12th Annual Snapshot Day,

May 12, 2012

A Lake Tahoe Basin and Truckee River Watershed Citizen Monitoring Event

Introduction

What is Snapshot Day?

Snapshot Day is a two-day, volunteer-based event designed to collect watershed information during one point in time. Volunteer "team leaders" are trained, and these leaders accompany teams of volunteers to various pre-determined sites to collect information relative to the health of our watersheds.

The goals of this effort are two-fold: 1) to promote environmental education and stewardship, and 2) to collect valuable water quality information. While there is a great deal of high quality agency and university-sponsored monitoring taking place in the region, there is still insufficient information to adequately assess the status of all of the aquatic resources in the Truckee River Hydrologic Unit which includes all the Lake Tahoe Basin and Truckee River watersheds. With proper training and quality assurance, community volunteers can help fill this void by providing valuable information for watershed management and pollution prevention.

Some of the objectives of Snapshot Day are:

- Build awareness of water quality issues, aquatic resources and pollution prevention
- Screen for water quality problems, including the identification of sources of pollution and detection of illegal activities (i.e., chemical spills, filling of wetlands, diversions, illicit discharges, destruction of stream environment zones (SEZs), non-compliance with ordinances or regulations in place to protect natural resources, etc.)
- Provide water quality data that may be compared to water quality standards set by the TRPA for the Tahoe Basin, and the States of California and Nevada;
- Provide water quality data that may be used in status and trend analyses;
- Provide some pre and post data for evaluating the effectiveness of restoration activities

It is important to note that citizen monitoring is designed to supplement existing agency monitoring efforts; all information is provided to the regulatory and resource management agencies, whose responsibility it is to protect water quality.

This was the 13th Annual Snapshot Day held May 12, 2012 and includes the entire Truckee River Watershed, from Lake Tahoe to the terminus at Pyramid Lake. This event has been sustained and operated by the dedication of both paid and unpaid staff, the funding of a few grants and donations, but mostly by the commitment of hundreds of citizens who value the public involvement to protect the watershed they live in.

Table 1: Snapshot Day 2012

	Volunteers	Locations
North Shore Lake Tahoe	30	21
South Shore Lake Tahoe	275	35
Middle Truckee River	52	24
Lower Truckee River	354	17
Totals for 2012	**711**	**97**
***excludes duplicate samplers		

This collaborative effort was planned and coordinated by the Truckee River Watershed Council (TRWC), Incline Village General Improvement District (IVGID), the Northern Sierra Region of California Trout (CalTrout), the Tahoe Resource Conservation District (TRCD), Nevada Division of Environmental Protection (NDEP) and the Pyramid Lake Paiute Tribe (PLPT). The list of organizations involved in putting on Snapshot Day 2012 includes:

- Tahoe Water Suppliers Association (TWSA)
- Incline Village General Improvement District (IVGID)
- The City of South Lake Tahoe
- Lahontan Regional Water Quality Control Board
- Lake Tahoe Community College (LTCC)
- Lake Tahoe Unified School District (LTUSD)
- Nevada Division of Environmental Protection (NDEP)
- Nevada Division of State Lands (NDSL)
- Pyramid Lake Paiute Tribe (PLPT)
- Tahoe Regional Planning Agency (TRPA)
- Tahoe Resource Conservation District (TRCD)
- Truckee River Watershed Council (TRWC)
- University of California Berkeley, Sagehen Creek Field Station
- University of California Cooperative Extension (UCCE)
- University of Nevada Cooperative Extension (UNCE)
- University of Nevada Reno (UNR) Electrical Engineering Department
- US Geological Survey, Carnelian Bay Field Station

Lower Truckee River

Education Partners	**Resource Partners**
Stead Elementary	Soil Tech Inc.
Galena High School	NDEP staff
Mountain View Montessori	U.S. Geological Survey
Legacy Christian School	Great Basin Institute
Rainshadow Charter School	WET Laboratory
Washoe Innovation High School	Washoe County School District
Bailey Charter School	Sierra Nevada Journeys
Sage Ridge School	City of Sparks Public Works
Reed High School	UNR Cooperative Extension
Dilworth Middle School	City of Reno Public Works
O'Brien Middle School	The Nature Conservancy
Washoe County On-line School	Pyramid Lake Paiute Tribe
Pyramid Lake High School	NV Dept of Transportation

Snapshot Day is a bi-state event and as such falls under two state-wide citizen-monitoring programs: the California State Regional Water Quality Control Board's (SWQCB) *Clean Water Team*, (http://www.swrcb.ca.gov/water_issues/programs/swamp/cwt_volunteer.shtml) and The Nevada equivalent under *Project Wet* (http://ndep.nv.gov/bwqp/wet01.htm). Through this bi-state collaborative Snapshot Day is able to achieve a larger watershed approach to successful data collection.

Methods of Data Collection

Citizen monitoring "team leaders" are provided training prior to Snapshot Day each year prior to the event. Team leader trainings cover protocols for visual observations, photo-documentation, water quality field measurements (temperature, pH, conductivity, dissolved oxygen), and water sampling (grab samples sent into the laboratory for subsequent analysis of nutrients, coliform, and turbidity). Each monitoring "team leader" is required to attend at least one session prior to the field day. Training for the team leaders is usually taught by the coordinator for that region, with assistance as needed from the cooperating resource and regulatory agencies.

Visual observations and photo-documentation are performed according to the procedures developed by the SWRCB Clean Water Team. The standardized observation form, the *California Stream and Shore Walk Visual Assessment Form*, was slightly revised to better apply to the region. At least three photos are taken at each sampling site (bed conditions, view across stream and view upstream from the starting point); however volunteers are encouraged to photograph as much as possible, especially of team members in the field. All stream-walks are initiated from a downstream position, traveling upstream.

A variety of instruments and kits are used on Snapshot Day by the volunteers. The majority of the monitoring teams are assigned these typical field instruments: armored Envirosafe thermometers (alcohol filled, 0.5° C resolution); standard pH indicator strips (0.5 pH unit resolution) or handheld Hannah pH meters (0.02 unit resolution); hand-held Oakton TDS Tester Conductivity meters (10 µS/cm resolution or Oakton Conductivity Low+ meters (1 µS/cm resolution); and Chemet dissolved oxygen kits (colorimetric, indigo carmine dye reaction, 1 mg/L resolution below 6 mg/L and 2 mg/L resolution above 6 mg/L). A few more

experienced volunteer teams are trained to use Winkler titration kits (0.2 mg/L resolution). Much of the equipment has been purchased though the years with grants or donations, the remainder of the equipment was borrowed from Alpine Watershed Group, CA State Water Resources, LTCC, IVGID, and others. Turbidity meters, to be used at the staging locations, were supplied by TRWC and TRPA. All of the instruments and kits are calibrated and tested/standardized at a quality control session held no sooner than 1 week prior to the event

All observations, photos, field measurements and samples are taken between 9:00 a.m. and 12:00 pm; this maintains the 'Snapshot' aspect of the project. Nutrient and bacteria samples are kept chilled with ice or blue ice in coolers from the point of collection until arrival at the lab for analysis. Any samples submitted past 1:00 pm are evaluated at that time to determine what the value is of samples submitted. Bacteria samples are collected in sterile Whirl-paks and nutrient and turbidity samples were collected in clean (acid rinsed) Nalgene® plastic bottles.

Bacteria samples are then transported from drop off points at Lake Tahoe and Truckee to either the Lahontan Water Quality lab in South Lake Tahoe or the U.S. Geologic Survey in Carnelian Bay. Bacteria samples collected from the Lower Truckee River were transported to the Nevada State Health Laboratory. The need for multiple labs for such a large area is to ensure sample analysis within the allotted 4 hour holding time. Quality assurance is comparable as each lab uses the same method, SM9222 from Standard Methods for Water and Wastewater Analysis, 21 Edition, 2007.

Nutrient samples collected from Lake Tahoe and the Middle Truckee River were delivered to Tahoe Environmental Research Center Laboratory in Incline Village within the allotted hold time, and can be several days as long as they are kept chilled to 4° Celsius. Lower Truckee River nutrient samples were taken to the Nevada State Health Lab for analysis. In past Snapshot Day reports the units for reporting were distinctly separate for the much lower concentrations in the upper watershed (Lake Tahoe through Truckee) and the more heavily developed Reno and Truckee Meadows. However in order to better ensure watershed wide comparability, all nutrient concentrations are shown as milligrams per liter. This also agrees with state standards. Readers are cautioned to note this difference in viewing previous reports.

Water Quality Standards

The US EPA has recommended criteria for nutrients and turbidity, and Nevada, California, and the TRPA have specific water quality standards and indicators generally more stringent in the Lake Tahoe Basin than elsewhere in the watershed. Table 2 lists some of these standards.

Table 2: Examples of Lake Tahoe Water Quality Standards

Parameter	Standard
Temperature	Shall not exceed 15° C, surface waters of Fallen Leaf Lake (CA)
pH	7.0 - 8.4 in Lake Tahoe (CA and NV)
TDS	Shall not exceed 60 mg/L average in Lake Tahoe (CA and NV)
Dissolved Oxygen	Mean no less than 6.5 and minimum of 4.0 mg/L for Lahontan waters designated as "cold freshwater habitat" (CA)
Turbidity	Shallow water shall not exceed 3 NTU near tributaries and 1 NTU not directly influenced by streams (TRPA)
Secchi Depth	December-March average of not less than 33.4 meters for Lake Tahoe (TRPA), and a mean of 18.5 meters for Fallen Leaf Lake (Lahontan Region, CA)
Algae	Lahontan RWQCB waters shall not contain biostimulatory substances (nutrients) that cause algae to become a nuisance or to affect the water's beneficial uses (CA)
Total Nitrogen	Mean of no more than 0.15-19 mg/l (CA)
Inorganic Nitrogen	Mean of no more than 0.025 mg/l for most tributaries to Lake Tahoe, Nevada side of Lake Tahoe (NDEP)
Total Phosphorous	Annual average of no more than 0.05 mg/l for most tributaries, Nevada side of Lake Tahoe and no more than 0.03 mg/l for most tributaries, California side of Lake Tahoe
Soluble Reactive Phosphorous	Mean of no more than .007 mg/l for Lake Tahoe, Nevada side (NDEP)
Fecal Coliform	Log mean of 20 CFU (30 day period) and maximum of 40 CFU, (Lahontan Region, CA)

The selected standards shown in Table 3 are from the Nevada Division of Environmental Protection for the Lower Truckee River watershed.

Table 3. Examples of Nevada State Water Quality Standards for the Truckee River

Parameter	Truckee River at Idlewild (LTR-IDL)	Truckee River at Wadsworth (LTR-WADS)
Temp	≤13º	≤14º
Dissolved Oxygen	≥5 mg/l	≥6 mg/l
pH	6.5-9.0	6.5-9.0
Chlorides	≤250 mg/l	≤250 mg/l
Total Phosphates	Annual average ≤ 0.10 mg/l	Annual average ≤ 0.05 mg/l
Ortho-phosphate	≤0.05 mg/l	NA
Nitrate	≤2.0 mg/l	≤2.0 mg/l
Nitrite	≤0.04 mg/l	≤0.04 mg/l
Total Nitrogen	NA	≤1.2 mg/l
Turbidity	≤10 NTU	≤10 NTU
Fecal coliform	≤200/400[a] No./100ml	≤200/400[a] No./100ml
E. coli	≤410 No./100ml	≤410 No./100ml

[a] Based on the minimum of not less than 5 samples taken over a 30-day period, the fecal coliform bacterial level may not exceed a geometric mean of 200 per 100 ml nor may more than 10 percent of the total samples taken during any 30-day period exceed 400 per 100 ml.

For full and more detailed information on water quality objectives in California refer to the Lahontan Regional Water Quality Control Board *Basin Plan* at the following website: http://www.waterboards.ca.gov/lahontan/BPlan/BPlan_Index.htm. For water quality standards in Nevada see the following website: http://ndep.nv.gov/bwqp/standards.htm. For a .pdf version, visit: http://www.ndep.nv.gov/nac/445a-118.pdf. For the Tahoe Regional Planning Agency (TRPA) water quality standards, see the following website: http://www.trpa.org/Documents.htm and select "Environmental Threshold Carrying Capacities."

Site Locations

It is important to remember that the measurements made on Snapshot Day were designed to represent a single point in time and do not necessarily represent average conditions. The actual monitoring results are complied in Appendix A, which includes both the field measurements collected by volunteers and selected sites for nutrient and bacteria analysis. For a comparison of data from the past 10 years, please refer to the Tahoe Integrated Information Management Systems on-line database and charting tool (www.snapshotday.org).

Volunteers gathered data at 97 locations from the upper watershed of the Truckee River to its terminus at Pyramid Lake.

Lake Tahoe Tributaries, South Shore:

- Angora abv Lake Tahoe Blvd
- Angora blw View Circle
- Angora at LT golf course
- Bijou Park Drainage at Werner Salas
- Bijou Park Drainage b/l Hansen's Resort
- Bijou Park Drainage Verdon
- Burke Creek blw Hwy 50
- Cascade Creek at mouth (at HWY 89?)
- Cold Creek abv Pioneer Trail
- Tahoe Keys Marina Slip 65
- Eagle Creek abr Hwy 89
- Echo Creek at Upper Truckee
- Heavenly Creek nr confluence @ Trout Creek
- Heavenly Creek above Pioneer Trail
- Meeks Creek at mouth
- Meeks Creek abv HWY89
- Meeks Creek Above Meadow
- Saxon Creek abv Trout Creek
- North Zephyr at mouth
- South Zephyr Creek at mouth
- Tallac Creek at mouth
- Tallac Creek upstream of Hwy 89
- Taylor Creek at mouth
- Trout Creek nr confluence w/Upper Truckee
- Trout Creek at Bellevue

- Upper Truckee River at mouth
- Upper Truckee River nr Airport Meadow
- Upper Trockee River at Meyers
- Upper Truckee River nr Carrows
- Tahoe Keys Cove

Lake Tahoe Tributaries, North Shore:

- Bonpland Creek at mouth
- Barton Creek at Star Harbor
- Carnelian Canyon at Hwy 28
- Doller Creek at mouth
- First Creek at mouth
- Griff Creek at mouth
- Lake Forest Creek at mouth
- Madden Creek at mouth
- Marlette Creek at mouth
- Mill Creek blw Lakeshore Dr
- McKinney Creek at mouth
- Quail Creek at mouth
- Secret Harbor Creek at mouth
- Slaughter House at the mouth
- Snow Creek at Mouth
- Hatchery Creek at Star Harbor
- Tahoe City Urban Ditch at lake
- Tunnel Creek at mouth
- Wood Creek at mouth
- Wood Creek at

Truckee River Watershed – Middle Truckee River:

- Alder Creek
- Bear Creek near mouth
- Truckee River in Big Chief Corridor
- Little Truckee River Below Boca Dam
- Cold Creek at Donner Creek
- Davies-Merril Creek
- Deep Creek
- Donner at Highway 89
- Donner at Donner Lake outflow
- East Martis Creek at bridge
- Union Valley Creek
- Martis Creek at Martis Creek Lake
- Martis Creek at COE boundary
- Pole Creek
- Prosser Creek below dam
- Prosser Creek at Hwy 89
- Sagehen Creek at Hwy 89
- Squaw Creek
- Truckee River at Regional Park

- Truckee River near Tahoe City
- Trout Creek Lower near mouth
- Trout Creek at Bennett Flat
- Upper Little Truckee

Truckee River Watershed – Lower Truckee River:

- Hunter Creek
- Evans Creek
- Steamboat Creek at Rhodes Road
- White's Creek
- Galena Creek
- Steamboat Creek at Mira Loma
- Alum Creek
- Dry Creek
- Thomas Creek
- North Truckee Drain
- Truckee River at Rock Park
- Truckee River at McCarran Ranch
- Truckee River at Idlewild Park
- Truckee River above Nixon Bridge
- Truckee River at Wadsworth
- Numana Wetlands
- Pyramid Lake

Results and Discussion

Water temperature for Lake Tahoe and the Truckee River watershed ranged from 23.6° Celsius (C) at Meeks Creek on the west shore to 4°C at Second Creek on the north shore of Lake Tahoe. Generally, cooler water temperatures are considered better habitat for aquatic life in mountain streams and lakes since colder water contains more dissolved oxygen, an essential ingredient for fish and invertebrates. Higher temperatures promote nutrient solubility and can occur as a result of low flow (shallow) conditions, and/or a lack of canopy (vegetation) cover along stream banks, which acts to shade and thus prevent solar heating of the water. For a complete list of water temperatures by site refer to Appendix A.

Figure 1. Water temperature for selected sites in South Lake Tahoe, May 12, 2012.

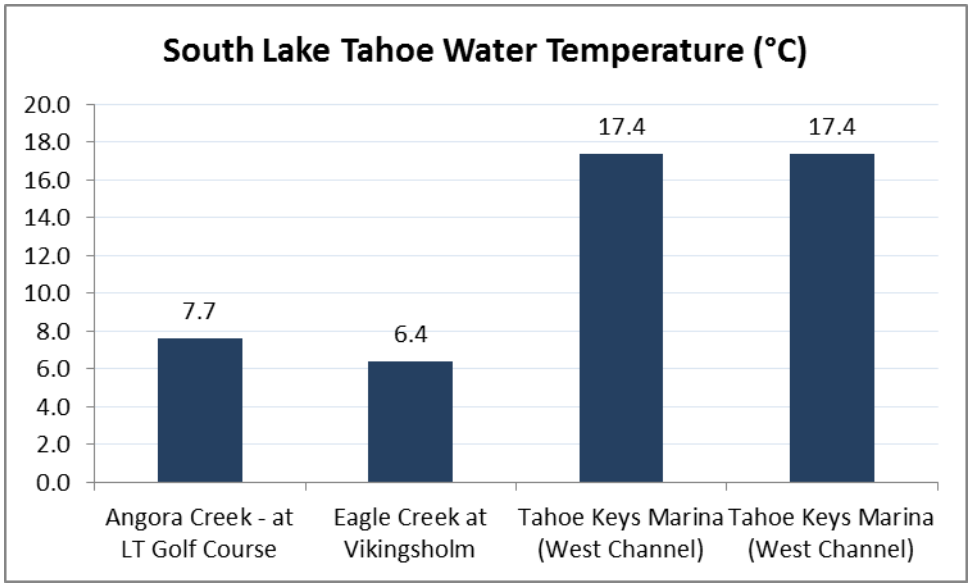


Figure 2. Water temperature for selected sites in North Lake Tahoe, May 12, 2012.

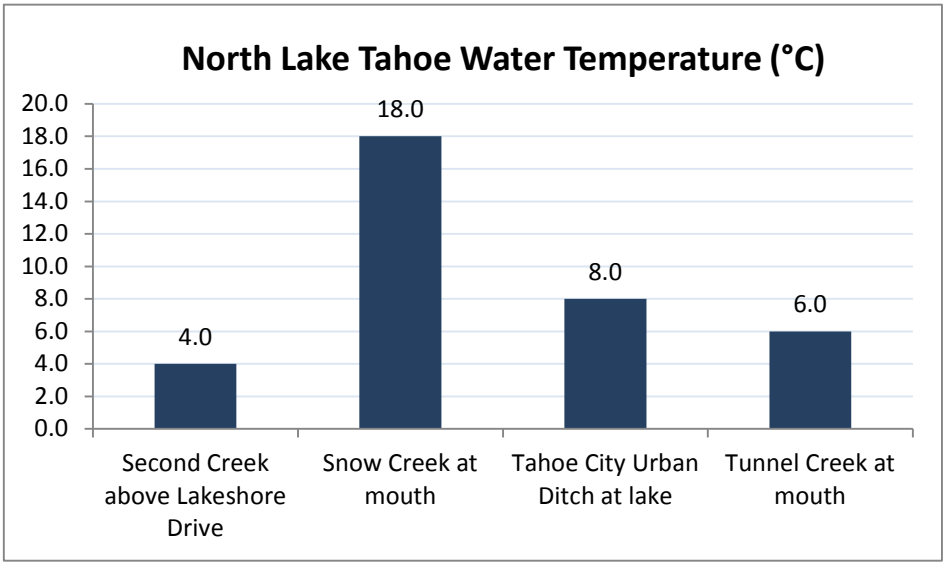


Figure 3. Water temperature for selected site in Middle Truckee River Watershed, May 12, 2012.

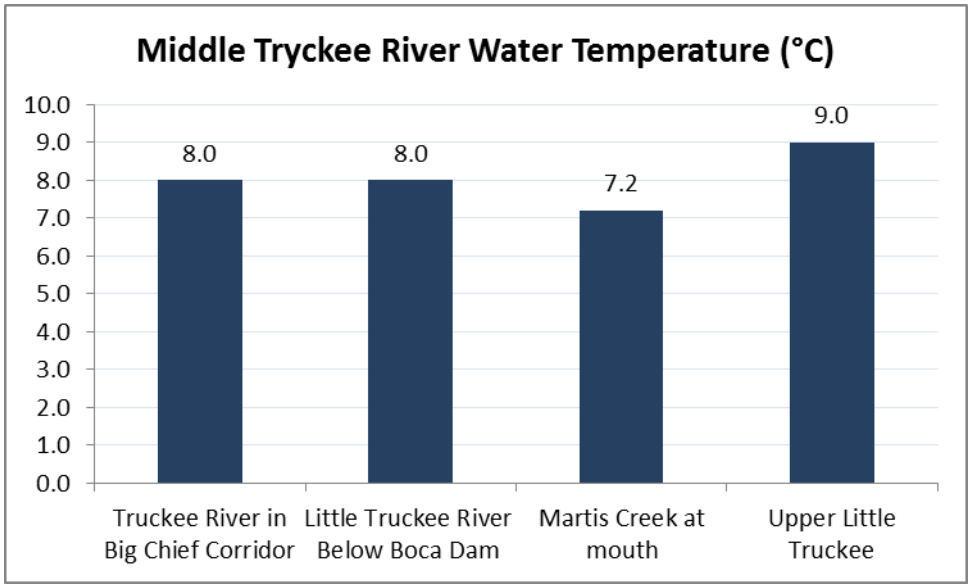
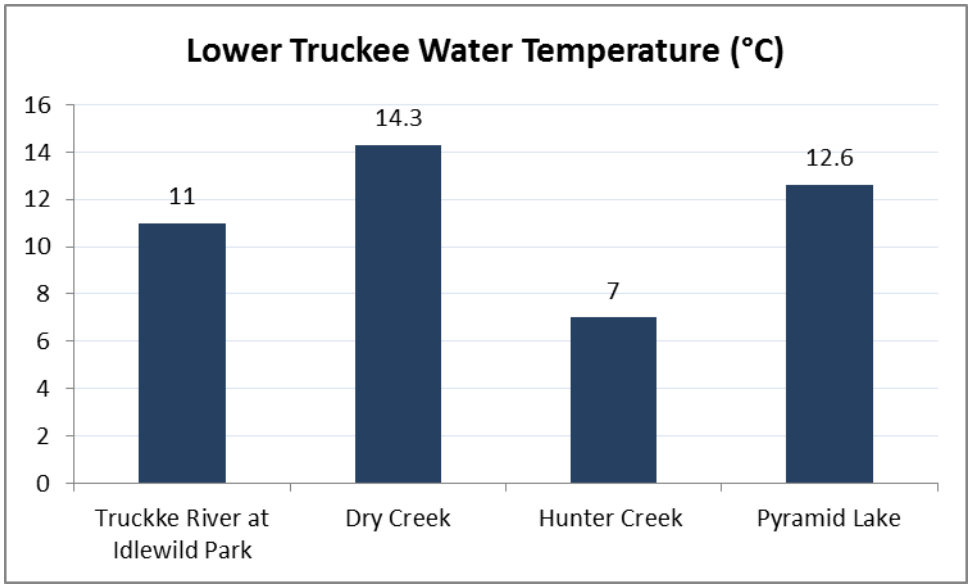


Figure 4. Water temperature for selected site in Lower Truckee River Watershed, May 12, 2012.



In many Sierra streams, propagation of cold-water fish (i.e. trout or salmon) is a designated beneficial use of the water. In such streams, numerical and narrative water quality standards generally are set at levels that will "support the beneficial use" of a cold water fishery. Such streams generally require cooler temperatures (ranges adequate for Rainbow trout survival shown below) and higher dissolved oxygen content than water in streams and lakes that do not have cold-water fishery as a designated beneficial use. Cold-water fish also require habitat characteristics that promote spawning (clear gravel beds, riffles), rearing habitat (glides and pools) and adequate food sources such as macroinvertebrates (mayfly, nymphs, stonefly nymphs, and caddisfly larvae). Such characteristics can be monitored, but they do not usually have numeric standards.

(Note that dissolved oxygen, temperature, total suspended solids (TSS) and turbidity are parameters directly related to habitat for which most waters generally have standards. Because macroinvertebrates are believed to be a primary indicator of stream health as related to fisheries, both LRWQCB and NDEP have developed or are in the process of developing an Index of Biologic Integrity (IBI). These are basically standards for benthic macroinvertebrates.)

Table 4: Beneficial Uses of the State's Waters

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

* The optimum or mean of the range of spawning temperatures reported for the species.
** The upper temperature for successful incubation and hatching reported for the species.
Adapted from EPA's Draft Volunteer Stream Monitoring: A Methods Manual.

All measured pH values fell between 5.0 and 9.2. Several creeks in the lower part of the watershed are slightly below the standards relating to pH; in fresh water, pH in the range of 6.5 to 8.5 should protect most organisms. The high value of 9.2 was from Pyramid Lake, exactly the same as last year. The highest reported value from an upper watershed stream was 8.8 at Burke Creek at the Mouth in the south shore of Lake Tahoe.

Dissolved oxygen measurements ranged between 5.0 and 12 mg/L, most of the data fell within reasonable levels for streams; Tallac Creek at the Mouth and Burke Creek at the mouth each registered at 5.0 mg/L. Cold, clean water usually has levels of dissolved oxygen averaging above 6.0 mg/L, and single-measurement levels below 5 mg/L are considered dangerous for cold water aquatic life. While water quality objectives for dissolved oxygen will vary from region to region, waters that support coldwater fishes usually require that the average dissolved oxygen concentration shall not fall below 6 to 8 mg/L.

Conductivity measurements ranged from 5 to 3,343 µS/cm (micro Siemens per centimeter, the units used for conductivity measurements in fresh water). Generally the highest reading for the area is at Pyramid Lake, a natural alkaline system. Conductivity is used as an indicator of dissolved solids (e.g., minerals or salts); higher levels can be associated with degraded water quality. Anthropogenic sources that may affect conductivity include drainage from agricultural fields, wastewater or stormwater discharge, or inputs stemming from deicing materials on the roadways.

Conductance tends to be lower as water volume increases due to dilution, and generally increases with higher turbidity. The 2012 Snapshot Day occurred during an extremely low water year. but flows at an interval during peak spring run off. (See Figure 4 below).

Turbidity is a measure of the amount of suspended particles in the water. Algae, suspended sediment, organic matter, and some pollutants can cloud the water making it more turbid. If the turbidity is caused by suspended sediment, it can be an indicator of erosion, either natural or man-made. High sediment loads can clog the gills of fish, foul gravel beds and smother fish eggs and benthic insects. The sediment can also carry pathogens, pollutants and nutrients.

The US EPA's recommended criteria for turbidity in streams in Eco-Region II (forested mountains in the western U.S.), is at or below **1.3 NTU** (Nephelometric Turbidity Units) or less (*US EPA Ambient Water Quality Criteria Recommendations).* Higher NTU levels indicate poorer water clarity. TRPA has a near shore turbidity standard of 1-3 NTUs, which is rarely exceeded in the lake. The Lahontan Regional Water Quality Control Board (LRWQCB) has established a standard of 3 NTUs for the Middle Truckee River, as measured by monthly means. The standard for the Truckee River in the State of Nevada is generally 10 NTU (single value measurement).

Valid turbidity data from the grab samples was determined for 97 sites. Values for North Lake Tahoe ranged from a low of 0.16 NTU on the relatively undisturbed Tunnel, to a high of 67 at Lake Forest Creek, which has a major restoration in progress. Middle Truckee River sites ranged from 0.1 at Davies Creek to 1.0 at Union Valley Creek. None of the 23 Middle Truckee River sites had values greater than 3 NTU, which is the CA Standard. All but four of the Lower Truckee River sites were below the Nevada State standard of 10 NTU.

Table 5: Average Turbidity for Snapshot Day by Region

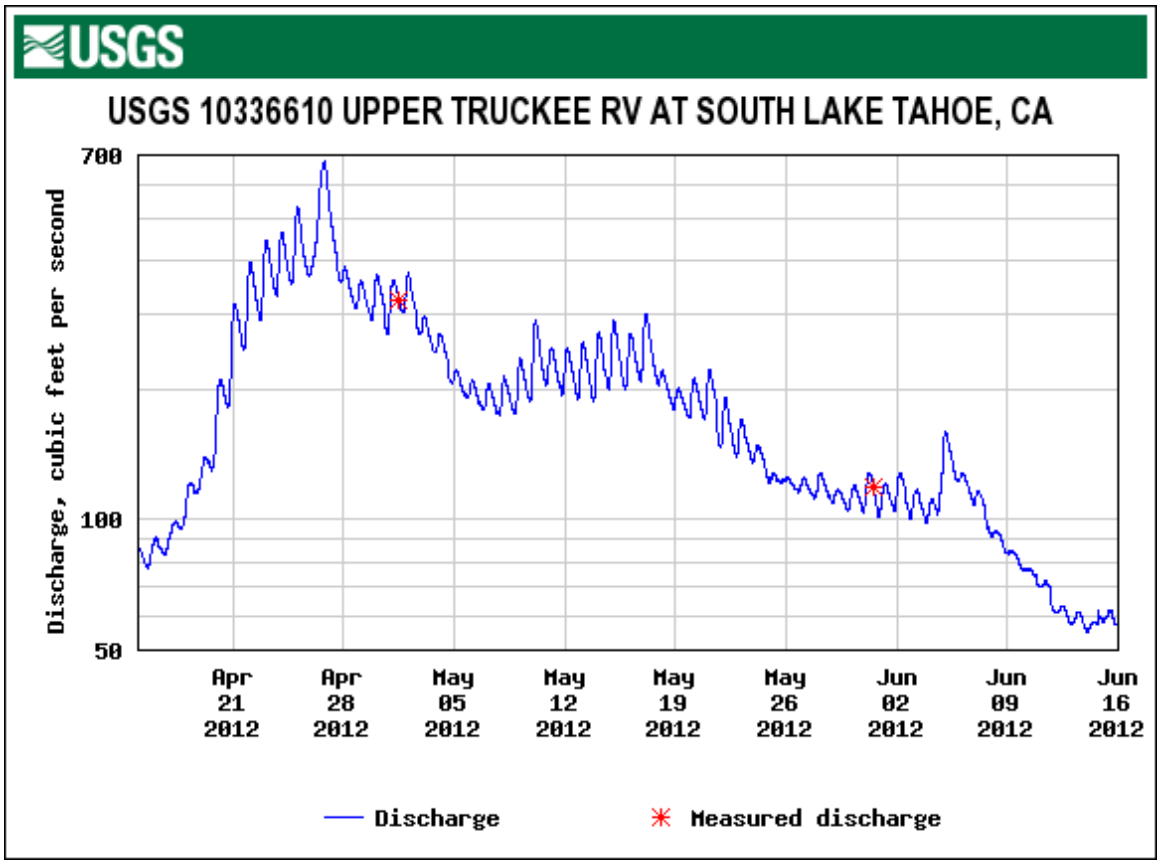
Region	Average turbidity measurement
South Tahoe	1.96
North Tahoe	4.88
Middle Truckee River	0.5
Lower Truckee River	7.75
Watershed average	4.21

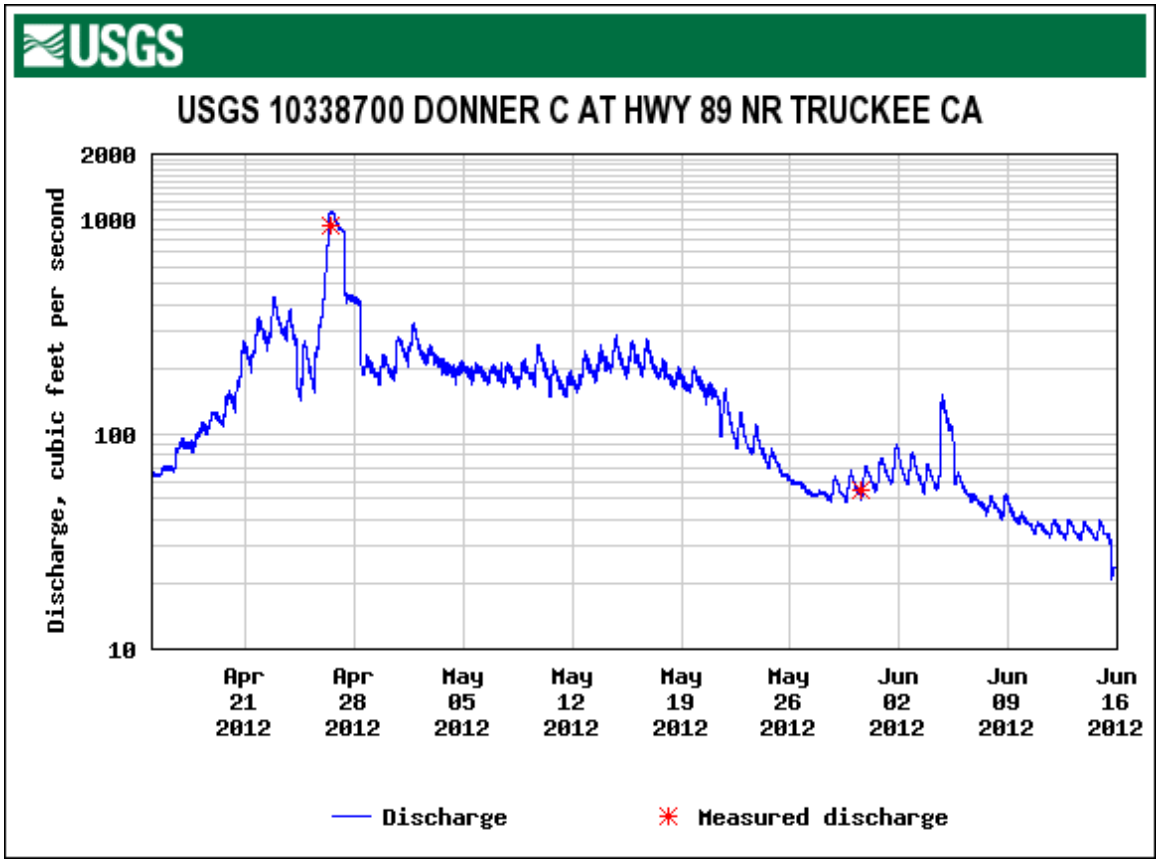
Streamflow is the measurement of how much water is following, which varies with precipitation. One of the major goals of Snapshot Day, besides the public involvement and education, is to gain information on the vast numbers of streams and creeks that are not routinely measured for water quality or streamflow (volume of water). The Tahoe Basin has about 13 streams that are regularly measured out of 64. The Middle and Lower Truckee have even less under regular monitoring. Stream flow data for those sites that are measured was obtained for May 12, 2012 from USGS gaging stations and selected site hydrographs are shown in Figure 2.

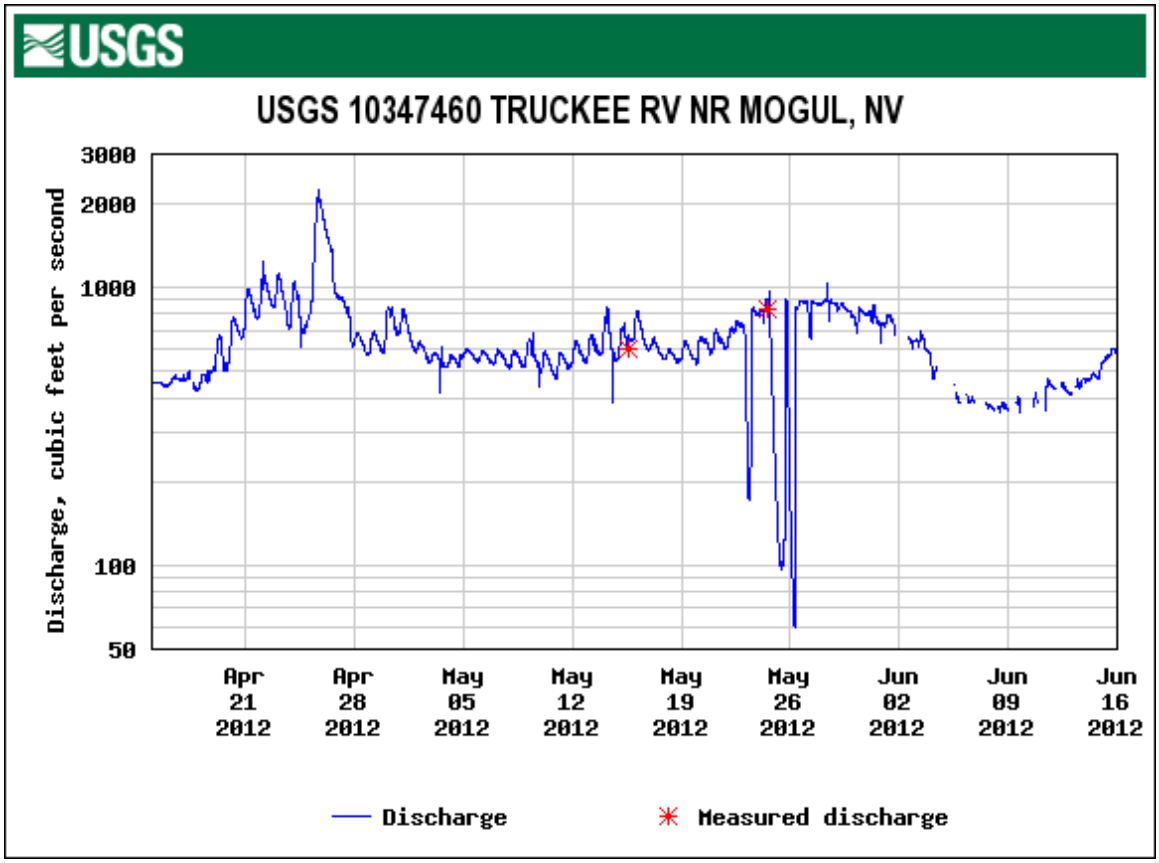
As of May 2012 NRCS Water Supply Outlook Report for the Lake Tahoe Basin was 37 percent, a stark contrast with last years' snowpack. The Truckee River was running at 47 percent of average. Reported precipitation was 112 percent of average in the Tahoe Basin. Reported stream flow forcasts were expected to be far below average for the Lake Tahoe and

Truckee River watershed as of May 1, 2012 despite the high amounts of rainfall that quickly melted the snowpack and decreased river volume later in the season.

Figure 5: Stream Flow of Selected Streams on Snapshot Day. Snapshot Day took place on **May 12th**.




USGS
USGS 10338700 DONNER C AT HWY 89 NR TRUCKEE CA
Discharge, cubic feet per second
2000
1000
100
10
Apr 21 2012
Apr 28 2012
May 05 2012
May 12 2012
May 19 2012
May 26 2012
Jun 02 2012
Jun 09 2012
Jun 16 2012
Discharge
Measured discharge


USGS
USGS 10347460 TRUCKEE RV NR MOGUL, NV
Discharge, cubic feet per second
3000
2000
1000
100
50
Apr 21 2012
Apr 28 2012
May 05 2012
May 12 2012
May 19 2012
May 26 2012
Jun 02 2012
Jun 09 2012
Jun 16 2012
Discharge
Measured discharge

Visual observations at most of the study locations were indicative of generally good water quality conditions. Algae were reported at 28 of the 97 sites. Litter was only reported at 8 sites: three in the north shore including Watson, Second and Wood Creeks; three sites in the south shore including Bijou Park, Meeks Creek, and Cold Creek, and Two in the middle Truckee at Cold Creek at Donnor, and Deep Creek. Five Creeks also indicated as having signs of foam including three in the south shore at Meeks Creek, Bijou Park, and South Upper Truckee (Elks Club), one at Mill Creek and two in the Middle Truckee at East Martis Creek and Bear Creek.

Coliform bacteria all observations, photos, field measurements and samples were taken between 9:00 a.m. and 12:00 pm, this maintains the 'Snapshot' aspect of the project. Nutrient and bacteria samples are kept chilled with ice or blue ice in coolers from the point of collection until arrival at the lab for analysis. Any samples submitted past 1:00 pm are evaluated at that time to determine what the value is of samples submitted. Bacteria samples were collected in sterile Whirl-paks and nutrient and turbidity samples were collected in clean (acid rinsed) Nalgene® plastic bottles.

Bacteria samples were transported from drop off points in South Lake Tahoe and Truckee to either the Lahontan Regional Water Quality Control Board laboratory in South Lake Tahoe or the U.S. Geologic Survey laboratory in Carnelian Bay. Bacteria samples collected from the Lower Truckee River were transported to the Nevada State Health Laboratory. The need for multiple labs for such a large area is to ensure sample analysis within the allotted 6 hour holding time. Quality assurance is comparable as each lab uses the same method, SM9222 from Standard Methods for Water and Wastewater Analysis, 21 Edition, 2007[j].

Coliform bacteria are found in the feces of warm-blooded animals, including humans, pets, livestock, beavers, and birds. Fecal Coliform is measured in colony forming units counted per 100 milliliters of water (CFU/100ml). CFU are roughly equivalent to the number of bacteria cells. The Lahontan Regional Water Quality Control Board standard for fecal coliform is 20 counts per 100 ml for a single occurrence.

There were few hits of bacteria in the upper watersheds. Two sites were above the CA standard (20 colonies/100 ML) at South Zephyr Creek and Burke Creek. South Zephyr Creek is located near a horse-back riding stable and has had numerous violations in the past. Burke Creek is a popular dog walking area and has benefited from a recent Eagle Scout Project that installed a dog waste station near the parking lot. Figure 5 shows a marked improvement in both creeks. Water quality improvement for Burke Creek over the past year could be attributed to the dog waste station.

Figure 6 shows fecal coliform data for two creeks which showed the greatest differences in coliform count between years. Figure 7 shows fecal coliform data for 8 North Lake Tahoe sites that had one or more colony per 100 ml. Figure 8 shows fecal coliform data for 15 of the 48 South Lake Tahoe sites that had one or more colony per 100 ml. The following list of west shore sites had 1 colony per 100 ml:

1. Bear Creek at mouth
2. Donner at Donner Lake outflow
3. Union Valley Creek at SFFCC road
4. Martis Creek at mouth
5. Martis Creek at COE boundary

6. Truckee River at Regional Park
7. Trout Creek at mouth

Lower Truckee River site continue to show some bacteria. The Nevada State standard for E. Coli for is 410 CFU/100 mL (single value measurement) and the only exceedance was at Lower Steamboat Creek, which is below the Truckee Meadows Wastewater Treatment Effluent discharge.

Figure 6: Graph of Fecal Coliform data for North Zephyr Creek and Trout Creek, 2011 & 2012.

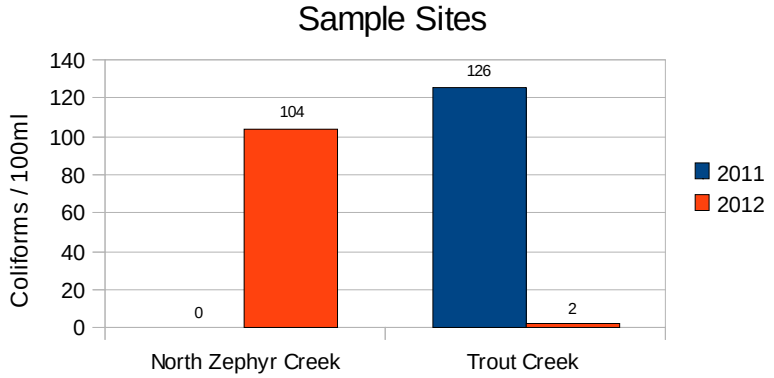


Figure 7: Graph of Fecal Coliform data for eight North Lake Tahoe sites.

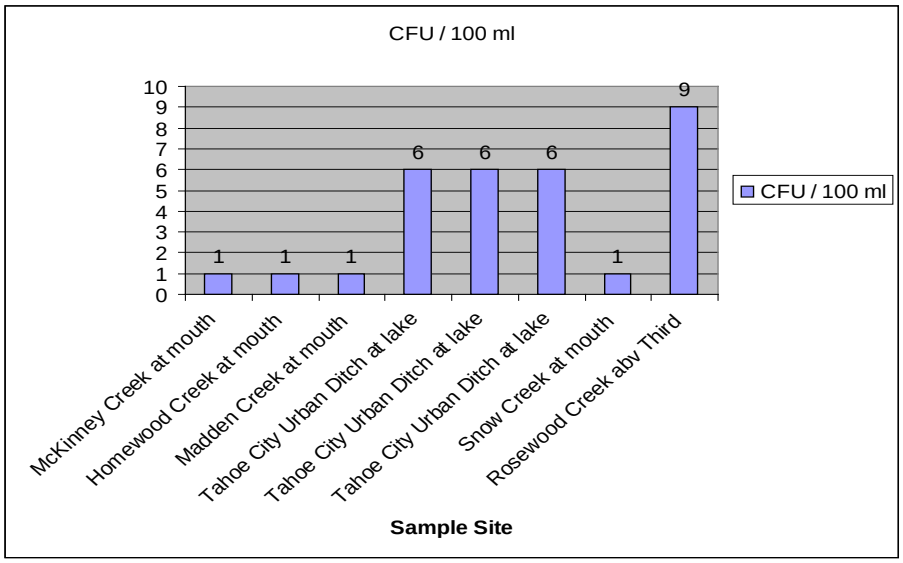
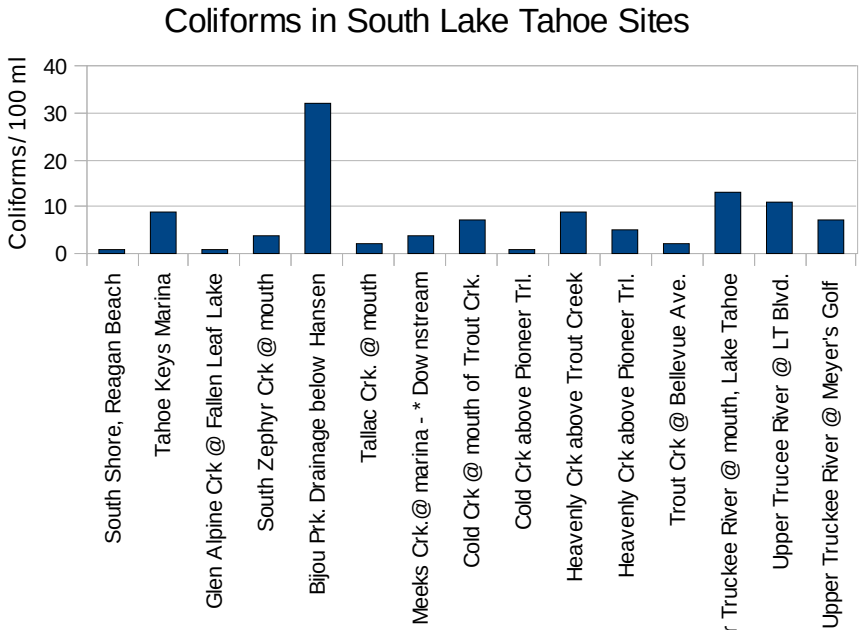


Figure 8: Graph of Fecal Coliform data for 15 South Lake Tahoe sites, 2012.



Nutrients
Sixty samples were analyzed for nitrogen and phosphorus, which are of most concern for algae growth and water clarity. Along with excess algae growth, nutrient concentrations that are too high can lead to odors, discolored waters, loss of clarity, and nighttime oxygen depletion, which can cause fish, kills in extreme cases.

Nitrogen naturally occurs in any watershed but excessive amounts are damaging as stated above. Nitrogen is very mobile so the dissolved portion is generally of more concern.

Phosphorous is a nutrient that stimulates algal growth, and phosphorus pollution has been identified as a serious problem contributing to the degradation of water quality in Lake Tahoe and the Truckee River. Sediment entering streams and the lake from human caused erosion of soil along roads, or from residential or commercial properties, is a common source of phosphorous. As more emphasis is placed on annual loads and TMDLs (Total Maximum Daily Loads), total phosphorous is not as much concern as the soluble and more reactive form that tends to cling to the smallest sediment particles.

The following graphs are created using the selected sites with the most record as described earlier.

Figure 9: Average Nutrients for South Lake Tahoe

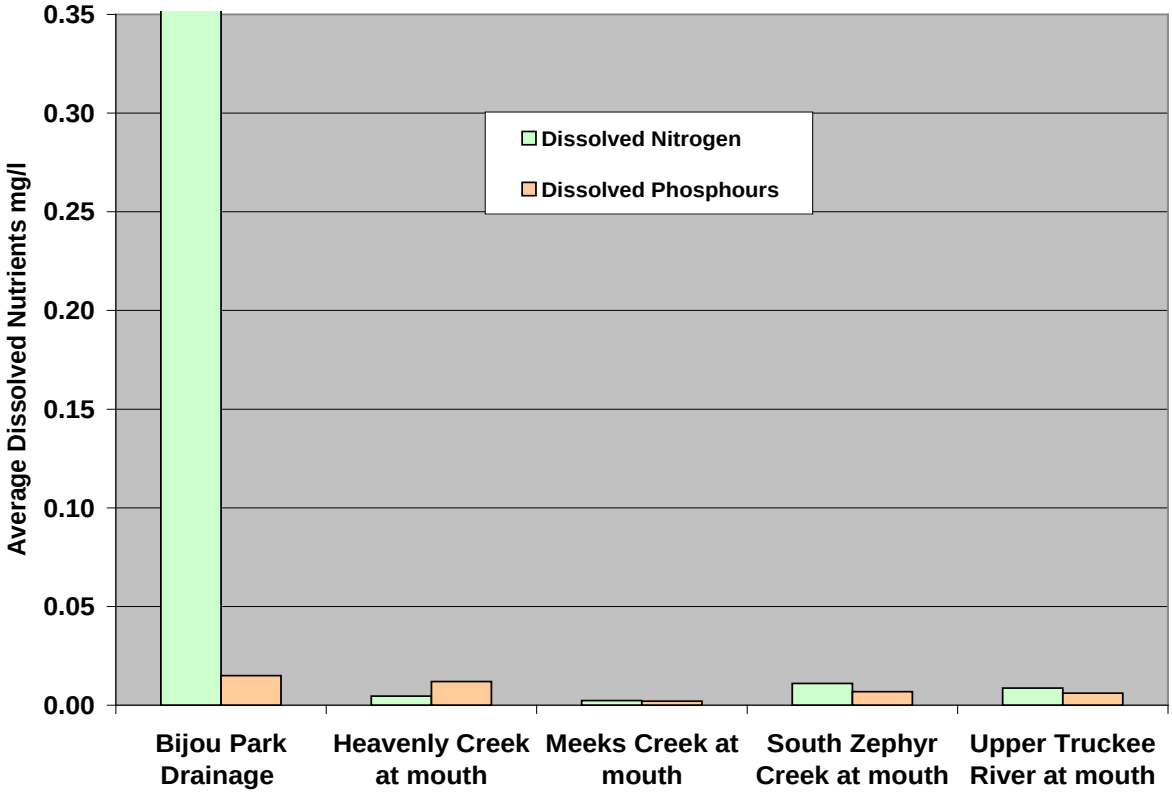


Figure 10: Average Nutrients for North Lake Tahoe

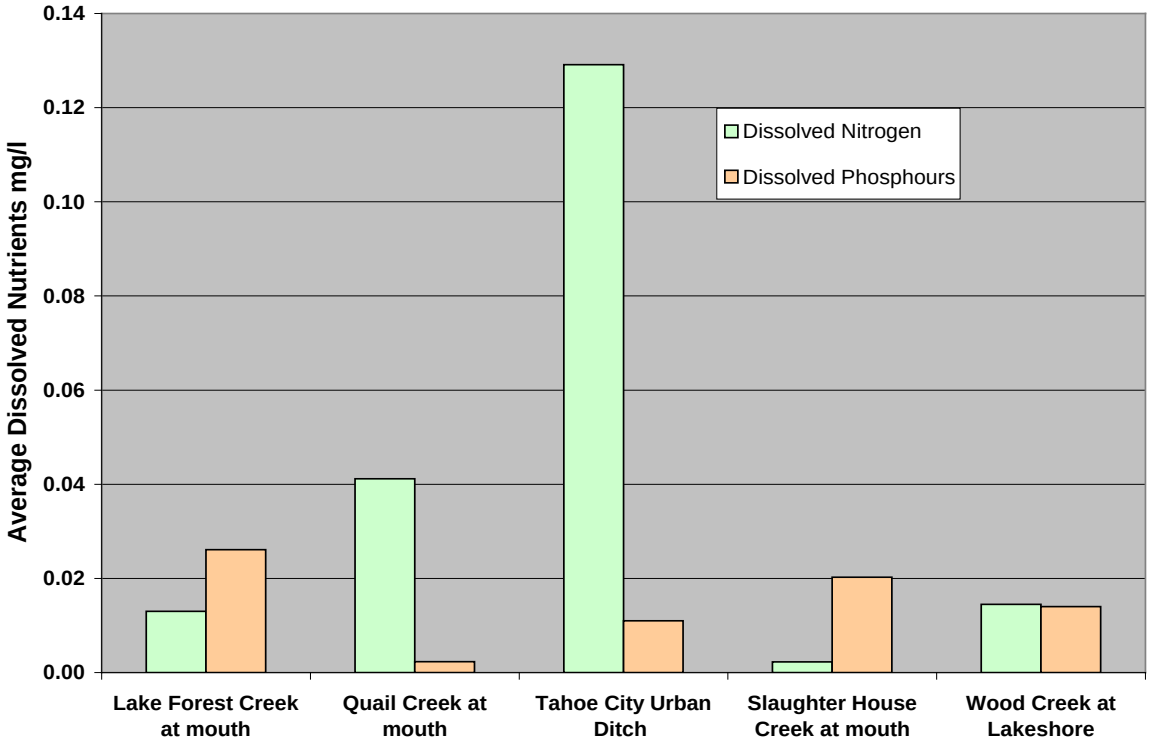


Figure 11: Average Nutrients for Middle Truckee River

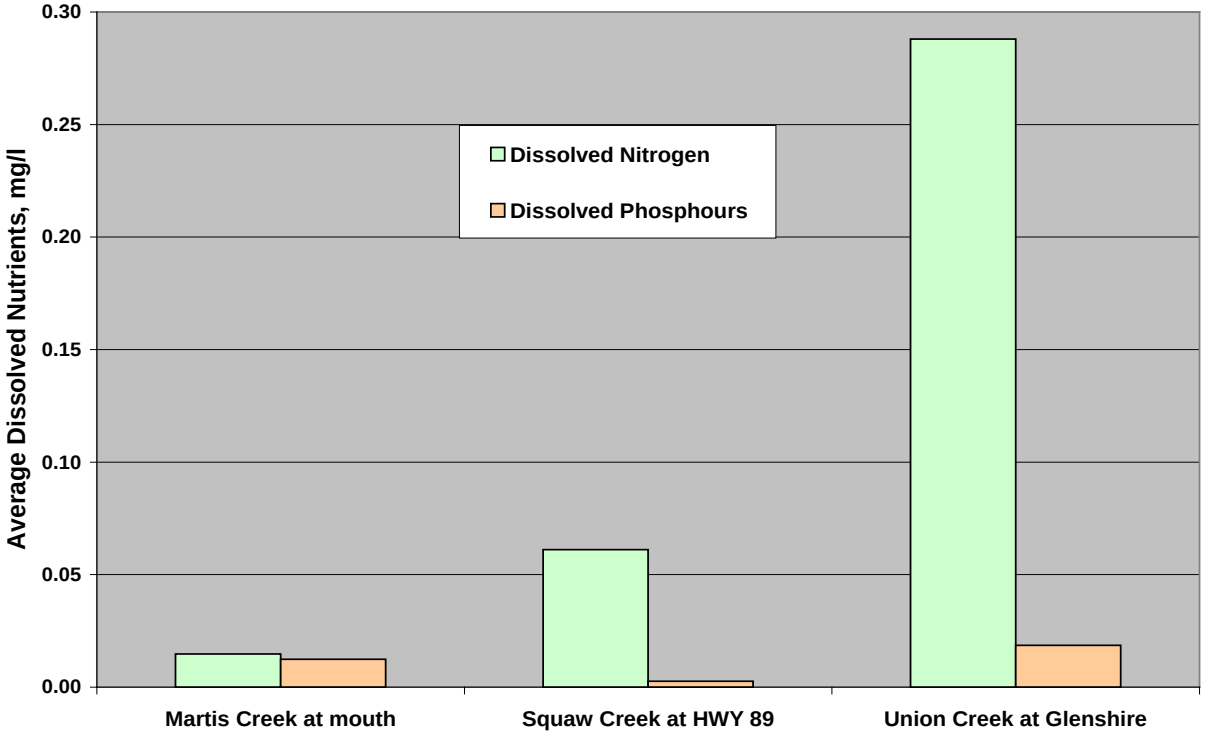
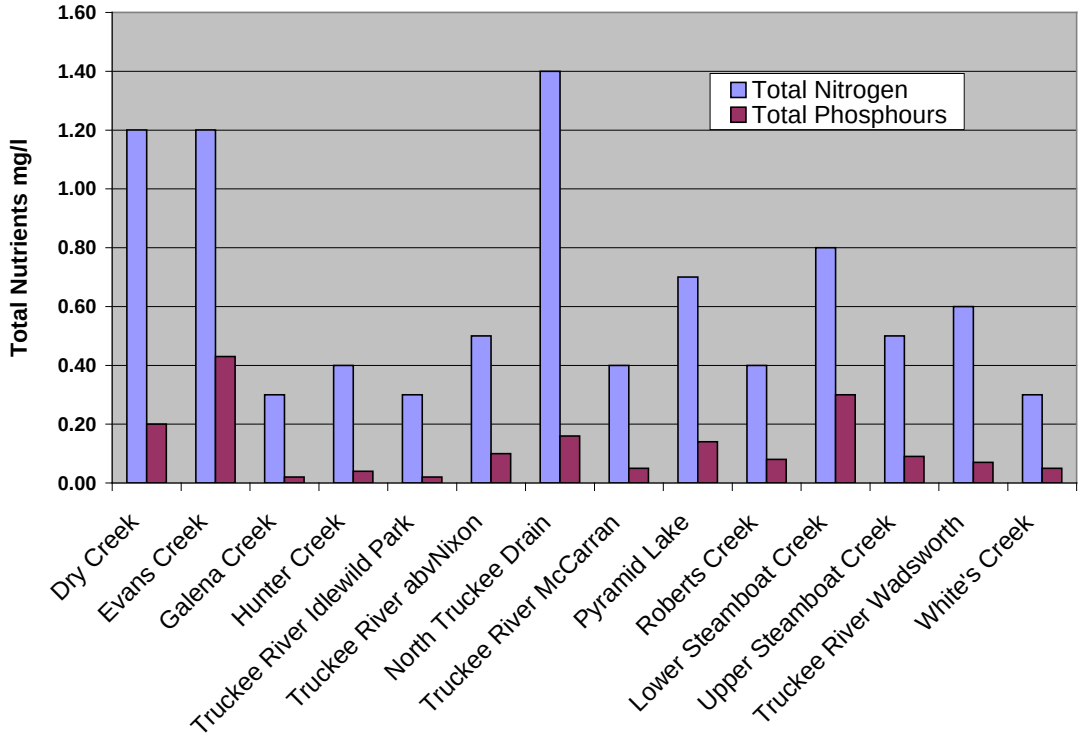


Figure 12: Lower Truckee River Nutrients



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Conclusion

As seen the overall water quality for 2012 was quite good, with very few major issues. Turbidity was somewhat elevated, typical for spring runoff, and the same 'hot spot' sites in each region continue to bear closer scrutiny.

The most amazing result is that Snapshot Day has reached its 13th year anniversary, only 1 of 2 in the State of California that has such distinction. This shows not only how possible it is to successfully engage the public in active watershed stewardship, but to also provide valuable data to the responsible agencies. This event has been funded primarily though local and state agencies and the largest source of continued support are from the Nevada State Lands Commission through the selling of license plates for conservation. Almost all years of nutrient analysis has been funded from NV State Lands and the continued support of Elizabeth Harrison. The event coordination is also mostly volunteer and yet the collaboration and continued dedication of those involved to engage citizen volunteers makes the event happen. Many residents have committed to the sampling near their homes to insure high quality data is collected for the protection of the waters in our region. The successes of this type of event show how average homeowners and residents can provide invaluable data collection and have fun at the same time!

For more information about how to get involved with water quality monitoring activities contact the following agencies:

- *South & West shores of Lake Tahoe* – Contact Jenny Hatch, Northern Sierra Regional Director of CalTrout, at (530)541-3495.

- *North Lake Tahoe - Incline Village* – Contact Incline Village GID Waste Not/Incline Village Clean Water Team, (775) 832-1284.

- *Middle Truckee River (Tahoe City to Nevada State Line)* – Contact Andy Otto, Truckee River Watershed Council, (530) 550-8760

- *Lower Truckee River (Nevada Stateline to Pyramid Lake)* – Contact Mary Kay Wagner, Nevada Division of Environmental Protection, (775) 687-9454

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Water Supply Outlook, Natural Resource Conservation Service website, www.nrcs.us.gov

Acknowledgements

2012 SNAPSHOT DAY SPONSORS

California State Water Resource Control Board
California Tahoe Conservancy
City of Reno
Lahontan Regional Water Quality Control Board
Lake Tahoe Community College
Lake Tahoe Unified School District
Nevada Division of Environmental Protection
Nevada Division of State Lands
Nevada State Health Laboratory
Pyramid Lake Paiute Tribe
Tahoe Environmental Research Center
Tahoe Regional Planning Agency
Tahoe Resource Conservation District
Tahoe Water Suppliers Association
Truckee River Watershed Council
University of California Cooperative Extension
University of Nevada Cooperative Extension
United States Geologic Survey
Washoe County
Waste Not, Incline Village General Improvement District
California Trout

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Jenny Hatch (Regional Director, CalTrout)
Kim Gorman (Tahoe Resource Conservation District)
Sarah Ford (Tahoe Resource Conservation District)
Mary Kay Wagner (Nevada Division of Environmental Protection)
Susie Kocher (University of California Cooperative Extension)

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CA State Water Resource Clean Water Team, Erick Burres
Incline Village General Improvement District, Rebecca Williams
Lake Tahoe Community College, Kathy Strain
Nevada Division of Environmental Protection, Mary Kay Wagner
Tahoe Regional Planning Agency, Rita Whitney
Truckee River Watershed Council, Beth Christman
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University of California, Davis

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Nevada State Health Laboratory
Lahontan Regional Water Quality Control
United States Geologic Survey

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And all the volunteers that made it happen!

Appendices

Appendices:

A. 2012 Summary of Field and Lab Data

B. Map of Sampling Locations

Note: Data collected as part of the Snapshot activities is available electronically. Contact Jenny Hatch, Cal Trout or go to www.snapshotday.org

APPENDIX A

APPENDIX B