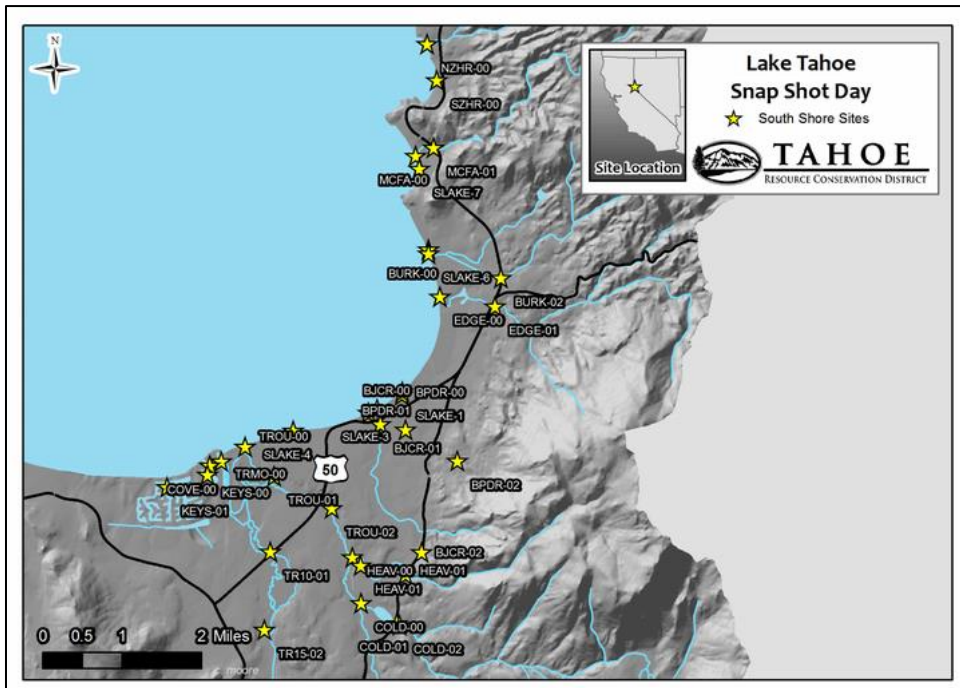
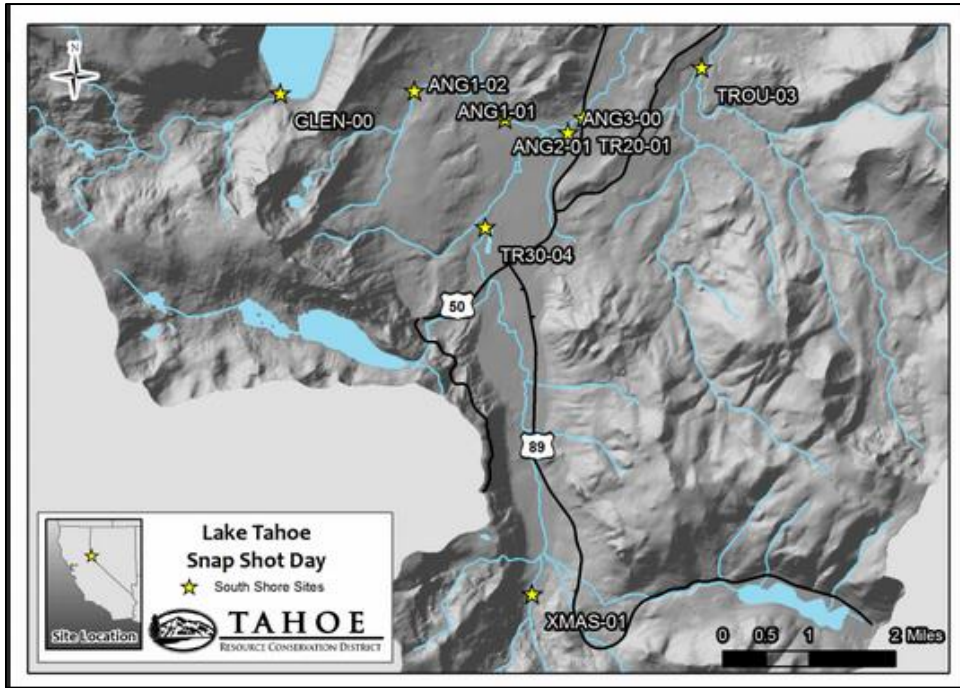
<http://keeptahoeblue.org/our-work/Pipekeepers/>

EPA TMDL

<http://water.epa.gov/lawsregs/lawsguidance/cwa/tmdl/>

<http://www.epa.gov/region9/water/watershed/tahoe/tools-tmdl.html>

# Appendix A





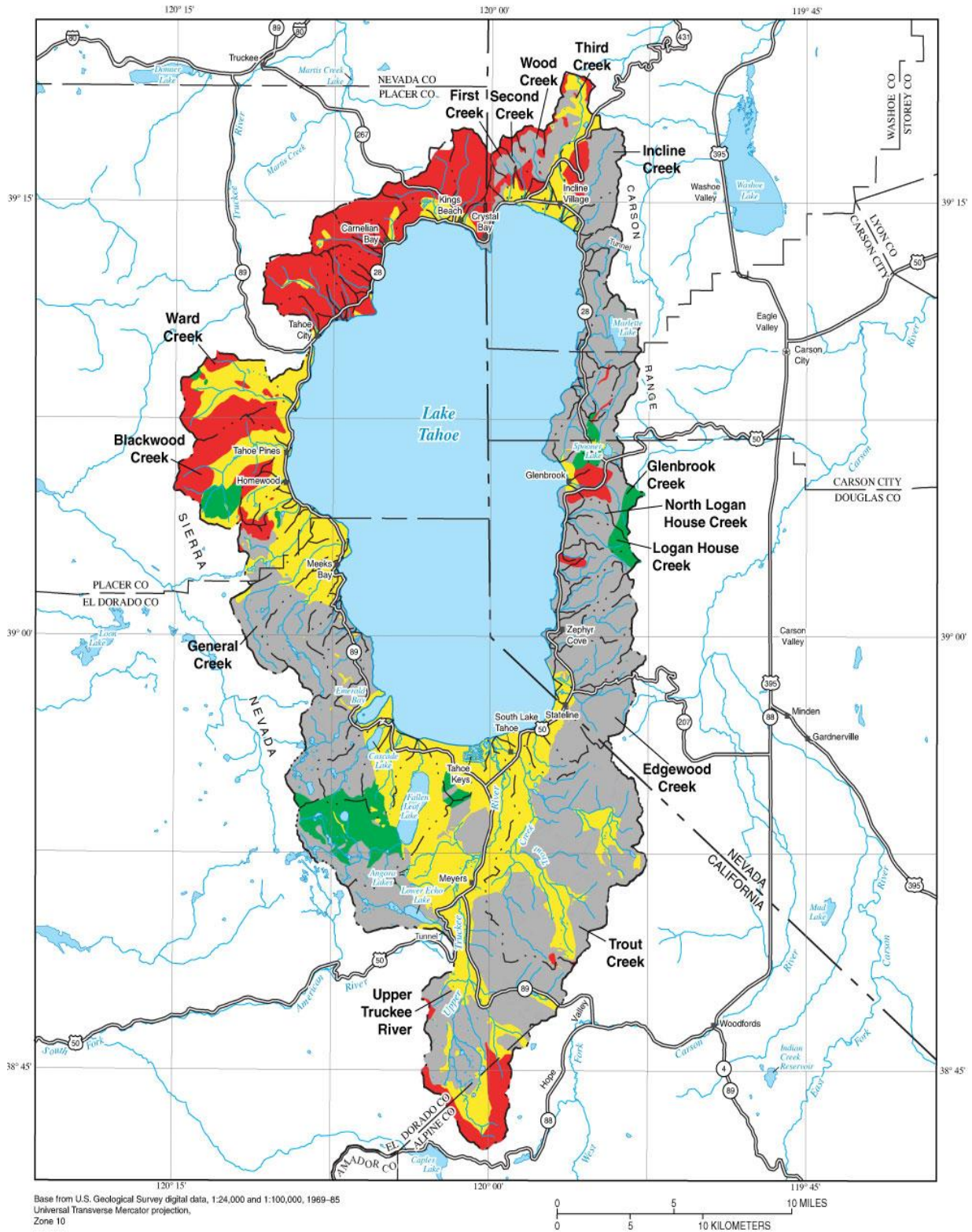
## Appendix B

<b>Tributary</b>	<b>Current Site Description</b>	<b>Current Site ID Tag</b>	<b>Other Site Description</b>	<b>Other Site ID Tags (SLT-Name)</b>
Angora Creek	Angora at Truckee Confluence	ANG3-00	Angora at Mouth	
	Angora at Washoe Meadows	ANG2-01	Angora above Golf Course	ANG-2, ANG3-01, ANG2-00
	Angora at View Circle	ANG1-01	Angora above View Circle, Angora below View Circle	ANG-02, ANG-03, ANG1-03
	Angora above Lake Tahoe Blvd.	ANG1-02	Angora above Bridge, Angora Flowing out of Residential	ANG1, ANG1-01, ANG2-02, ANG-01
Bijou Park Drainage	Bijou Park Drainage at Mouth	BPDR-00	Bijou Park Drainage Ski Run Marina	
	Bijou Park Drainage at Werner Salsa Rd.	BPDR-01		
	Bijou Park Drainage below Hansen's Resort	BPDR-02	Bijou Park Drainage at Verdon Road	BPDR-03, BPDR-04
Bijou Creek	Bijou at Mouth	BJCR-00	Bijou Creek at Culvert to Lake	
	Bijou at Fairway	BJCR-01	Bijou below the Golf Course	BJCR
	Bijou above Pioneer Trail	BJCR-02		
Burk Creek	Burk at Mouth	BURK-00	Burk Creek near pump at Kahle Drive, Burk Creek near pup at end of campground, Burk at pump station	
	Burk below Highway 50	BURK-02		BURK, BURK-01
Cascade	Cascade Lake at Mouth	CASC-00		CASC-01
	Cascade above Highway 50	CASC-01		CASC
Cold Creek	Cold at Trout Creek Confluence	COLD-00	Cold Creek at Mouth	COLD3, COLD-01
	Cold below Pioneer Trail	COLD-01	Cold Creek above Pioneer	COLD-02, COLD2-01, COLD2
	Cold above Pioneer Trail	COLD-02	Cold above Cattleman's Ranch	COL-01, COLD1, COLD-00

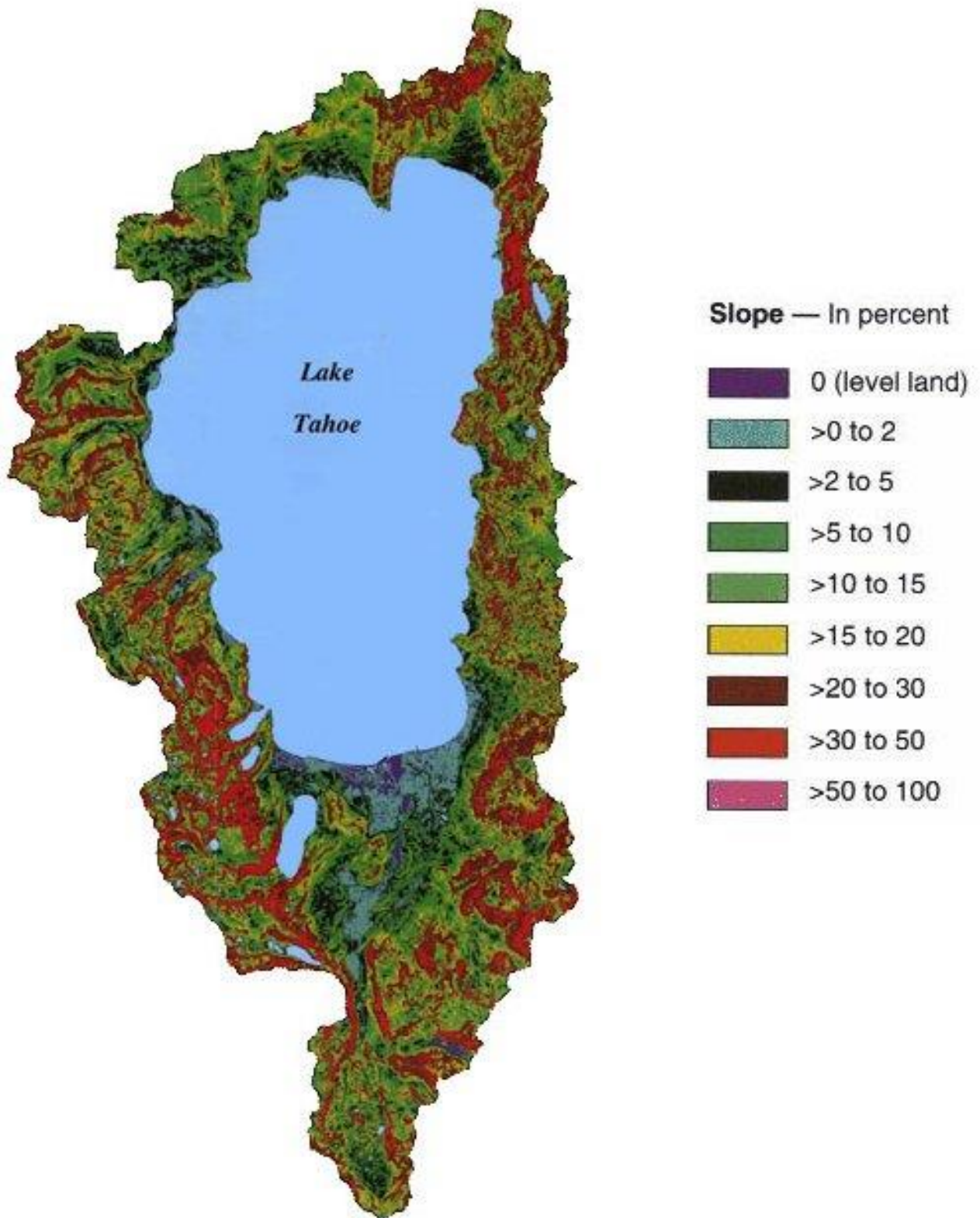
Eagle Falls	Eagle Falls at Mouth	EAGL-00	Eagle Falls at Vikingsholm	
	Eagle Falls above Highway 89	EAGL-01	Eagle Falls below Highway 50 (dangerous for volunteers not to be taken below)	
Edgewood	Edgewood at Mouth	EDGE-00	Edgewood Creek at Edgewood	
	Edgewood above Highway 50	EDGE-01		
Heavenly Creek	Heavenly at Trout Creek Confluence	HEAV-00	Heavenly Creek above Trout Creek	
	Heavenly above Pioneer Trail	HEAV-01	Heavenly Creek near Chinquapin St., Heavenly Creek at Verdon Rd.	HEAV-02, HEAV2-01, HEAV2
McFaul	McFaul at Mouth	MCFA-00		
	McFaul below Highway 50	MCFA-01		
Mixed Lakes	Ski Run Marina	SLAKE-1		TAH-SHORE
	Timber Cove	SLAKE-3		
	Regean Beach	SLAKE-4		
	Nevada Beach	SLAKE-5	Change Cover to Nevada Beach	
	Kahle Beach	SLAKE-6		SLAKE-5
	Roundhill Pines	SLAKE-7		SLAKE-E5
Meeks Creek	Meeks at Mouth	MEEK-00	Meek at confluence with lake	MEEK-01
	Meeks at Meadow	MEEK-01	Meeks above Highway 89, Meeks below	MEEK-03, MEEK-02
Tallac Creek	Tallac at Mouth	TALL-00		
	Tallac above Highway 89	TALL-01	Tallac Creek upstream of Highway 89	TALL, TALL-00
	Tallac above Spring Creek Road	TALL-02		
Keys Marina	Cove East	COVE-00	Marina Slip #65, East Channel, Tahoe Keys Cove 5	
	Tahoe Keys West Channel	KEYS-00	Tahoe Keys Marina	KEYS, KEYS-02
	Tahoe Keys LS Home	KEYS-01	Aloha Drive, Emerald Drive	KEYS2, KEYS1, KEYS, KEYS-00
Taylor Creek	Taylor at Mouth	TALR-00		
	Taylor above Highway 89	TALR-02	Taylor Creek at Highway 89	TALR-1, TALR, TALR-00

Taylor Creek (Continued)	Fallen Leaf Lake	FLLF-01	Fallen Leaf Lake 200yrds off Standford Camp	FLLF-00
	Glen Alpine at Fallen Leaf Lake	GLEN-00	Glen Alpine Creek at Mouth	GLNA-00, GLNA-01
Trout Creek	Trout at Mouth	TROU-00	(only if creek has created its own mouth to the lake)	
	Trout at Upper Truckee/Bellevue	TROU-01	Trout Creek behind LTCC, Trout Creek at Highway 50,	TROU-1, TROU-00, TROU-02
	Trout at Grinding Stone	TROU-02	Upper Truckee near Carrows	TROU-06, TROU-07, TCCC2, TCC1, TROU-02
	Trout at Saxon Creek Confluence	TROU-03	Trout Creek South of Pioneer, Trout Creek at Restoration Project, Trout Creek at Blackbart bridge	TROU-09, TROU-10, TCSP, TCCC1
Upper Truckee River	U. Truckee at Mouth	TRMO-00	Upper Truckee River at Cove East	TRMO
	U. Truckee below Lake Tahoe Blvd.	TR10-01	U. Truckee River below Highway 50	TRMO-01
	U. Truckee at Airport	TR15-02	U. Truckee behind Airport	
	U. Truckee at Elks Club	TR20-01		TR20-30, TR20-02, TR20-03
	U. Truckee at Washoe Meadows	TR30-04	U. Truckee River Meyers and Washoe, Paradise Park	
	U. Truckee River at Christmas Valley	XMAS-01		XMAS
Zephyr	North Zephyr	NZHR-00		
	South Zephyr	SZHR-00		

# Appendix C



- EXPLANATION**
- Metamorphic
  - Granitic
  - Volcanic
  - Unconsolidated
  - Boundary of Lake Tahoe Basin
  - Boundary of subbasin



Maps borrowed from the USGS; <http://tahoe.usgs.gov/maps.html>

## Appendix D

### Total Number of Years Sampled per Constituent

	Temperature	Dissolved Oxygen	pH	Turbidity	Fecal Coliform	Total Dissolved Nitrogen	Total Phosphorous	Soluble Reactive Phosphorous	Average # of Years Sampled
SLT-ANG1-01	5	4	5	4	1	2	1	2	3.0
SLT-ANG1-02	11	9	10	10	5	7	6	8	8.3
SLT-ANG2-01	10	9	10	6	5	7	7	7	7.6
SLT-ANG3-00	10	8	10	9	7	7	6	7	8.0
SLT-BJCR-00	5	3	4	2	2	5	5	5	3.9
SLT-BJCR-01	2	1	3	4	1	1	1	1	1.8
SLT-BJCR-02	3	1	3	2	--	1	1	1	1.7
SLT-BPDR-00	3	--	3	3	1	2	2	2	2.3
SLT-BPDR-01	12	5	12	7	7	6	5	6	7.5
SLT-BPDR-02	9	6	11	8	5	9	9	11	8.5
SLT-BPDR-03	7	--	--	--	--	--	--	--	7.0
SLT-BURK-00	12	10	12	7	9	9	8	9	9.5
SLT-BURK-02	7	7	6	8	5	6	5	6	6.3
SLT-CASC-00	8	7	8	5	5	5	4	5	5.9
SLT-CASC-01	7	7	6	7	5	3	2	3	5.0
SLT-COLD-00	4	5	4	3	4	5	4	5	4.3
SLT-COLD-01	5	4	2	4	2	3	2	3	3.1
SLT-COLD-02	9	6	6	7	4	4	4	4	5.5
SLT-COVE-00	12	11	10	10	6	6	6	6	8.4
SLT-EAGL-00	5	5	5	4	4	3	2	3	3.9
SLT-EAGL-01	5	4	5	5	1	2	2	2	3.3
SLT-EDGE-00	5	3	4	5	3	5	5	5	4.4
SLT-EDGE-01	1	1	1	1	--	1	1	1	1.0
SLT-FLLF-01	11	11	11	7	4	6	4	5	7.4
SLT-GLEN-00	13	11	13	9	6	8	4	5	8.6
SLT-HEAV-00	11	10	11	7	7	10	10	10	9.5
SLT-HEAV-01	9	8	9	7	4	5	4	5	6.4
SLT-KEYS-00	8	8	7	6	6	3	3	3	5.5
SLT-KEYS-01	--	2	2	2	--	2	2	2	2.0
SLT-KEYS-02	2	--	--	--	--	--	--	--	2.0
SLT-MCFA-00	5	4	5	4	5	5	5	5	4.8
SLT-MCFA-01	1	1	1	--	1	1	1	1	1.0
SLT-MEEK-00	10	9	11	7	6	11	10	10	9.3
SLT-MEEK-01	4	5	4	6	4	5	4	6	4.8
SLT-MEEK-02	4	--	--	--	--	--	--	--	4.0
SLT-NZHR-00	12	8	11	8	5	4	3	4	6.9
SLT-SZHR-00	11	9	10	10	10	11	10	11	10.3
SLT-TALL-00	10	11	11	8	5	9	8	9	8.9
SLT-TALL-01	3	2	2	2	1	3	3	3	2.4
SLT-TALL-02	1	1	1	1	--	--	--	--	1.0
SLT-TALR-00	10	11	11	7	6	11	8	8	9.0
SLT-TALR-02	3	1	2	2	--	3	3	3	2.4
SLT-TR10-01	8	6	6	7	4	2	2	2	4.6
SLT-TR10-02	4	4	2	4	2	1	1	1	2.4
SLT-TR15-02	3	2	3	2	1	1	1	1	1.8
SLT-TR20-01	11	9	10	7	4	7	6	7	7.6
SLT-TR30-04	4	5	5	4	4	4	3	4	4.1
SLT-TRMO-00	10	10	8	9	8	10	9	10	9.3
SLT-TROU-00	8	8	7	6	5	6	5	7	6.5
SLT-TROU-01	6	6	6	5	3	5	5	5	5.1
SLT-TROU-02	6	6	5	6	2	4	3	4	4.5
SLT-TROU-03	2	3	3	2	1	1	1	1	1.8
SLT-1MAS-01	7	4	5	6	1	3	3	3	4.0
TAH-SLAKE-01	7	5	7	4	5	5	4	5	5.3
TAH-SLAKE-02	1	--	--	--	--	--	--	--	1.0
TAH-SLAKE-03	6	6	6	3	4	5	2	3	4.4
TAH-SLAKE-04	4	3	4	1	2	2	2	2	2.5
TAH-SLAKE-05	2	1	2	1	1	1	1	1	1.3
TAH-SLAKE-06	4	3	4	4	3	2	1	2	2.9
TAH-SLAKE-07	2	1	2	1	--	2	1	0	1.3

## Sites Sampled per Year for Temperature

	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	# of Years Sampled
SLT-ANG1-01					X		X	X	X					X	5
SLT-ANG1-02			X	X	X	X	X		X	X	X	X	X	X	11
SLT-ANG2-01	X	X	X	X		X		X	X		X	X	X		10
SLT-ANG3-00		X	X	X			X	X	X	X		X	X	X	10
SLT-BJCR-00			X	X	X	X					X				5
SLT-BJCR-01			X		X										2
SLT-BJCR-02			X		X	X									3
SLT-BPDR-00			X	X	X										3
SLT-BPDR-01			X	X	X	X	X	X	X	X	X	X	X	X	12
SLT-BPDR-02					X	X	X	X	X	X	X	X	X		9
SLT-BPDR-03			X	X	X	X	X	X	X						7
SLT-BURK-00			X	X	X	X	X	X	X	X	X	X	X	X	12
SLT-BURK-02	X	X		X					X	X			X	X	7
SLT-CASC-00			X		X			X	X		X	X	X	X	8
SLT-CASC-01		X		X						X	X	X	X	X	7
SLT-COLD-00							X			X			X	X	4
SLT-COLD-01		X	X	X								X		X	5
SLT-COLD-02	X	X	X	X				X	X		X	X	X		9
SLT-COVE-00	X	X	X	X	X	X	X	X	X	X	X		X		12
SLT-EAGL-00			X								X	X	X	X	5
SLT-EAGL-01				X	X			X	X	X					5
SLT-EDGE-00	X	X	X	X	X										5
SLT-EDGE-01					X										1
SLT-FLLF-01	X	X	X	X	X	X	X	X	X				X	X	11
SLT-GLEN-00	X	X	X	X	X	X	X	X	X		X	X	X	X	13
SLT-HEAV-00		X		X	X	X	X	X	X	X	X	X	X		11
SLT-HEAV-01				X	X		X		X	X	X	X	X	X	9
SLT-KEYS-00	X			X	X	X	X			X	X	X			8
SLT-KEYS-02		X	X												2
SLT-MCFA-00			X	X	X	X	X								5
SLT-MCFA-01						X									1
SLT-MEEK-00			X	X	X			X	X	X	X	X	X	X	10
SLT-MEEK-01		X								X			X	X	4
SLT-MEEK-02									X	X		X	X		4
SLT-NZHR-00		X	X	X	X	X	X	X		X	X	X	X	X	12
SLT-SZHR-00			X	X	X	X	X			X	X	X	X	X	11
SLT-TALL-00			X	X	X	X			X	X	X	X	X	X	10
SLT-TALL-01		X						X	X						3
SLT-TALL-02										X					1
SLT-TALR-00			X	X	X	X			X	X	X	X	X	X	10
SLT-TALR-02	X	X						X							3
SLT-TR10-01			X	X	X				X	X	X	X	X		8
SLT-TR10-02	X	X	X	X											4
SLT-TR15-02	X								X	X					3
SLT-TR20-01	X	X				X	X	X	X	X	X	X	X	X	11
SLT-TR30-04										X	X	X	X		4
SLT-TRMO-00	X			X	X	X		X	X	X		X	X	X	10
SLT-TROU-00				X		X		X	X	X	X	X		X	8
SLT-TROU-01	X		X					X	X		X		X		6
SLT-TROU-02	X	X	X		X								X	X	6
SLT-TROU-03	X	X													2
SLT-1MAS-01	X	X	X	X	X	X	X								7
TAH-SLAKE-01	X				X				X		X	X	X	X	7
TAH-SLAKE-02					X										1
TAH-SLAKE-03				X		X				X	X	X		X	6
TAH-SLAKE-04					X	X					X	X			4
TAH-SLAKE-05					X							X			2
TAH-SLAKE-06				X							X		X	X	4
TAH-SLAKE-07						X			X						2
<b>Total Sites Sampled</b>	<b>18</b>	<b>21</b>	<b>30</b>	<b>33</b>	<b>34</b>	<b>26</b>	<b>18</b>	<b>23</b>	<b>31</b>	<b>28</b>	<b>29</b>	<b>30</b>	<b>32</b>	<b>27</b>	<b>380</b>

### Sites Sampled per Year for Dissolved Oxygen

	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	# of Years Sampled
SLT-ANG1-01							X	X	X					X	4
SLT-ANG1-02			X			X	X		X	X	X	X	X	X	9
SLT-ANG2-01	X	X	X			X	X		X	X	X	X	X	X	9
SLT-ANG3-00			X				X		X	X	X	X	X	X	8
SLT-BJCR-00				X		X					X				3
SLT-BJCR-01							X								1
SLT-BJCR-02						X									1
SLT-BPDR-01									X	X	X	X		X	5
SLT-BPDR-02						X	X		X	X	X	X			6
SLT-BURK-00			X		X	X	X	X	X	X	X	X	X		10
SLT-BURK-02	X			X			X		X	X			X	X	7
SLT-CASC-00			X					X	X		X	X	X	X	7
SLT-CASC-01		X					X			X	X	X	X	X	7
SLT-COLD-00							X	X		X			X	X	5
SLT-COLD-01		X	X									X		X	4
SLT-COLD-02		X	X						X		X	X	X		6
SLT-COVE-00	X	X	X	X		X	X	X	X	X	X		X		11
SLT-EAGL-00			X								X	X	X	X	5
SLT-EAGL-01							X	X	X	X					4
SLT-EDGE-00		X	X		X										3
SLT-EDGE-01					X										1
SLT-FLLF-01	X	X	X	X	X	X	X	X	X				X	X	11
SLT-GLEN-00	X		X	X	X	X	X	X	X			X	X	X	11
SLT-HEAV-00		X			X	X	X	X	X	X	X	X	X	X	10
SLT-HEAV-01					X		X		X	X	X	X	X	X	8
SLT-KEYS-00	X		X	X			X			X	X	X			7
SLT-KEYS-01					X	X									2
SLT-MCFA-00			X	X		X	X								4
SLT-MCFA-01						X									1
SLT-MEEK-00			X		X	X			X	X	X	X	X	X	9
SLT-MEEK-01		X							X	X		X	X		5
SLT-NZHR-00					X	X	X			X	X	X	X	X	8
SLT-SZHR-00						X	X	X	X	X	X	X	X	X	9
SLT-TALL-00			X	X	X	X	X		X	X	X	X	X	X	11
SLT-TALL-01		X							X						2
SLT-TALL-02										X					1
SLT-TALR-00			X	X	X	X	X		X	X	X	X	X	X	11
SLT-TALR-02								X							1
SLT-TR10-01			X						X	X	X	X	X		6
SLT-TR10-02	X	X	X	X											4
SLT-TR15-02									X	X					2
SLT-TR20-01	X					X		X	X	X	X	X	X	X	9
SLT-TR30-04										X	X	X	X	X	5
SLT-TRMO-00	X					X	X	X	X	X	X	X	X	X	10
SLT-TROU-00					X	X	X	X	X	X	X	X		X	8
SLT-TROU-01	X		X					X	X		X		X		6
SLT-TROU-02	X	X	X		X								X	X	6
SLT-TROU-03	X	X				X									3
SLT-XMAS-01	X		X			X	X								4
TAH-SLAKE-01									X		X	X	X	X	5
TAH-SLAKE-03				X		X				X	X	X		X	6
TAH-SLAKE-04						X					X	X			3
TAH-SLAKE-05												X			1
TAH-SLAKE-06											X		X	X	3
TAH-SLAKE-07									X						1
<b>Total Sites Sampled</b>	13	13	22	11	13	25	25	15	30	27	30	30	29	26	309

## Sites Sampled per Year for pH

	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	# of Years Sampled
SLT-ANG1-01					X		X	X	X					X	5
SLT-ANG1-02		X	X		X	X	X		X	X	X	X	X		10
SLT-ANG2-01	X		X	X		X	X	X	X		X	X	X		10
SLT-ANG3-00		X	X	X		X	X		X	X		X	X	X	10
SLT-BJCR-00			X		X	X					X				4
SLT-BJCR-01		X	X		X										3
SLT-BJCR-02			X		X	X									3
SLT-BPDR-00			X	X	X										3
SLT-BPDR-01			X	X	X	X	X	X	X	X	X	X	X	X	12
SLT-BPDR-02			X	X	X	X	X	X	X	X	X	X	X		11
SLT-BURK-00			X	X	X	X	X	X	X	X	X	X	X	X	12
SLT-BURK-02	X			X					X	X			X	X	6
SLT-CASC-00			X		X			X	X		X	X	X	X	8
SLT-CASC-01				X						X	X	X	X	X	6
SLT-COLD-00							X			X			X	X	4
SLT-COLD-01												X		X	2
SLT-COLD-02	X		X						X		X	X	X		6
SLT-COVE-00		X	X	X	X	X	X		X	X	X		X		10
SLT-EAGL-00			X								X	X	X	X	5
SLT-EAGL-01				X	X			X	X	X					5
SLT-EDGE-00	X		X	X	X										4
SLT-EDGE-01					X										1
SLT-FLF-01	X	X	X	X	X	X	X	X	X				X	X	11
SLT-GLEN-00	X	X	X	X	X	X	X	X	X		X	X	X	X	13
SLT-HEAV-00		X		X	X	X	X	X	X	X	X	X	X		11
SLT-HEAV-01				X	X		X		X	X	X	X	X	X	9
SLT-KEYS-00	X		X	X			X			X	X	X			7
SLT-KEYS-01					X	X									2
SLT-MCFA-00			X	X	X	X	X								5
SLT-MCFA-01					X										1
SLT-MEEK-00			X	X	X	X		X	X	X	X	X	X	X	11
SLT-MEEK-01					X					X		X	X		4
SLT-NZHR-00		X	X	X	X	X	X			X	X	X	X	X	11
SLT-SZHR-00		X	X		X	X	X		X	X	X	X	X		10
SLT-TALL-00			X	X	X	X	X		X	X	X	X	X	X	11
SLT-TALL-01							X	X							2
SLT-TALL-02										X					1
SLT-TALR-00			X	X	X	X	X		X	X	X	X	X	X	11
SLT-TALR-02	X							X							2
SLT-TR10-01			X						X	X	X	X	X		6
SLT-TR10-02	X		X												2
SLT-TR15-02	X								X	X					3
SLT-TR20-01	X	X				X	X		X	X	X	X	X	X	10
SLT-TR30-04									X	X	X	X	X	X	5
SLT-TRMO-00						X		X	X	X	X	X	X	X	8
SLT-TROU-00						X	X		X	X	X	X		X	7
SLT-TROU-01	X		X					X	X		X		X		6
SLT-TROU-02	X		X		X								X	X	5
SLT-TROU-03	X	X				X									3
SLT-XMAS-01	X		X	X	X	X									5
TAH-SLAKE-01	X				X				X		X	X	X	X	7
TAH-SLAKE-03				X	X					X	X	X		X	6
TAH-SLAKE-04					X	X					X	X			4
TAH-SLAKE-05					X							X			2
TAH-SLAKE-06				X							X		X	X	4
TAH-SLAKE-07						X			X						2
<b>Total Sites Sampled</b>	16	11	29	24	32	27	20	16	29	27	30	30	31	25	347

### Sites Sampled per Year for Turbidity

	2001	2002	2003	2004	2005	2007	2009	2010	2011	2012	2013	2014	# of Years Sampled
SLT-ANG1-01					X	X	X					X	4
SLT-ANG1-02		X	X	X	X	X	X	X	X		X	X	10
SLT-ANG2-01	X	X		X		X			X		X		6
SLT-ANG3-00		X	X	X		X	X	X	X		X	X	9
SLT-BJCR-00					X				X				2
SLT-BJCR-01		X	X		X	X							4
SLT-BJCR-02			X		X								2
SLT-BPDR-00			X	X	X								3
SLT-BPDR-01			X	X			X	X	X		X	X	7
SLT-BPDR-02			X	X	X	X	X	X	X		X		8
SLT-BURK-00			X	X	X		X		X		X	X	7
SLT-BURK-02	X	X		X		X	X	X			X	X	8
SLT-CASC-00			X		X		X		X		X		5
SLT-CASC-01		X		X		X		X	X		X	X	7
SLT-COLD-00						X					X	X	3
SLT-COLD-01		X	X	X								X	4
SLT-COLD-02	X	X	X	X			X		X		X		7
SLT-COVE-00	X	X	X	X	X	X	X	X	X		X		10
SLT-EAGL-00			X						X		X	X	4
SLT-EAGL-01				X	X	X	X	X					5
SLT-EDGE-00	X	X	X	X	X								5
SLT-EDGE-01					X								1
SLT-FLLF-01	X	X	X	X		X					X	X	7
SLT-GLEN-00	X	X	X	X	X	X			X		X	X	9
SLT-HEAV-00		X		X	X		X	X	X		X		7
SLT-HEAV-01				X		X	X	X	X		X	X	7
SLT-KEYS-00	X		X	X		X		X	X				6
SLT-KEYS-01		X			X								2
SLT-MCFA-00			X	X	X	X							4
SLT-MEEK-00			X	X			X	X	X		X	X	7
SLT-MEEK-01		X			X			X	X		X	X	6
SLT-NZHR-00			X	X	X	X		X	X		X	X	8
SLT-SZHR-00		X	X	X	X	X		X	X		X	X	10
SLT-TALL-00			X	X		X	X	X	X		X	X	8
SLT-TALL-01		X					X						2
SLT-TALL-02								X					1
SLT-TALR-00			X			X	X	X	X		X	X	7
SLT-TALR-02	X	X											2
SLT-TR10-01			X	X	X		X	X	X		X		7
SLT-TR10-02	X	X	X	X									4
SLT-TR15-02	X							X					2
SLT-TR20-01	X	X					X	X	X		X	X	7
SLT-TR30-04								X	X		X	X	4
SLT-TRMO-00			X	X	X	X	X	X	X		X	X	9
SLT-TROU-00				X		X	X	X	X			X	6
SLT-TROU-01	X		X			X			X		X		5
SLT-TROU-02	X	X	X		X						X	X	6
SLT-TROU-03	X	X											2
SLT-XMAS-01	X	X	X	X	X	X							6
TAH-SLAKE-01	X						X			X		X	4
TAH-SLAKE-03				X				X		X			3
TAH-SLAKE-04									X				1
TAH-SLAKE-05					X								1
TAH-SLAKE-06				X					X		X	X	4
TAH-SLAKE-07							X						1
<b>Total Sites Sampled</b>	17	23	29	31	25	23	25	25	30	2	30	26	286

### Sites Sampled per Year for Fecal Coliform

	2001	2002	2003	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	# of Years Sampled
SLT-ANG1-01													X	1
SLT-ANG1-02									X	X	X	X	X	5
SLT-ANG2-01	X						X			X	X	X		5
SLT-ANG3-00			X				X	X		X	X	X	X	7
SLT-BJCR-00			X							X				2
SLT-BJCR-01			X											1
SLT-BPDR-00			X											1
SLT-BPDR-01							X	X	X	X	X	X	X	7
SLT-BPDR-02							X	X		X	X	X		5
SLT-BURK-00			X	X	X		X	X	X	X		X	X	9
SLT-BURK-02						X		X	X			X	X	5
SLT-CASC-00			X					X		X	X	X		5
SLT-CASC-01						X				X	X	X	X	5
SLT-COLD-00							X		X			X	X	4
SLT-COLD-01											X		X	2
SLT-COLD-02								X		X	X	X		4
SLT-COVE-00	X		X	X			X			X		X		6
SLT-EAGL-00										X	X	X	X	4
SLT-EAGL-01								X						1
SLT-EDGE-00	X		X	X										3
SLT-FLLF-01	X	X										X	X	4
SLT-GLEN-00				X			X	X			X	X	X	6
SLT-HEAV-00				X			X	X	X	X	X	X		7
SLT-HEAV-01										X	X	X	X	4
SLT-KEYS-00	X		X				X		X	X	X			6
SLT-MCFA-00			X	X	X	X	X							5
SLT-MCFA-01				X										1
SLT-MEEK-00			X				X			X	X	X	X	6
SLT-MEEK-01										X	X	X	X	4
SLT-NZHR-00							X			X	X	X	X	5
SLT-SZHR-00			X	X		X	X	X	X	X	X	X	X	10
SLT-TALL-00									X	X	X	X	X	5
SLT-TALL-01							X							1
SLT-TALR-00								X	X	X	X	X	X	6
SLT-TR10-01			X							X	X	X		4
SLT-TR10-02	X		X											2
SLT-TR15-02	X													1
SLT-TR20-01										X	X	X	X	4
SLT-TR30-04										X	X	X	X	4
SLT-TRMO-00			X				X	X	X	X	X	X	X	8
SLT-TROU-00								X	X	X	X		X	5
SLT-TROU-01								X		X		X		3
SLT-TROU-02												X	X	2
SLT-TROU-03	X													1
SLT-XMAS-01			X											1
TAH-SLAKE-01	X							X		X	X		X	5
TAH-SLAKE-03									X	X	X		X	4
TAH-SLAKE-04										X	X			2
TAH-SLAKE-05											X			1
TAH-SLAKE-06										X		X	X	3
<b>Total Sites Sampled</b>	9	1	16	8	2	4	16	16	13	31	29	30	27	202

### Sites Sampled per Year for Total Dissolved Nitrogen

	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	# of Years Sampled
SLT-ANG1-01									X					X	2
SLT-ANG1-02		X					X		X	X		X	X	X	7
SLT-ANG2-01	X	X		X		X	X					X	X		7
SLT-ANG3-00						X	X			X	X	X	X	X	7
SLT-BJCR-00			X	X	X	X					X				5
SLT-BJCR-01			X												1
SLT-BJCR-02						X									1
SLT-BPDR-00				X	X										2
SLT-BPDR-01						X			X	X		X	X	X	6
SLT-BPDR-02				X		X	X	X	X	X	X	X	X		9
SLT-BURK-00				X	X	X			X	X	X	X	X	X	9
SLT-BURK-02	X	X					X		X	X				X	6
SLT-CASC-00									X		X	X	X	X	5
SLT-CASC-01												X	X	X	3
SLT-COLD-00							X	X		X			X	X	5
SLT-COLD-01		X										X		X	3
SLT-COLD-02		X							X			X	X		4
SLT-COVE-00	X	X				X			X		X		X		6
SLT-EAGL-00												X	X	X	3
SLT-EAGL-01							X	X							2
SLT-EDGE-00	X	X		X	X			X							5
SLT-EDGE-01					X										1
SLT-FLLF-01	X	X			X	X							X	X	6
SLT-GLEN-00						X	X	X	X		X	X	X	X	8
SLT-HEAV-00		X		X	X	X		X	X	X	X	X	X		10
SLT-HEAV-01						X	X					X	X	X	5
SLT-KEYS-00	X									X		X			3
SLT-KEYS-01		X				X									2
SLT-MCFA-00				X	X	X	X	X							5
SLT-MCFA-01						X									1
SLT-MEEK-00			X	X	X	X		X	X	X	X	X	X	X	11
SLT-MEEK-01									X	X		X	X	X	5
SLT-NZHR-00				X								X	X	X	4
SLT-SZHR-00		X		X	X		X	X	X	X	X	X	X	X	11
SLT-TALL-00				X	X	X			X	X	X	X	X	X	9
SLT-TALL-01		X						X	X						3
SLT-TALR-00			X	X	X	X	X		X	X	X	X	X	X	11
SLT-TALR-02	X	X						X							3
SLT-TR10-01												X	X		2
SLT-TR10-02	X														1
SLT-TR15-02	X														1
SLT-TR20-01	X	X				X	X					X	X	X	7
SLT-TR30-04											X	X	X	X	4
SLT-TRMO-00	X			X	X	X			X	X	X	X	X	X	10
SLT-TROU-00						X	X	X		X		X		X	6
SLT-TROU-01	X			X					X		X		X		5
SLT-TROU-02	X	X											X	X	4
SLT-TROU-03	X														1
SLT-XMAS-01	X	X	X												3
TAH-SLAKE-01						X			X		X	X		X	5
TAH-SLAKE-03											X	X		X	3
TAH-SLAKE-04						X						X			2
TAH-SLAKE-05												X			1
TAH-SLAKE-06													X	X	2
TAH-SLAKE-07						X			X						2
<b>Total Sites Sampled</b>	15	16	5	15	13	24	14	12	21	16	17	30	29	28	255

### Sites Sampled per Year for Total Phosphorous

	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	# of Years Sampled
SLT-ANG1-01									X						1
SLT-ANG1-02		X					X		X	X		X	X		6
SLT-ANG2-01	X	X		X		X	X					X	X		7
SLT-ANG3-00						X	X			X	X	X	X		6
SLT-BJCR-00			X	X	X	X					X				5
SLT-BJCR-01			X												1
SLT-BJCR-02						X									1
SLT-BPDR-00				X	X										2
SLT-BPDR-01						X			X	X		X	X		5
SLT-BPDR-02				X		X	X	X	X	X	X	X	X		9
SLT-BURK-00				X	X	X			X	X	X	X	X		8
SLT-BURK-02	X	X					X		X	X					5
SLT-CASC-00									X		X	X	X		4
SLT-CASC-01												X	X		2
SLT-COLD-00							X	X		X			X		4
SLT-COLD-01		X										X			2
SLT-COLD-02		X							X			X	X		4
SLT-COVE-00	X	X				X			X		X		X		6
SLT-EAGL-00												X	X		2
SLT-EAGL-01							X	X							2
SLT-EDGE-00	X	X		X	X			X							5
SLT-EDGE-01					X										1
SLT-FLLF-01	X	X				X							X		4
SLT-GLEN-00						X			X			X	X		4
SLT-HEAV-00		X		X	X	X		X	X	X	X	X	X		10
SLT-HEAV-01						X	X					X	X		4
SLT-KEYS-00	X									X		X			3
SLT-KEYS-01		X				X									2
SLT-MCFA-00				X	X	X	X	X							5
SLT-MCFA-01						X									1
SLT-MEEK-00			X	X	X	X		X	X	X	X	X	X		10
SLT-MEEK-01									X	X		X	X		4
SLT-NZHR-00				X								X	X		3
SLT-SZHR-00		X		X	X		X	X	X	X	X	X	X		10
SLT-TALL-00				X	X	X			X	X	X	X	X		8
SLT-TALL-01		X						X	X						3
SLT-TALR-00				X	X	X			X	X	X	X	X		8
SLT-TALR-02	X	X						X							3
SLT-TR10-01												X	X		2
SLT-TR10-02	X														1
SLT-TR15-02	X														1
SLT-TR20-01	X	X				X	X					X	X		6
SLT-TR30-04											X	X	X		3
SLT-TRMO-00	X			X	X	X			X	X	X	X	X		9
SLT-TROU-00						X	X	X		X		X			5
SLT-TROU-01	X			X					X		X		X		5
SLT-TROU-02	X	X											X		3
SLT-TROU-03	X														1
SLT-XMAS-01	X	X	X												3
TAH-SLAKE-01						X			X		X	X			4
TAH-SLAKE-03											X	X			2
TAH-SLAKE-04						X						X			2
TAH-SLAKE-05												X			1
TAH-SLAKE-06													X		1
TAH-SLAKE-07									X						1
<b>Total Sites Sampled</b>	15	16	4	15	12	23	12	11	21	16	16	30	29	0	220

## Sites Sampled per Year for Soluble Reactive Phosphorous

	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	# of Years Sampled
SLT-ANG1-01									X					X	2
SLT-ANG1-02		X					X		X	X		X	X	X	8
SLT-ANG2-01	X	X		X		X	X					X	X		7
SLT-ANG3-00						X	X			X	X	X	X	X	7
SLT-BJCR-00			X	X	X	X					X				5
SLT-BJCR-01			X												1
SLT-BJCR-02						X									1
SLT-BPDR-00				X	X										2
SLT-BPDR-01						X			X	X		X	X	X	6
SLT-BPDR-02				X		X	X	X	X	X	X	X	X		11
SLT-BURK-00				X	X	X			X	X	X	X	X	X	9
SLT-BURK-02	X	X					X		X	X				X	6
SLT-CASC-00									X		X	X	X	X	5
SLT-CASC-01												X	X	X	3
SLT-COLD-00							X	X		X			X	X	5
SLT-COLD-01		X										X		X	3
SLT-COLD-02		X							X			X	X		4
SLT-COVE-00	X	X				X			X		X		X		6
SLT-EAGL-00												X	X	X	3
SLT-EAGL-01							X	X							2
SLT-EDGE-00	X	X		X	X			X							5
SLT-EDGE-01					X										1
SLT-FLLF-01	X	X				X							X	X	5
SLT-GLEN-00						X			X			X	X	X	5
SLT-HEAV-00		X		X	X	X		X	X	X	X	X	X		10
SLT-HEAV-01						X	X					X	X	X	5
SLT-KEYS-00	X									X		X			3
SLT-KEYS-01		X				X									2
SLT-MCFA-00				X	X	X	X	X							5
SLT-MCFA-01						X									1
SLT-MEEK-00			X		X	X		X	X	X	X	X	X	X	10
SLT-MEEK-01									X	X		X	X	X	6
SLT-NZHR-00				X								X	X	X	4
SLT-SZHR-00		X		X	X		X	X	X	X	X	X	X	X	11
SLT-TALL-00				X	X	X			X	X	X	X	X	X	9
SLT-TALL-01		X						X	X						3
SLT-TALR-00				X	X	X			X		X	X	X	X	8
SLT-TALR-02	X	X						X							3
SLT-TR10-01												X	X		2
SLT-TR10-02	X														1
SLT-TR15-02	X														1
SLT-TR20-01	X	X				X	X					X	X	X	7
SLT-TR30-04											X	X	X	X	4
SLT-TRMO-00	X			X	X	X			X	X	X	X	X	X	10
SLT-TROU-00						X	X	X		X		X		X	7
SLT-TROU-01	X			X					X		X		X		5
SLT-TROU-02	X	X											X	X	4
SLT-TROU-03	X														1
SLT-XMAS-01	X	X	X												3
TAH-SLAKE-01						X			X		X	X		X	5
TAH-SLAKE-03											X	X		X	3
TAH-SLAKE-04						X						X			2
TAH-SLAKE-05												X			1
TAH-SLAKE-06													X	X	2
TAH-SLAKE-07															0
<b>Total Sites Sampled</b>	<b>15</b>	<b>16</b>	<b>4</b>	<b>14</b>	<b>12</b>	<b>25</b>	<b>12</b>	<b>12</b>	<b>20</b>	<b>16</b>	<b>16</b>	<b>30</b>	<b>30</b>	<b>28</b>	<b>250</b>

## Appendix E - Site Priority List

The Tahoe RCD developed the following recommendations to prioritize sites for future Snapshot Day events based on the lessons learned while developing the 14-year Snapshot Day report. The purpose is to help guide future Snapshot Day organizers to identify higher priority sites from lower priority sites in order to bring consistency to the database. Higher priority sites are recommended to be monitored yearly to develop the historic database, medium priority sites are recommended to be monitored based on funding and number of volunteers available, followed by lower priority sites. Criteria breakdown is as follows:

(1) High Priority-

- Monitored on average 7+ years
- Mouth sites because of the connectivity to the lake
- High fecal coliform counts-important for health managers
- Site easily accessible to volunteers
- Data stood-out in the 14-year report
- Located in a past or future restoration project area

(2) Medium Priority-

- Monitored on average 4-6 years
- Mouth sites monitored <7 years
- Confluence sites
- Lake Sites (Lake Tahoe Mouths) monitored on average 6+ years
- Site moderately accessible to volunteers

(3) Low Priority-

- Monitored on average <4 years
- Lake Sites (Lake Tahoe Mouths)- Snapshot Day is interested in monitoring what is entering the lake
- High difficulty accessing site
- No real trends identified in the 14-year report

Angora Creek

ANG3-00	Angora at Truckee Confluence	1
ANG2-01	Angora at Washoe Meadows	1
ANG1-01	Angora at View Circle	2
ANG1-02	Angora above Lake Tahoe Blvd.	1

Bijou Park Drainage

BPDR-00	BP Drainage at Mouth	1
BPDR-01	BP Drainage at Werner Salsa Rd.	2
BPDR-02	BP Drainage below Hansen's Resort	2
BPDR-03	BP Drainage at Verdon	3

Bijou Creek

BJCR-00	Bijou at Mouth	1
BJCR-01	Bijou at Fairway	3
BJCR-02	Bijou above Pioneer Trail	3

Burk Creek

BURK-00	Burk at Mouth	1
BURK-02	Burk below Highway 50	2

Cascade Lake

CASC-00	Cascade at Mouth	2
CASC-01	Cascade above Highway 89	2

Cold Creek

COLD-00	Cold Trout Creek Confluence	2
COLD-01	Cold below Pioneer Trail	3
COLD-02	Cold Creek above Pioneer Trail	2

Eagle Falls

EAGL-00	Eagle at Mouth	2
EAGL-01	Eagle above Highway 89	2

Edgewood Creek

EDGE-00	Edgewood at Mouth	1
EDGE-01	Edgewood above Highway 50	3

Heavenly Creek

HEAV-00	Heavenly at Trout Creek Confluence	1
HEAV-01	Heavenly above Pioneer Trail	1

Mixed Lake

SLAKE-1	Ski Run Marina	2
SLAKE-2	Bijou	3
SLAKE-3	Timber Cove	2
SLAKE-4	Regean Beach	3
SLAKE-5	Nevada Beach	3
SLAKE-6	Kahle	2
SLAKE-7	Roundhill Pines	3

Meeks Creek

MEEK-00	Meeks at Mouth	1
MEEK-01	Meeks at Meadow	1

McFaul Creek

MCFA-00	McFaul at Mouth	1
MCFA-01	McFaul below Highway 50	3

Tallac Creek

TALL-00	Tallac at Mouth	1
TALL-01	Tallac above Highway 89	2

TALL-02	Tallac above Spring Creek Road	3
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Keys Marina

COVE-00	Cove East	1
KEYS-00	Keys West Channel	2
KEYS-01	Keys at LS Home	3
KEYS-02	Keys at Aloha Drive	3

Taylor Creek

TALR-00	Taylor at Mouth	1
TALR-02	Taylor above Highway 89	3
FLLF-01	Fallen Leaf Lake	1
GLEN-00	Glen at Fallen Leaf Lake Confluence	1

Trout Creek

TROU-00	Trout at Mouth	1
TROU-01	Trout at U. Truckee Confluence/Bellevue	1
TROU-02	Trout at Grinding Stone	1
TROU-03	Trout at Saxon Creek Confluence	3

Upper Truckee River

TRMO-00	U. Truckee at Mouth	1
TR10-01	U. Truckee below Lake Tahoe Blvd.	1
TR15-02	U. Truckee at the Airport	1
TR20-01	U. Truckee at Elks Club	1
TR30-04	U. Truckee at Washoe Meadows	3
XMAS-01	U. Truckee at Christmas Valley	3

Zephyr Creeks

NZHR-00	North Zephyr Mouth	1
SZHR-00	South Zephyr Mouth	1