



How's The Water in Alpine County?

Water Quality Objectives Summary

Interactive Map Version available at <https://arcg.is/0rSHiO>

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The Story:

One of the Alpine Watershed Group's goals is to answer the seemingly-simple and often-asked question: How is the water? With such a broad question, a myriad of answers from various the senses (taste, sight, smell) provide possible solutions. Such a question rarely elicits a simple and automatic response with so many variables that may occur in water. In reviewing our water quality data for an annual report, we compared our data collected by volunteer monitors to the Lahontan Regional Water Quality Control Board's Basin Plan. The Basin Plan contains "water quality objectives" - specific metrics that determine if a water body is healthy, based on its "designated uses" such as drinking water, agriculture, or recreation.

The Place: Alpine County

The water in Alpine County looks beautiful as compared to many places in the state and country. With 96% of Alpine County now made up of public lands, the area remains pristine and has been relatively untouched within the last fifty years. Despite historic uses which impacted the land, Alpine County streams and meadows are recovering slowly, often with human assistance.

What is "healthy" water?

While our waters seem pristine, there are some unhealthy, or impaired, sections of river. A water body is considered impaired if it is not meeting water quality objectives. The State of California evaluates monitoring data to determine if a water body becomes impaired, or becomes healthy enough to take off the list of impaired water bodies. Within Alpine County, some water bodies are not meeting their water quality objectives for pollutants like metals, total dissolved solids, sedimentation, turbidity, sulfates, nitrogen, etc.

What are Water Quality Objectives?

Water Quality Objectives (WQO) are scientifically determined by the Regional Water Quality Control Board. Within the Upper Carson Watershed, the Lahontan Regional Water Quality Control Board's Basin Plan denotes the WQO.

WQOs are the limits of water quality for specific constituents or characteristics of a waterbody that are established for the protection of beneficial uses of water. WQOs are numeric thresholds and qualitative objectives designed to ensure that bodies of water in the state can support their designated beneficial uses, as identified in the Regional Water Board.

Alpine Watershed Group's Volunteer Monitors

Volunteer monitors collect ambient monitoring samples four times a year. These parameters include: water temperature, dissolved oxygen, pH, total dissolved solids, and turbidity. These water quality measures and physical attributes of streams provide information about the health of water systems and their ability to support wildlife and vegetation. Collecting water quality data since 2004, AWG captured the fourteen years of data by relating them to Lahontan's Water Quality Objectives to determine the status of the watershed.

Impaired Water Bodies

Under Section 303(d) of the Federal Clean Water Act, individual states are required to evaluate water quality. Through data analysis, the state develops a list of water bodies with pollution levels that exceed protective water quality standards. A body of water is said to be impaired when a water quality objective(s) or standard is not met. For example, if an objective for nitrate is set at a maximum of 45 milligrams per liter, and a stream has nitrate occurring at a level greater than 45 milligrams per liter, then that body of water is said to be impaired. Water quality objectives are established to protect beneficial uses. When a water body exceeds the water quality objective, a TMDL is eventually set to limit the amount of pollutant allowed in the water body. TMDL stands for Total Maximum Daily Load which describes the maximum amount of a pollutant that the water body can receive and still ensure that it is within the water quality standards.

To view an interactive list and map of Alpine County's impaired water bodies map, follow this [link](#). [Here](#) is a list of the impaired water bodies in Alpine County.

The Data

With the Upper Carson River Watershed making up a majority of Alpine County total area and impacting most directly the people of the Carson Valley, all of AWG's monitoring sites are located within the Carson Watershed. Carson River headwaters begin at separate peaks, geographically divided into the West and East Fork. The West Fork Carson begins at the top of Carson Pass and flows through Hope Valley, past Pickett's Junction and Paynesville and on into Nevada. The East Fork Carson headwaters are located on the edge of South Alpine County past Ebbetts Pass and meanders down Silver Creek, through Grover Hot Springs and Markleeville.

However, water temperature is not specifically outlined within the basin plan as a WQO. It is labelled as either COLD or WARM. With this lack of specific standards to compare our water temperature data with, AWG researched articles that provided optimum growth temperatures for local species of fish. According to *Elliot & Hurley, 2001*, optimum temperatures for growth for brown trout are between 13.1 and 13.9 °C. Growth limits are between 5 and 19 where at the extreme temperatures, minimal to no growth occurs. For our uses, AWG set the water temperature objective at a maximum cap of 19 °C. In this way, we would be able to determine at what percentage our data has exceeded this maximum value.

The next section describes the water quality objectives for each of the constituents that AWG monitors. Some of the constituent objectives vary for different locations such as between the East and West Fork.

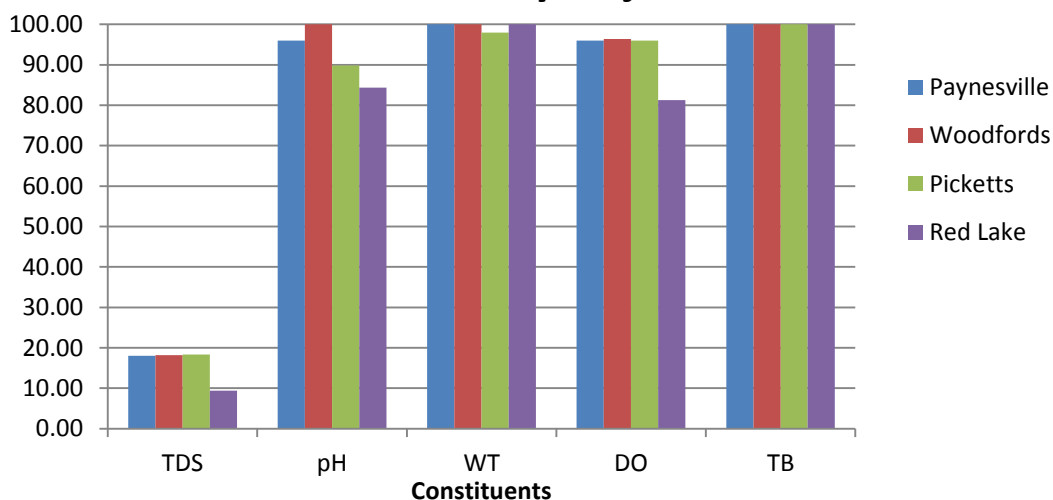
Water Quality Objectives

- Dissolved Oxygen (DO): Dissolved Oxygen concentration should not be lower by more than 10% nor shall the minimum DO be less than 80 % or **less 7.0 mg/L**
- pH: the pH shall not be depressed **below 6.5 nor raised above 8.5**.
- Turbidity (TB): Turbidity increases shall not exceed natural levels by more than 10% or **max value 15 NTU**
- Total Dissolved Solids (TDS): Not to be less than **55 mg/L** for West Fork Carson, **80 mg/L** for East Fork Carson, and **70 mg/L** WFC for Paynesville
- Exception: Water Temperature (WT): No specific threshold is identified in the Basin Plan. **Not to exceed 19°C**, the warmest water that can be to support healthy brown trout according to *Elliot & Hurley, 2001*

West Fork Carson

Within the West Carson River watershed, AWG volunteers monitor four distinct sites: Woodfords, Paynesville, Picketts and Red Lake. With Paynesville the most downstream and Red Lake the furthest upstream, the data does not indicate any particular relationship with parameter results and location in stream. The graph below visually describes how AWG ambient water quality data compares to the water quality objectives set by Lahontan. For total dissolved solids (TDS), each of the sites are significantly outside of parameters set by the WQO with only 20% of samples that meet WQO. Results for pH differ for each site with 100% of samples at Woodfords meeting WQO. Red Lake Creek holds the lowest percentage of samples that meet WQO of these sites. The graph shows that water temperature and turbidity for all the sites almost completely meet WQO. Dissolved oxygen shows that around 80% of the samples meet WQO for Red Lake but are within 95% for the rest of the sites.

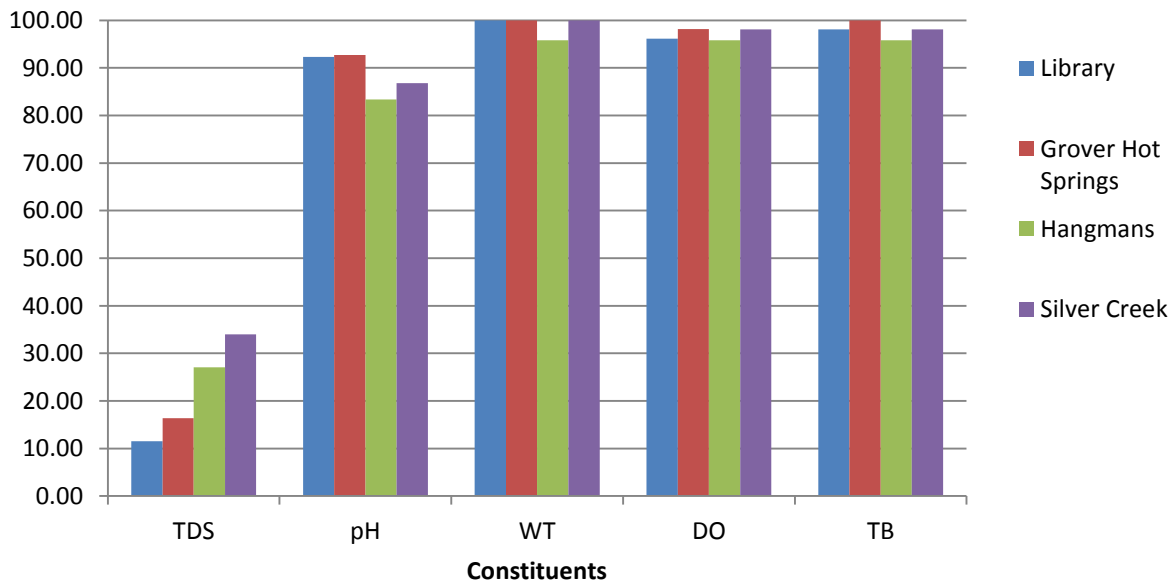
West Fork Carson: Percentage of Samples that MEET Water Quality Objectives



East Fork Carson

The East Fork differs from the West Fork in that there are several more tributaries that join the East Fork before the two forks meet at their confluence. The East Fork and its tributaries also flow through more historically settled and currently inhabited areas such as old mining sites, Markleeville, and Grover Hot Springs State Park. From upstream to downstream, the East Fork flows from Silver Creek to Hangmans and Grover Hot Springs becomes Markleeville Creek tributary which passes through the Library site. The graph describes the percentage of samples that meet WQO for each parameter and site. Like the West Fork, total dissolved solids hold the lowest percentage of samples that meet WQO with Silver Creek at the highest percentage. pH samples indicate that at least 85% of samples for all the sites meet WQO. The remaining parameters and sites are all within 95% of meeting WQO.

East Fork Carson River & Tributaries: Percentage of Samples that MEET Water Quality Objectives



Data Summary

Practical applications of these data comparisons relate to what we do in Alpine County through our restoration projects and for general knowledge for Alpine County residents and interested public. The water quality objectives allow for AWG to establish a set of baseline conditions for their respective water bodies. It also helps illustrate how well these specific water bodies within the Upper Carson Watershed are doing and how this could influence the Carson Valley. Overall, the information shows that both the East and West Fork Carson are healthy watersheds. Percentages of samples for total dissolved solids for both East and West Fork Carson indicate that this parameter is the least likely to meet the WQO. East Fork Carson portrays a slightly healthier system especially for Silver Creek in regards to TDS. By developing this data summary and maintaining upkeep of new data input, AWG can stay up to date on the conditions of the water bodies. As AWG continues to work with volunteer monitors and develop the monitoring program, we strive to foster a stronger connection between the people and their watershed. The water quality data collected by volunteers also help develop baseline conditions and status for potential and current restoration projects. Knowledge of the status of the water and its compliance to the WQOs may support future restoration project ideas and designs.

Sources

To learn more about the Lahontan Basin Plan, check out waterboards.ca.gov. The water quality objectives were referenced from the regulatory source, Lahontan Basin Plan.

- Total Dissolved Solids - Lahontan Basin Plan (Table 3-14)
- Dissolved Oxygen - Lahontan Basin Plan (Page 3-9)
- pH - Lahontan Basin Plan (Page 3-5)
- Turbidity - Lahontan Basin Plan (Table 3-14)
- Water Temperature - E., & H. (2001). Modelling growth of brown trout, *Salmo trutta*, in terms of weight and energy units. *Freshwater Biology*, 46(5), 679-692. doi:10.1046/j.1365-2427.2001.00705.x

Recognition & Resources

Thank you to all of our volunteer monitors and engaged stakeholders! Without you, the AWG monitoring program would not be where it is today.

Here are a few ways you can find out more and get involved:

- If you are interested in learning more, check out our website at alpinewatershedgroup.org
- If you are interested in learning about our ambient monitoring program and other ways we evaluate our data, check out our [2017 data summary](#).
- If you would like to financially support our monitoring program, please donate [here](#).