

**PERAZZO MEADOWS RESTORATION
HYDROLOGIC MONITORING DATA
REPORT, PERAZZO MEADOWS, SIERRA
COUNTY, CALIFORNIA**

WATER YEAR 2019

Report prepared for:
Truckee River Watershed Council

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A report prepared for:

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**Perazzo Meadows Restoration Hydrologic Monitoring Data Report
Sierra County, California, Water Year 2019**

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1. PROJECT PURPOSE AND INTRODUCTION

The Truckee River Watershed Council (TRWC) requested that Balance Hydrologics, Inc. (Balance) monitor streamflow and groundwater conditions at Perazzo Meadows in Sierra County, California. The purpose of the monitoring program is to evaluate pre- and post-restoration hydrologic conditions in the Upper Little Truckee River watershed as part of the Perazzo Meadows Restoration project. Monitoring streamflow, groundwater levels, and their interactions are important for the following reasons:

- Streamflow is the principal attribute affecting aquatic habitat and fish populations;
- Little is known about shallow groundwater fluctuations and the amount of groundwater that can be retained in restored meadows;
- Limited documentation is available regarding the effect of meadow restoration on downstream peak flows and mid-to-late-summer baseflow;
- Observed conditions and restoration performance criteria need to be placed in context of long-term variability in order to make reliable comparisons to other systems and other years; and
- A continuous record of streamflow and groundwater levels allows for an evaluation of the restoration program and geomorphic and vegetation changes for which the project was designed.

This report summarizes streamflow at six different locations upstream and downstream of Upper, Middle and Lower Perazzo Meadows and groundwater conditions in each meadow for water year 2019 (WY2019)¹, the tenth year of a multi-year hydrology monitoring program. This data report includes:

- A brief description of what measurements were made, and where;
- A summary of the measurements;
- Groundwater levels at 23 piezometers placed in select areas of the meadows;

¹Most hydrologic and geomorphic monitoring occurs for a period defined as a water year, which begins on October 1 and ends on September 30 of the named year. Water year 2019 (WY2019) began on October 1, 2018 and concluded on September 30, 2019.

- A comparison of groundwater level fluctuations in restored meadows to groundwater levels prior to restoration;
- Daily, monthly, and annual streamflow values for the six gaging stations during WY2019; and
- A comparison of annual peaks and daily mean streamflow at measured inflows to and outflows from Perazzo Meadows.

1.1 Acknowledgments

Funding for the data collection and synthesis presented in this report is from the California Department of Fish and Wildlife, the U.S Forest Service (USFS)-Tahoe National Forest, the California Wildlife Conservation Board and the Bella Vista Foundation, awarded to the TRWC. Work was carried out in coordination with the TRWC and the USFS, and individuals from those organizations were instrumental in helping to develop the monitoring program. Beth Christman of the TRWC conducted field monitoring and data collection activities as part of this program.

2. SITE DESCRIPTION

2.1 Perazzo Meadows

Perazzo Meadows is located in the Little Truckee Watershed, part of the Truckee River Watershed, about 15 miles northwest of the Town of Truckee in Sierra County, California. The Meadows are accessed from Jackson Meadows Road to the north and from Henness Pass Road to the south (**Figure 1**). The watershed includes three named tributaries: the Little Truckee River (termed Lacey Creek upstream of Webber Lake), Perazzo Creek, and Cold Stream. The series of meadows is divided into an Upper, Middle, and Lower Meadow, separated by small canyons and volcanic bedrock outcrop.

These sub-alpine meadows are situated in a tectonically formed basin, now filled with glacial outwash, lacustrine deposits, and alluvial silt, sand, and gravel. The watershed reflects many of the geologic events that have shaped the Central Sierra: the hillsides north and south of the meadows consist of andesitic breccia, mudflow deposits, and welded tuff, while the headwaters of Perazzo Creek drain meta-sedimentary rocks. A veneer of glacial till and moraines are also present along the margins of the valley. Several glacial outwash terraces are present within the alluvium of the valley floor; most notably on the south side of the Middle Meadow at an elevation approximately 30 feet above the Middle Meadow. Remnant outwash terraces are also present on the northeast side of the Upper Meadow, approximately 2 to 3 feet higher than the meadow surface. The banks of Perazzo Creek and the Little Truckee River are typically composed of sand and silty sand overlying gravel and cobble, with occasional exposures of silty clay and clay underlying the alluvial sediments.

Hydrology in the watershed is influenced by California's Mediterranean climate and the sub-alpine elevation. The watershed ranges from 6,459 feet above mean sea level (NGVD29) at the Lower Meadow to 9,148 feet at Mount Lola. Most of the annual precipitation falls as snow, with occasional summer thunderstorms and early fall rainstorms. Atmospheric river events can drive winter storms and result in rain-on-snow events that trigger mid-winter flooding. Annual peak flows often occur during spring snowmelt, but periodic rain-on-snow events often exceed snowmelt peak flow magnitudes. Perennial streams and associated wet meadows are also supported by

springs emanating from the adjacent hillsides, especially on the south side of the valley, creating discharge slope wetlands.²

2.2 Pre-Project Conditions and Restoration Activities

Prior to restoration, portions of the meadows had been converted from riparian low and middle gradient meadows to dry meadows as the result of cumulative effects of historical land-uses (Swanson Hydrology and Geomorphology, 2008). The degraded system included a single channel that followed a meandering course through each meadow. High-magnitude, low-frequency floods were largely contained with the channel with limited floodplain/meadow connectivity.

During the summers of 2009 and 2010, the USFS employed a 'plug and pond' restoration approach in the Upper and Middle Meadows that included filling ('plugging') the channel at various intervals through the meadows. Material used for channel fill was excavated from the channel upstream of each plug to create a pond. The approach encouraged streamflow to spread across the valley floor and reoccupy multiple relict channels that had been abandoned.

The Truckee River Watershed Council completed restoration of the Lower Perazzo Meadow in the summer of 2019, using a channel fill approach. Material used for channel fill was excavated from borrow pits in the nearby uplands. Much like 'pond and plug', this approach was designed to spread flow across the meadow and reconnect the relict channels that had been abandoned by the incised channel.

2.3 Groundwater Monitoring

Balance and the TRWC established a groundwater monitoring program beginning in summer 2009, just prior to implementation of restoration activities in the Upper Meadow. A network of eleven shallow monitoring wells ('piezometers') was installed in the Upper and Middle Meadows, supplementing four piezometers that had been previously installed by the USFS. Piezometers were installed in the Upper Meadow on August 21, 2009, and the Middle Meadow on August 27, 2009. On September 23, 2009, several piezometers were instrumented with water-level recorders, programmed to measure and record water levels every 15 minutes. Water level recorders were installed in all

Meadow and wetland terminology used herein is based on Weixelman and others' (2011) hydrogeomorphic classification system for the Sierra Nevada and Southern Cascade Ranges in California.²

piezometers in WY2015. Groundwater, stream stage monitoring and streamflow station locations in the Upper and Middle Meadows are shown in **Figures 2 and 3**.

Upper and Middle Meadow piezometers were designed to measure seasonal water-table fluctuations, and range in depth from 4.1 to 8.0 feet below the meadow surface. Piezometer locations were chosen to represent a range of geomorphic and hydrologic conditions, including spring-fed areas with perennial saturation or near-saturation pre-project (e.g. Piezometers 09-02, 09-06), upland surfaces (e.g. 09-05, FS-14, 09-11), and areas adjacent to the main channel (e.g. 09-03, 09-09), as shown in **Figures 2 and 3**.

Campbell well points were used to construct the screened interval of each piezometer, with a nominal diameter of 1¼-inches, and connected via galvanized steel couplers to 1¼-inch galvanized steel pipe. The well points were driven by hand with a fencepost pounder until refusal, presumably in gravels or perhaps clayey silt at depth. In order to evaluate potential vertical hydraulic gradients, a reflection of the upward or downward movement of shallow groundwater, the piezometers were selected with screens only in the bottom 24 inches. When present, vertical hydraulic gradients provide an indication of the shallow groundwater flow direction, either downward from the surface into the ground, or upward from the ground to the surface.

During the summer of 2011, UC Merced researchers installed several additional piezometers in Lower Perazzo Meadow (see **Figure 4**) using similar methods and equipment to those described for the Upper and Middle Meadows and assisted with field measurements of groundwater levels in the Middle Meadow and streamflow at the Lower Perazzo Meadow outlet, as part of a Sierra-wide study of restoration effects on meadow hydrology. One piezometer (LP_W4) was relocated and replaced during restoration activities in October 2019.

Upper and Middle Meadow piezometers were monitored by TRWC and Balance staff beginning in September 2009. In the fall of 2014, UC Merced discontinued monitoring efforts and Balance and TRWC began monitoring the Lower Meadow piezometers, utilizing the existing instruments. Monitoring consists of measuring the depth to water with an electronic water-level sounder and measuring the specific conductance and temperature of the groundwater at each piezometer. Specific conductance measures the ability of water to conduct electricity and is a field surrogate for the concentration of total dissolved salts in the water. Snow and rain have a very low specific conductance, (approaching zero) and groundwater is considerably higher; as water passes over and through the ground, salts are dissolved, and the specific conductance

increases. Higher specific conductance therefore indicates longer residence times in the ground, or transmittal through salt-bearing geologic formations, and can be used to distinguish groundwater sources.

The piezometers were occasionally bailed after water-level readings were taken in order to 'flush' the piezometer and allow the water level to equilibrate with the surrounding soil. The specific conductance and temperature measured in bailed piezometers were thus assumed to have remained representative of groundwater conditions. TRWC or Balance staff performed these activities approximately monthly during the dry season and periodically during the winter months as access permitted.

2.4 Streamflow Monitoring

The TRWC authorized Balance to establish and maintain a streamflow monitoring program beginning in summer 2009, just prior to implementation of restoration activities in the Upper Meadow. Beginning October 1, 2009, one continuous-recording streamflow gaging station was established on the Little Truckee River at the downstream end of the Middle Meadow (Station ID LTPM). Early in WY2011, the TRWC authorized Balance to establish five additional streamflow gaging stations to help evaluate inflows to the meadow, flows through the meadows and downstream of the meadows. Three gages were installed and instrumented in November 2010, and two additional gages were installed and instrumented in August 2011. All six gages are instrumented with water level and temperature recorders, programmed to measure and record readings every 15 minutes. For the purposes of this report, our results are presented as daily mean streamflow ('daily flow') values. Locations of all six streamflow gaging stations are illustrated in **Figure 5** and summarized in **Table 1**. WY2012 was the first year in which we reported a full annual record for all six stream gages. Gaging continues through the current water year (WY2020).

Balance's standard stream-gaging practices have consistently followed procedures used by the USGS, as outlined by Carter and Davidian (1968). Balance hydrologists and USFS staff measured flow over a range of different water depths at all six stations. Based on our periodic site visits, staff plate readings, and streamflow measurements, we created an empirical stage-to-discharge relationship for each station, also referred to as a stage-discharge "rating curve." We then used this rating curve developed for each station to convert the continuous-logging record of stage to flow. As is typically done, we applied multiple stage shifts to account for local scour and fill during the monitoring period, and the effects of leaf and debris dams during low flows. As with all

open-channel gaging of natural streams, a higher degree of uncertainty remains at high flows and during periods of ice formation, despite efforts to be as precise as possible, as discussed in more detail by Rantz (1982). Because this monitoring program has been developed with the intent of evaluating flows during the spring and summer, efforts to accurately measure winter peak flows are limited. As such all peak flows and annual runoff values are estimated. Also, the stream gages can be affected by ice during the winter. When ice effects are identified we estimate the flow values by way of interpolation between known flow conditions or by correlation with other streamflow gages.

2.4.1 Description of the Streamflow Gaging Stations

2.4.1.1 *Perazzo Creek above Perazzo Meadows (PCAP)*

The stream gage is located on the west bank of Perazzo Creek along a bedrock channel approximately 0.5 miles upstream from Upper Perazzo Meadow and approximately 1.4 miles upstream from the confluence with the Little Truckee River. The gaging site was selected to evaluate inflows to the Upper Meadow from Perazzo Creek. The gaging station was installed on November 17, 2010 and designated as 'PCAP' (Perazzo Creek above Perazzo). The watershed area above PCAP is approximately 6.1 square miles and receives an average of 64.6 inches of precipitation (USGS, 2017). This gage can be affected by ice during winter and spring months.

2.4.1.2 *Little Truckee River above Perazzo Meadows (LTAP)*

The stream gage is located on the south bank of the Little Truckee River, just downstream of a bedrock channel and boulder riffle, approximately 0.25 miles upstream from Upper Perazzo Meadow, at the USFS road #7-030 bridge. The gaging site was selected to evaluate inflows to the Upper Meadow from the Little Truckee River. The gaging station was installed on November 18, 2010 and designated as 'LTAP' (Little Truckee River above Perazzo Meadows). The watershed area above LTAP is approximately 15.8 square miles and includes Webber Lake and the Lacey Meadows watershed. This area receives an average of 58.7 inches of precipitation (USGS, 2017), and can be affected by ice during winter and spring months.

2.4.1.3 *Little Truckee River below Upper Perazzo Meadow (LTUM)*

The stream gage is located on the east bank of the Little Truckee River, along a boulder and cobble channel approximately 0.9 miles downstream from the confluence with Perazzo Creek, downstream of Upper Perazzo Meadow, at the Henness Pass Road

Bridge. The gaging site was selected to evaluate outflows from the Upper Meadow, and a portion of inflow to the Middle Meadow. The gaging station was installed on November 19, 2010 and designated as 'LTUM' (Little Truckee River below Upper Perazzo Meadow). The watershed area above LTUM is approximately 25.5 square miles and includes the sub-watersheds gaged by LTAP and PCAP and an additional 3.6 square miles of intervening area. Mean annual precipitation in the contributing watershed area is approximately 58.5 inches (USGS, 2017). This gage can be affected by ice during winter and spring months. This gage was damaged by high flows during WY2017. The staff plate was dislodged and bent, and the stilling well was ripped off the gage. A new staff plate and well was installed on July 19, 2017 at the original gage location.

2.4.1.4 Cold Stream above Perazzo Meadows (CSAP)

The stream gage is located on the right (east) bank of Cold Stream, a perennial tributary to the Little Truckee River, along a step-pool reach with abundant wood, approximately 1.57 miles upstream from the confluence with the Little Truckee River. The gaging site was chosen to be well above the meadow to avoid the dynamic channel changes in the lower alluvial fan reach, and also above very steep and dynamic reaches immediately above the alluvial fan. The gaging station was installed on August 18, 2011. The gaging site has been designated as 'CSAP' (Cold Stream above Perazzo Meadows). The watershed area above CSAP is approximately 3.1 square miles and receives an annual average of 54.4 inches of precipitation (USGS, 2017).

2.4.1.5 Little Truckee River below Middle Perazzo Meadow (LTPM)

The stream gage is located on the south bank of the Little Truckee River at the outlet of the Middle Meadow. The gaging site was selected to evaluate outflows from the Middle Meadow, as well as a portion of inflows to the Lower Meadow. The gaging station was installed on September 25, 2009 and designated as 'LTPM' (Little Truckee at Middle Perazzo Meadow). The watershed area above LTPM is approximately 32.8 square miles and includes the sub-watersheds of the four upstream gages (LTAP, PCAP, CSAP, and LTUM), as well as an additional 4.2 square miles of intervening watershed area. The contributing watershed receives an average of 56.3 inches of precipitation annually (USGS, 2017). The original gage pool began to fill with sediment in 2017 when a secondary overflow channel on the right bank of the downstream control became the primary channel. In WY2018 a new gage was installed on the south bank of the upstream pool.

2.4.1.6 *Little Truckee River at Lower Perazzo Meadow (LTLM)*

The stream gage is located on the north bank of the Little Truckee River at the outlet of the Lower Meadow. The gaging site was selected to evaluate flows at the outlet of the Lower Meadow, downstream of the Upper and Middle Meadows. The gaging station was installed on August 18, 2011 and designated as 'LTLM' (Little Truckee at Lower Perazzo Meadow). The watershed area above LTLM is approximately 34.2 square miles and includes the sub-watersheds gaged by the five upstream gages (LTAP, PCAP, CSAP, LTUM and LTPM), plus an additional intervening area of 1.4 square miles. The watershed receives an average of 56.3 inches of precipitation. This gage can be affected by ice during winter and spring months. This gage was damaged during WY2017 when the tree that the gage was anchored to fell. The staff plate and water-level recorders were recovered from the stream bed on May 23, 2017. A new gage was installed on July 19, 2017, when snowmelt flows had receded. Restoration in the Lower Perazzo Meadow was completed in October 2019.

2.5 **Historical Streamflow Gaging**

The United States Geological Survey (USGS) operated a stream gage on the Little Truckee River from June 26, 1993 to September 30, 1998 and again during parts of WY2014, WY2015 and WY2016 (USGS Station 10341950). Streamflow at this station is affected by the Sierra Valley Mutual Water Company diversion ditch immediately upstream. Mean annual flow for the period of record at the USGS gage ranged between 23.5 cfs and 183 cfs. Peak annual flows ranged between 300 cfs and 3,980 cfs. Peak flows are generally less affected by diversions and can be used to assist in the interpretation of peak flows reported for Perazzo Meadows. **Table 2** summarizes the USGS gage station information and data for the period of record through WY2016. This station was decommissioned on November 2, 2016.

We understand that streamflow data has been collected on the Sierra Valley Diversion Ditch and reported to the Federal Watermaster but we have not accessed or evaluated that data set as part of this monitoring program.

2.6 **Comparisons to Other Watersheds**

The streamflow records for Perazzo Meadows are also compared to Sagehen Creek, near Truckee, California (USGS 10343500), about 7 miles to the southeast, to provide a basic check on flow magnitudes and timing of streamflow variations.

The Sagehen Creek gaging station (USGS 10343500) measures streamflow from a 10.5 square-mile watershed with a mean annual precipitation of 38 inches. The Sagehen Creek watershed is more distant from the Sierra Nevada crest with less precipitation than many of the Perazzo Meadow contributing watersheds. However, this gaging station has an uninterrupted 65-year period of record with no upstream storage or diversions; therefore, it is referenced and used as part of this monitoring program for comparison with general hydrology trends and for ice correction.

3. WY2019 HYDROLOGIC SUMMARY AND DISCUSSION

This section summarizes WY2019 annual precipitation, snowpack conditions, streamflow conditions at each gaging station and groundwater trends in each of the meadows.

3.1 Annual Precipitation

The Independence Creek weather monitoring station (SNOTEL Station 540) is operated by the Natural Resource Conservation Service (NRCS) and is located at similar elevation to (6,455 feet) and approximately 3.5 miles east of Perazzo Meadows. This station is used for daily and annual precipitation for this report as it is the closest weather monitoring station to the project site. Mean annual precipitation at this station is 32.7 inches. Annual and long-term average snow-water equivalent (SWE) is reported from Independence Lake SNOTEL Station (NRCS SNOTEL Station 541), located 3.5 miles southeast of Perazzo Meadows at 8,338 feet elevation. The Independence Lake SNOTEL station serves as the best available reference for WY2019 snowpack conditions in the Perazzo Meadows watershed, given its similar elevation.

Cumulative precipitation during WY2019 is illustrated in **Figure 6** with the daily mean, maximum and minimum air temperatures. WY2019 was relatively dry until Mid-November. Several moderate storms occurred in December and early January. Precipitation in February was above average, with a total of 12.6 inches of precipitation and snowfall or rain occurring on 20 days during the month. Another 7 inches of precipitation fell during March, April and May. As in recent years, the summer was again relatively dry with little to no rainfall or snow until late September, when a few early fall frontal systems moved through the region. Overall the annual precipitation total was 35.7 inches, slightly above the long-term average of 32.7 inches.

Figure 7 illustrates snowpack, measured as Snow Water Equivalent (SWE), during WY2019, the previous 9 years, and the long-term monthly average. Peak SWE in WY2019 (April 18, 2019) was 70 inches. After an early winter with near- or below-average precipitation, the very cold, wet February increased the snowpack (SWE) by almost 28 inches. An additional 16.8 inches was added over March and early April. Late season snow and cold weather extended the snowmelt recession with total melt-out occurring on July 21, 2019, exactly the same day of the year as WY2017-the wettest year on record at this station, and slightly earlier than in WY2011, another very snowy year.

3.2 Streamflow

WY2019 was an above average precipitation year with an extended snowmelt recession due to a large snowpack. In the following subsections, we describe streamflow during WY2019 at each gaging station from upstream to downstream.

3.2.1 Perazzo Creek above Upper Perazzo Meadow (PCAP)

Table 3 provides information and observations from site visits and manual measurements of flow at Station PCAP. An annual streamflow summary, including peak flows and monthly and annual statistics, is provided in **Form 1**. Daily stage and flow are graphically illustrated in **Figures 8 and 9**, respectively.

Baseflow at the beginning of WY2019 varied between 0.6 cubic feet per second (cfs) and 1.1 cfs. The gage was ice affected from November 10, 2018 to February 24, 2019, estimated flows during that period are based on correlation to Sagehen Creek (USGS Station 10343500). The estimated annual peak flow of 284 cfs was recorded on June 6, 2019 at this station during snowmelt runoff. Streamflow remained elevated through most of June with a monthly mean flow of 143 cfs. Flows began to recede in mid-June with daily mean flows just above 60 cfs at the end of the month. Snowmelt runoff continued to recede through July with a daily mean flow of 11 cfs by the end of the month. Flows continued to recede in August and a mean baseflow of 1.3 cfs was recorded for the month of September.

Estimated total annual discharge from Perazzo Creek was approximately 25,129 acre-feet, more than twice that measured in WY2018 (12,803 acre-feet).

3.2.2 Little Truckee River above Upper Perazzo Meadow (LTAP)

Table 4 provides information and observations from site visits and manual measurements of flow at LTAP. A streamflow summary of available data is provided in **Form 2**. Records of daily stage and flow records are graphically illustrated in **Figures 10 and 11**, respectively.

LTAP was dry in the beginning of WY2019 with intermittent disconnected pools in the channel. Continuous flow returned to the stream in late December 2018. A large rain on snow event on February 14, 2019 resulted in a peak flow of 292 cfs. The estimated annual peak flow of 418 cfs was recorded on April 9, 2019 as a result of a rain event during spring snowmelt. Spring snowmelt runoff increased through April, May and June

with a snowmelt peak flow of 405 cfs recorded on June 5, 2019. Daily mean flow remained above 10 cfs until July 24 and continued to slowly decrease through most of August. Baseflow of below 1 cfs was recorded through September.

In WY2019, LTAP discharged an estimated 38,300 acre-feet of surface water into Upper Perazzo Meadow.

3.2.3 Little Truckee River below Upper Perazzo Meadow (LTUM)

Table 5 provides information and observations from site visits and manual measurements of flow at Station LTUM. A streamflow summary of available data is provided in **Form 3**. Records of daily stage and flow are graphically illustrated in **Figures 12 and 13**, respectively.

Baseflow at the beginning of WY2019 was recorded between 0.3 cfs and 1 cfs. The gage was ice-affected from January 18, 2019 through March 12, 2019, data from this period was based on correlation to LTLM (downstream gage that was not ice-affected). The estimated annual peak flow of 800 cfs was recorded on June 6, 2019 during snowmelt runoff. Elevated daily mean flows persisted above 100 cfs through early July 2019. Daily mean flows decreased through July and fell below 10 cfs in early August. A monthly mean baseflow of 3 cfs was recorded during the month of September.

The estimated annual discharge from Upper Perazzo Meadow was approximately 87,232 acre-feet of water during WY2019.

3.2.4 Cold Stream above Middle Perazzo Meadow (CSAP)

Table 6 provides information and observations from site visits and manual measurements of flow at Station CSAP. An annual streamflow summary, including peak flows and monthly and annual statistics is provided in **Form 4**. Daily stage and flow are graphically illustrated in **Figures 14 and 15**, respectively.

CSAP is the highest elevation gage in the monitoring program. During winter, most precipitation falls as snow at this station and in the contributing watershed above. As such, ice-affected flows are more common, and snowmelt runoff may persist later into the spring and summer relative to other stations. WY2019 began with daily mean baseflow of just under 1 cfs. Baseflow remained near 1 cfs through most of the winter

months with several days in November and February that were above 2 cfs due to storm response.

Snowmelt began in early April and was enhanced by several springtime rain on snow storm events. The annual peak flow of 87 cfs was recorded on June 20, 2019 during snowmelt. Daily mean flows remained above 20 cfs until late-July, dropping below 10 cfs at the beginning of August. Daily mean flows continued to decrease through August and the beginning of September. Daily mean baseflows between 1.5 cfs and 2.0 cfs were recorded through the end of the water year.

Cold Stream contributed approximately 5,927 acre-feet of water to Middle Perazzo Meadow, approximately 34 percent more than in WY2018 (3,913 acre-feet).

3.2.5 Little Truckee River below Middle Perazzo Meadow (LTPM)

Table 7 provides information and observations from site visits and manual measurements of flow at Station LTPM. An annual streamflow summary, including peak flows, monthly and annual statistics is provided in **Form 5**. Daily stage and flow for Station LTPM are graphically illustrated in **Figures 16 and 17**, respectively.

WY2019 began with daily mean baseflows between 2 cfs and 4 cfs at this station. Daily mean flow increased after the late-November storms. Snowmelt runoff began in April with daily mean flows starting at 41 cfs and increasing to over 500 cfs by the end of the month. An estimated annual peak flow of 881 cfs was recorded on June 6, 2019. Daily mean flows began to recede in late-June falling below 10 cfs on August 18, 2019. Daily mean baseflow between 4 cfs and 6 cfs were recorded from late-August through the rest of the water year.

The total estimated annual flow was measured to be 95,939 acre-feet at LTPM, 44 percent more than the measured flow in WY2018 (54,573 acre-feet).

3.2.6 Little Truckee River below Lower Perazzo Meadow (LTLM)

Lower Perazzo Meadow, downstream from LTPM, was restored in late WY2019 (August through October). WY2019 is the last year of baseline data prior to restoration of the meadow and provides a valuable data set which can be used for comparison to post-restoration conditions. **Table 8** provides information and observations from site visits and manual measurements of flow at Station LTLM. An annual streamflow summary,

including peak flows, monthly and annual statistics is provided in **Form 4**. Daily mean stage and flow are graphically illustrated in **Figures 18 and 19**, respectively.

Daily mean baseflow in the beginning of WY2019 ranged between 2.9 cfs and 4.7 cfs. Daily mean flow increased with the late-November storms to roughly 10 cfs. A rain-on-snow event resulted in an estimated peak flow of 337 cfs on February 19, 2019. Snowmelt began in April and the peak snowmelt runoff and estimated annual peak flow of 1,035 cfs at this station was recorded on June 7, 2019. Streamflow receded through July and August, with daily mean streamflow dropping below 10 cfs on August 19, 2019.

Restoration of the Lower Perazzo Meadow was initiated in mid-August and the Little Truckee River was diverted around the meadow from August 26, 2019 until October 4, 2019 to allow for meadow construction. The diversion discharge point was approximately 500 feet upstream of the gaging station; data collected at the gage indicate that there was no interruption in streamflow during restoration implementation, with perhaps a small increase in flow when the diversion was activated.

In total, the Little Truckee River at the outlet of Lower Perazzo Meadow discharged an estimated 100,691 acre-feet of water in WY2019.

3.2.7 Comparison of Streamflow and Annual Runoff

WY2019 streamflow hydrographs from all six stations are illustrated in **Figure 20** and estimate annual runoff volumes for all six stations (including estimates for ungaged areas) are reported in **Table 9**. Snowmelt recession runoff is reported for all six stations on a monthly basis (May-September) in **Table 10**, and monthly snowmelt recession streamflow is tabulated in **Figure 21**.

Based on a comparison of available streamflow data from all six stations and streamflow on Sagehen Creek, we draw the following conclusions:

- The flow records are generally consistent with regional hydrologic trends;
- Based on the methods used for field streamflow measurements, the flow records are reasonably accurate. High flows are not well calibrated and therefore peak flows and total annual flow are estimated;

- All stations with complete records exhibited similar timing for peak flows, except Coldstream (CSAP) which (as consistent with other years) had a later snowmelt peak, and all peak flows were recorded during snowmelt, except LTAP that was associated with an April rain on snow event;
- Colder winter storms formed a large snowpack and late spring cold storms extended snowmelt into mid-Summer; and
- Cold conditions during the winter created ice-affects at several gages; data were estimated during this period by correlation to nearby gages and/or interpolation.

Perazzo Meadows streamflow has been measured since 2009 and there are complete records for all six stations since WY2012³. **Figure 22** shows the total annual flow measured at all stations since WY2011. WY2019 was an above average precipitation year. Unlike previous years there were fewer “atmospheric river” warm storms in the winter and the result was a larger snowpack. Compared to WY2016, when precipitation was very close to the long-term average, WY2019 had 28,094 more acre-feet of annual flow at LTLM, the outlet of Perazzo Meadows.

3.3 Groundwater

Groundwater levels were monitored beginning in July 2009 and through WY2019. The piezometers are located (shown in **Figures 2, 3 and 4**) to characterize groundwater response to the plug and pond restoration efforts, as well as to document pre-restoration conditions in the Lower Meadow. Field observations for the period of record are presented in **Table 11**, including depth to groundwater, specific conductance, and qualitative observations. Specific conductance in groundwater is illustrated in **Figure 23**. **Figures 24 and 25** show the continuous record of depth to groundwater in the Upper Meadow during the past two years for comparison of a near-average precipitation year with a lower than average snowpack (WY18) to an above average precipitation year with a well above average snowpack (WY19). **Figure 26** shows depth to groundwater in the western section of the Middle Meadow and **Figure 27** shows depth to groundwater in the eastern section of the Middle Meadow for the complete period of record that includes pre-restoration data. **Figure 28** shows the depth to groundwater in the Lower Meadow for WY2017 through WY2019 for comparison of a record precipitation year, a near average year and an above average snowpack year.

³ LTAP, LTUM and LTLM have partial data for WY2017 due to damage caused by high flows from record precipitation.

Restoration of the Lower Meadow began in August 2019 and concluded just after the end of the water year (October 2019). **Figure 29** shows groundwater response in the Lower Meadow during and after construction.

The Upper Meadow was restored in Summer 2009 and the Middle Meadow was restored in Summer 2010. Restoration of the Lower Meadow was completed in late-summer 2019. As outlined in the first annual monitoring report for this study, immediate groundwater level increases in response to restoration ranged from 0 to 6 feet in the Upper Meadow, and 0.5 to 2 feet in the Middle Meadow, depending on location (Shaw, 2010). Since that time, some late summer groundwater levels have become lower than during the immediate post-restoration period, possibly due to anticipated channel and meadow evolution or, in some cases, unanticipated breaching of plugs.

Specific conductance in piezometers (**Figure 23**) provides an indication of whether shallow groundwater is primarily under the influence of snowmelt and surface runoff, or if deeper groundwater is moving through the meadow at a particular location. In many areas of the meadow, no discernable pattern in specific conductance values is present. Other areas of the meadow exhibit a trend in which specific conductance starts off low in the spring (an indication of relatively fresh snowmelt) and rise over the course of the summer and fall (indicating influences of deeper groundwater that has had more contact time in the ground). The specific conductance data also highlight areas which receive support from deeper groundwater in the late summer, such as in the southeastern portion of the Upper Meadow in the vicinity of Piezometers 09-2 and other areas as well.

The conductance values in the Middle Meadow have less variability, with little to no consistent interannual or intra-annual trends.

In contrast, specific conductance values in the Lower Meadow have increased in variability over the last three years. This could be attributed to less retention of runoff in the Lower Meadow, combined with increased late season groundwater discharge due to upgradient aquifer recharge. Restoration efforts that were completed in late WY2019 may show changes in WY2020.

3.3.1 WY2018 and WY2019 Groundwater Levels in the Upper Meadow

Snowpack is an important factor in maintaining late-season groundwater conditions. Most of WY2018 was relatively dry and even with late season precipitation and briefly

elevated groundwater levels, groundwater receded to levels at or below those during the WY2012 to WY2015 drought in some areas. WY2019 was an above average precipitation year and had a cold winter season, with a peak snowpack well above the 30-year median (see **Figures 6 and 7**). This resulted in higher groundwater levels that persisted later into the dry season.

Figure 24 shows groundwater levels in the upstream (south end) of the upper meadow for WY2018 and WY2019. As mentioned above, groundwater levels remained higher through June and into July 2019, as opposed to the relatively early recession during 2018. Piezometer 09-2 is located in an area southeast of the main channel and ponds. The portion of the meadow where 09-2 resides has some small relict channels but is located well away from the main channel. Records indicate that water levels were up to two feet above ground surface for some time in April and early May. This could be due to a beaver dam or a debris/ice dam that forced water into the meadow, or late-season runoff from the western arm of the watershed. Piezometers FS-12 and FS-13 show a noticeable drop in water levels in late July and early August. These two piezometers are on opposite sides of a pond with significant beaver activity. The change in groundwater could be an indication of a debris dam or beaver dam either diverting or trapping flow upstream or breaking and allowing more flow downstream out of the ponded area.

Figure 25 shows the four piezometers located at the downstream (north end) of the upper meadow WY2018 and WY2019. Piezometer 09-5 is located at an upland terrace roughly 2 to 3 feet above the meadow surface and shows the largest seasonal variability and limited connection to streamflow. In both 2018 and 2019, groundwater levels rise to the ground surface only during the wettest conditions and regularly drop to 4 feet below the ground surface during the summer months with the piezometer drying up.

Piezometer 09-3 is located downstream in a low gradient portion of the meadow near the confluence of the Little Truckee River and Perazzo Creek and near relict channels which were re-wetted as part of restoration efforts. In 2018, water levels in this piezometer dropped below the ground surface in late June-- earlier than in previous years, and to levels not observed since restoration was implemented. We presume that this is primarily due to geomorphic changes associated with the high flows in WY2017. In WY2019 water levels remained higher than the previous year at this location.

Piezometer 09-4 was inundated for an extended period of time after a rain on snow event on February 14, 2019. The record indicates that water levels began to recede after another wet storm in early April. Ice dams from deep snowpack and cold winter conditions could have caused this change in water distribution in the meadow. Streamflow records into and out of the Upper Meadow also reflect water retention during this period; inflows to the Upper Meadow rose and fell rapidly during and after the February 14 storm, but outflows from the Upper Meadow rose more slowly, to a lower magnitude, and fell at a much more gradual rate over the weeks following the storm, indicating retention and slow release of mid-winter storm flows.

Unlike during 2018 and other previous years, late season groundwater levels remained almost three feet higher in 2019. This could be a result of more persistent baseflow from the Little Truckee River, downstream geomorphic changes or beaver dams, and highlights the variability in restoration effects year-to-year. In years with average and below-average precipitation, it appears that this restored area releases late-season flows to downstream areas, whereas in years with above average precipitation, this release is not detected.

3.3.2 Groundwater Levels in the Middle Meadow

Figures 26 and 27 show depth to groundwater in the western and eastern portions of the Middle Meadow, respectively. Restoration and subsequent beaver activity caused water levels to rise in the eastern Middle Meadow (Piezometers 09-6, 09-8, and 09-9) and persist at shallow depths for several years after restoration. Groundwater levels in these areas began to fall deeper in the summer during WY2016, likely due to evolution of the channel and meadow. This seasonal decline in groundwater levels has persisted through WY2019, such that groundwater levels in this area now fall to within 1 foot of pre-restoration late summer water levels.

Piezometer 09-11 is located at an elevation slightly higher than much of the meadow, and as such continues to show minimal to no effects from restoration activities, with late season groundwater levels consistently within 1 to 2 feet of pre-restoration conditions and 2 to 3 feet below the ground surface.

3.3.3 Groundwater Levels in the Lower Meadow

Since Balance assumed monitoring responsibilities in the Lower Meadow, depth to groundwater in all the piezometers have consistently fallen to 2 to 6 feet below the ground surface during the summer months, except for during WY2017 which was one of

the wettest years on record (**Figure 28**). Lower Meadow groundwater levels are typically further below the ground surface than in the restored Upper and Middle Meadows, and winter and spring groundwater conditions are also generally lower in the unrestored lower meadow.

Restoration of Lower Perazzo Meadow began in August 2019 and concluded in October 2019. The restoration used a channel fill method which required a diversion of flow around the meadow from August 26, 2019 until October 4, 2019. **Figure 29** shows the groundwater response to the re-introduction of water into the restored meadow. Piezometer LP-W2 is located on a point bar off slope on the south side of the channel. It shows a dramatic rise in groundwater level as its location was inundated from the restoration effort (see Table 11). All piezometers in the lower meadow showed an increase in groundwater levels, ranging from over 4 feet to approximately 2 feet from mid-summer groundwater conditions.

4. CONCLUSIONS

Ten years after plug and pond restoration activities in the Upper Meadow and nine years after the Middle Meadow restoration, we observed groundwater levels at Upper and Middle Perazzo Meadows to vary spatially and temporally, in some locations from the landscape and elevation position, and in other locations due to minor modifications and re-direction of surface flows.

WY2019 precipitation and snowpack conditions were above average. A cold winter and significant snowpack from WY2019 were shown to have some extended effects on streamflow and groundwater levels.

Restoration in the Lower Meadow was completed from August to October 2019. Beginning in WY2015, groundwater monitoring in the Lower Meadow was included in this program and allow for comparison to conditions after restoration. Preliminary results show an increase in late season groundwater levels of 2 to 4 feet in the Lower Meadow, as associated with restoration activities. Ongoing monitoring through WY2020 will allow us to further evaluate the effectiveness of the restoration effort.

In summary, examination of several years of data leads us to conclude the following:

- WY2019 had a large snowpack and snowmelt runoff persisted later into the dry season than previous years. Topographic changes and channel evolution, and debris or beaver activity led to lower groundwater conditions in some portions of the Upper and Middle Meadows and higher groundwater conditions in others;
- Upland areas in the Upper and Middle Meadows show minimal effects from restoration activities and can also serve as a control on year-to-year variation in more affected zones of the Upper and Middle Meadows; and
- Surface water retention in the Upper Meadow appears to be a significant hydrologic process that has resulted from restoration. The expansive relict channel zone near Piezometer 09-4 and 09-3 can store significant volumes of water which can be released to downstream in the weeks following a mid-winter storm event, as well as during the late summer in average and below-average precipitation years.

5. LIMITATIONS

This report was prepared in general accordance with the accepted standard of practice existing in Northern California at the time the investigation was performed. No other warranties, expressed or implied, are made. It should be recognized that interpretation and evaluation of streamflow records and of subsurface conditions is a difficult and inexact art. Judgment leading to conclusions and recommendations presented above were based on existing information and personnel communications, which in total represent an incomplete picture of the site. Because this monitoring program has been developed with the intent of evaluating flows during the spring and summer, efforts to accurately measure winter peak flows are limited. As such all peak flows and annual runoff values are estimated. More extensive studies, including those recommended above, can reduce some of the uncertainties associated with this study.

Balance Hydrologics has prepared this report for the Truckee River Watershed Council's exclusive use on this particular groundwater and surface water monitoring study. Analyses and information included in this report are intended for use at the watershed scale. Analyses of channels and other water bodies, rocks, earth properties, topography and/or environmental processes are generalized to be useful at the scale of a watershed, both spatially and temporally. Information and interpretations presented in this report should not be applied to specific projects or sites without the expressed written permission of the authors, nor should they be used beyond the area to which we have applied them.

This study was conducted to monitor work done by others. Our conclusions and any implied or inferred recommendations are based on a limited range of surface water and groundwater data in a region of relatively complex geology. They are limited to restoration evaluation purposes and should not be used for design or site-specific work. If readers are aware of additional data, observations, conditions, or forthcoming changes to the bases of our decisions, please contact us or the Truckee River Watershed Council at the first opportunity, such that this report may be promptly revised.

6. REFERENCES

- Carter, R.W., and Davidian, J., 1968, General procedures for gaging streams, Techniques of Water Resources Investigations of the United State Geological Survey, Chapter A6, Book 3, 13 p. + figures.
- Hastings, B., Shaw, D., Lass, D., Henery, R., Purdy, S., and Fesenmeyer, K., 2013, Little Truckee River Assessment: Sierra Valley Diversion downstream to Stampede Reservoir, Sierra County, California: Balance Hydrologics and Trout Unlimited consulting report prepared for Trout Unlimited Feather River Chapter, 133 p. + appendices.
- Hastings, B., Shaw, D. and Strassenburgh, C., 2012, Middle Truckee River Total Maximum Daily Load (TMDL) Suspended Sediment Monitoring Report (Draft), Water Year 2012, Nevada County, California: Balance Hydrologics, Inc. consulting report prepared for Truckee River Watershed Council, 38 p. + appendices.
- National Resource Conservation Service (NRCS), 2018, Independence Creek SNOTEL site #540, <http://wcc.sc.egov.usda.gov/nwcc/site?sitenum=540>.
- National Resource Conservation Service (NRCS), 2018, Independence Lake SNOTEL site #541, <http://www.wcc.sc.egov.usda.gov/nwcc/site?sitenum=541>.
- Rantz, 1982, Measurement and computation of streamflow, U.S. Geological Survey Water-Supply Paper 2175, 284 p.
- Shaw, D., 2010, Perazzo Meadows restoration hydrologic monitoring data report, upper and middle Perazzo Meadows, water year 2010, Sierra County, California: Balance Hydrologics, Inc. consulting report prepared for Truckee River Watershed Council, 14 p. + figures, tables, and forms.
- Shaw, D. and Hastings, B., 2012, Perazzo Meadows restoration hydrologic monitoring data report, upper and middle Perazzo Meadows, water year 2012, Sierra County, California: Balance Hydrologics, Inc. consulting report prepared for Truckee River Watershed Council, 21 p. + figures, tables, and forms.
- Shaw, D. and Hastings, B., 2013, Perazzo Meadows restoration hydrologic monitoring data report, Upper and Middle Perazzo Meadows, water year 2013, Sierra County, California: Balance Hydrologics, Inc. Consulting report prepared for the Truckee River Watershed Council, 23 p. + figures, tables, and forms.
- Shaw, D., and Hastings, B., 2014, Perazzo Meadows restoration hydrologic monitoring data report, Upper and Middle Perazzo Meadows, water year 2014, Sierra County, California: Balance Hydrologics, Inc. Consulting report prepared for the Truckee River Watershed Council, 23 p. + figures, tables, and forms.
- Snider, R.L., 1999, Reference Evapotranspiration Map of California: California Irrigation Management Information System (CIMIS), <http://www.cimis.water.ca.gov/cimis/info.jsp>.
- Svahn, J., pers. comm., Truckee-Donner Land Trust, Truckee, California, (530) 582-4711.
- Swanson Hydrology and Geomorphology, 2008, Perazzo Meadows Geomorphic Assessment: consulting report prepared for the Truckee River Watershed Council, 53 p. + appendices.

Trustman, B., Shaw, D., and Hastings, B., 2015, Perazzo Meadows restoration hydrologic monitoring data report, Upper and Middle Perazzo Meadows, water year 2015, Sierra County, California: Balance Hydrologics, Inc. Consulting report prepared for the Truckee River Watershed Council, 24 p. + figures, tables, and forms.

Trustman, B., Shaw, D., and Hastings, B., 2016, Perazzo Meadows restoration hydrologic monitoring data report, Upper and Middle Perazzo Meadows, water year 2016, Sierra County, California: Balance Hydrologics, Inc. Consulting report prepared for the Truckee River Watershed Council, 24 p. + figures, tables, and forms.

Trustman, B., Shaw, D., and Hastings, B., 2017, Perazzo Meadows restoration hydrologic monitoring data report, Upper and Middle Perazzo Meadows, water year 2017, Sierra County, California: Balance Hydrologics, Inc. Consulting report prepared for the Truckee River Watershed Council, 28 p. + figures, tables, and forms.

USGS, 2017, Streamstats, <http://www.water.usgs.gov/osw/streamstats/ssonline.html>; accessed December 2017.

Weixelman, D.A., Hill, B., Cooper, D.J., Berlow, E.L, Viers, J., Purdy, S.E., Merrill, A.G., and Gross, S.E., 2011, Meadow hydrogeomorphic types for the Sierra Nevada and Southern Cascade Ranges in California, a field key: USDA US Forest Service RF-TP-034, 24 p. + appendices.

FORMS

Water Year: 2019
Stream: Perazzo Creek
Station: Above Perazzo Meadows (PCAP)
County: Sierra County, California

Form 1. Annual Hydrologic Record, WY2019

Station Location / Watershed Descriptors

N 39° 27' 53", W 120° 23' 16" near Truckee, California. Gage is located on west bank.
 Along USFS Road 07-030
 Land use includes timber harvesting, recreation, and open space
 Flows are unregulated
 Drainage area is 6.1 square miles.

Annual Mean Flows

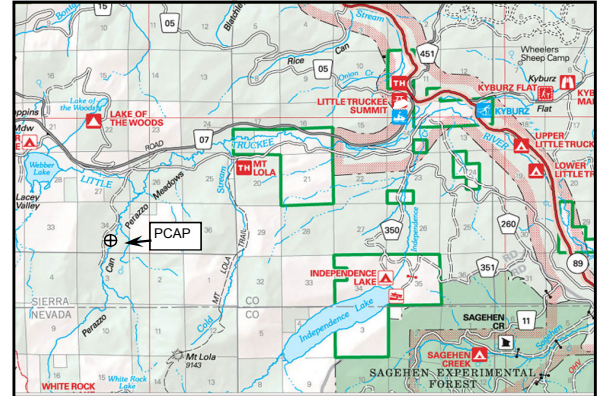
Annual mean flow for WY2019 was 34.8; WY2018 was 17.7; WY2017 was 59.7 cfs; WY2016 was 34.4 cfs; WY2015 was 9.2 cfs; WY2014 was 7.8 cfs; WY2013 was 13.9 cfs; WY2012 was 14.0 cfs; WY2011 was 37.4 cfs.

Peak Flows (WY2019)

Date	Time (24-hr)	Gage Ht. (feet)	Discharge (cfs)	Date	Time (24-hr)	Gage Ht. (feet)	Discharge (cfs)
4-9-19	0:15	5.86	234				
4-25-19	23:30	5.74	208				
5-16-19	4:30	5.78	216				
6-6-19	20:00	6.10	284				

Extreme for period of record (WY2011-2017) is 502 cfs on January 8, 2017.

Station Location Map



Period of Record

Staff plate and water level recorder were installed on November 17, 2010.
 Gaging is sponsored by the Truckee River Watershed Council and USFS

WY 2019 Daily Mean Flow (cubic feet per second)

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEPT
1	0.6	1.0	2.3	2.0	4.1	9.9	14.7	99.7	164	64.2	10.8	1.6
2	0.7	1.0	2.1	1.9	7.5	10.1	23.4	92.8	170	65.9	9.8	1.4
3	0.9	1.0	2.0	1.8	5.9	14.6	24.0	97.1	187	60.9	8.8	1.3
4	1.0	1.0	2.0	1.8	5.1	14.5	23.7	109	203	57.0	8.5	1.4
5	0.8	1.0	2.1	2.1	4.6	13.0	23.6	118	221	60.9	7.9	1.4
6	0.8	1.1	2.1	1.7	4.0	12.8	21.2	128	239	60.8	7.0	1.4
7	0.8	1.0	1.9	3.1	3.7	12.1	29.1	142	188	54.1	7.2	1.3
8	0.7	0.9	1.8	2.4	3.7	11.9	55.8	152	144	49.4	6.8	1.3
9	0.8	0.9	1.8	3.4	3.6	11.4	144.1	151	130	46.4	6.3	1.3
10	0.8	1.0	1.8	3.0	3.4	11.1	89.8	145	153	48.0	6.0	1.4
11	0.8	0.9	1.8	2.6	3.5	10.6	61.9	141	181	49.2	5.5	1.4
12	0.8	0.9	1.8	2.6	3.2	11.1	49.0	162	187	49.1	4.8	1.1
13	0.9	1.0	1.8	2.3	10.3	10.5	46.6	177	190	47.7	4.5	1.0
14	0.8	1.0	1.8	2.3	58.6	10.3	54.3	165	184	44.5	4.1	0.9
15	0.6	1.1	1.8	1.6	41.6	10.7	62.8	160	181	40.8	3.8	0.7
16	0.9	1.1	2.0	3.4	20.7	10.7	53.7	174	153	40.0	3.7	1.4
17	0.9	1.1	2.1	11.6	12.9	11.3	51.2	109	150	38.9	3.5	1.5
18	1.0	1.0	2.1	5.6	10.3	12.2	68.5	85.4	153	38.8	3.3	1.8
19	0.9	1.0	2.1	5.4	9.0	13.0	102	73.5	160	36.5	3.0	2.4
20	0.9	1.0	2.1	12.3	8.0	14.0	122	61.1	150	33.2	2.9	1.8
21	0.9	1.6	3.4	10.6	8.0	13.6	113	55.6	112	32.0	2.9	1.5
22	0.9	1.8	2.8	4.3	8.0	13.2	105	50.4	91.9	31.4	2.7	1.3
23	0.9	4.9	2.5	5.2	8.0	13.0	122	59.1	86.4	29.4	2.6	1.2
24	1.0	7.9	6.7	4.6	8.0	13.1	149	69.6	93.6	26.1	2.5	1.0
25	1.0	3.4	5.6	4.2	8.3	12.5	169	86.1	89.2	23.0	2.5	0.9
26	1.0	2.4	3.5	3.8	10.5	12.1	173	84.8	83.5	21.1	2.5	0.9
27	1.0	2.8	3.0	3.7	10.2	13.0	165	69.2	75.0	19.4	2.1	0.8
28	0.9	4.6	2.5	3.7	10.1	13.5	150	80.0	61.6	17.8	2.0	1.2
29	1.1	3.5	1.3	3.6	12.9	12.9	137	110.4	57.8	16.1	1.9	1.6
30	1.0	2.6	2.1	3.7	13.1	12.8	128	127.2	61.2	13.6	1.8	1.7
31	1.0		2.1	3.9	13.2			134.3		11.6	1.8	
MEAN	0.9	1.9	2.4	4.0	10.5	12.2	84.4	112	143	39.6	4.6	1.3
MAX. DAY	1.1	7.9	6.7	12.3	58.6	14.6	173	177	239	65.9	10.8	2.4
MIN. DAY	0.6	0.9	1.3	1.6	3.2	9.9	14.7	50.4	57.8	11.6	1.8	0.7
cfs days	27	56	75	124	295	379	2533	3469	4300	1228	143	40
ac-ft	54	110	148	246	585	752	5024	6881	8528	2436	284	79

Monitor's Comments

- Data manager: Benjamin Trustman
- Daily mean values are based on 15-minute automated measurements of stage; stage shifts have been applied to account for changes in sedimentation of the gage over the course of the monitoring program.
 - Stage and flow are commonly affected by ice in the winter months; flow during these periods have been estimated from daily mean flows at USGS 10343500 (Sagehen Crk near Truckee CA).
 - Peak flows associated with snow-melt hydrographs commonly occur between April and June; multiple peaks are also common
 - Data are subject to revision, should additional measurement or observer account warrant adjustment of the new rating curve.
 - Italics represent data that has been corrected for water level recorder inconsistencies due to ice effects

Water Year 2019 Totals:		
Mean flow	34.8	(cfs)
Max. daily flow	239	(cfs)
Min. daily flow	0.61	(cfs)
Annual total	12,669	(cfs-days)
Annual total	25,129	(ac-ft)

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Preliminary and subject to revision

Water Year:	2019
Stream:	Little Truckee River
Station:	Above Perazzo Meadows (LTAP)
County:	Sierra County, California

Form 2. Annual Hydrologic Record, WY2019

Station Location / Watershed Descriptors

N 39° 28' 59", W 120° 22' 57" near Truckee, California. Gage is located on south bank approximately 130 feet upstream of USFS Road 07-030 bridge.
Land use includes timber harvesting, recreation, open space, and rural residential.
Streamflow may be affected by Webber Lake (reservoir)
Drainage area is 15.8 square miles.

Annual Mean Flows

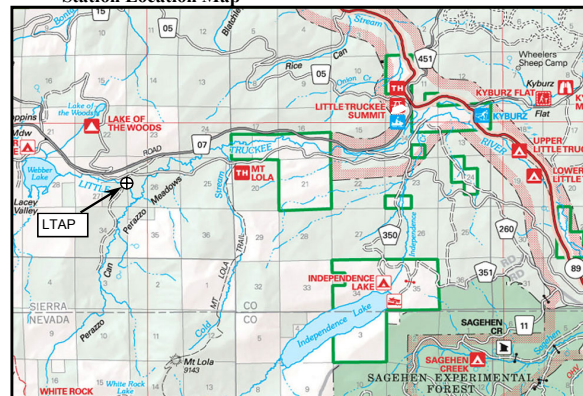
Annual mean flow for WY2019 was 78.0 cfs, WY2018 was 42.5 cfs, WY2017 was not calculated due to incomplete record from damaged gage, WY2016 was 46.7 cfs, WY2015 was 15.3 cfs, WY2014 was 12.4 cfs, WY2013 (partial) was 24.7 cfs, WY2012 is 27.0 cfs, WY2011 (partial) is 88.5 cfs.

Peak Flows (WY2019)

Date	Time (24-hr)	Gage Ht. (feet)	Discharge (cfs)	Date	Time (24-hr)	Gage Ht. (feet)	Discharge (cfs)
2-14-19	10:45	4.63	292				
2-27-19	5:00	2.86	32				
4-9-19	3:45	5.31	418				
6-5-19	2:15	5.24	405				

Extreme for period of record (WY2011-WY2018) is 701 cfs on June 24, 2011.

Station Location Map



Period of Record

Staff plate and water level recorder were installed on November 18, 2010. Gaging is sponsored by the Truckee River Watershed Council and USFS

WY2019 Daily Mean Flow (cubic feet per second)

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEPT
1	--	--	--	0.1	1.1	7.3	15.6	206	269	66.5	5.2	1.1
2	--	--	--	0.2	1.7	6.1	22.7	195	302	61.7	4.7	1.0
3	--	--	--	0.2	1.6	6.7	23.6	204	316	56.9	4.5	0.9
4	--	--	--	0.3	2.1	6.1	24.8	223	333	52.8	4.4	1.0
5	--	--	--	0.3	2.5	5.3	30.2	237	356	50.9	4.2	0.9
6	--	--	--	0.1	2.5	8.2	32.3	244	335	51.4	3.9	0.8
7	--	--	--	0.1	2.9	8.5	36.9	259	309	48.1	3.8	0.9
8	--	--	--	0.1	2.0	6.7	74.4	272	255	42.1	3.8	0.8
9	--	--	--	0.2	2.0	6.0	190	276	223	37.4	3.5	0.8
10	--	--	--	0.3	3.7	5.7	105	265	228	33.8	3.4	0.8
11	--	--	--	0.5	3.0	5.6	107	260	254	33.0	3.2	0.7
12	--	--	--	0.4	2.5	5.9	118	266	272	32.4	3.2	0.7
13	--	--	--	0.5	4.7	6.5	119	285	268	31.2	3.0	0.7
14	--	--	--	0.4	164	6.3	124	292	265	28.5	2.9	0.6
15	--	--	--	0.3	30.0	6.5	130	274	256	25.1	2.8	0.5
16	--	--	--	0.6	53.6	6.7	127	298	243	23.7	2.6	0.7
17	--	--	--	1.0	20.3	7.0	122	240	221	23.8	2.4	0.6
18	--	--	--	0.8	7.9	7.5	127	200	219	21.8	2.4	0.6
19	--	--	--	0.9	5.8	7.9	147	181	219	19.6	2.3	0.7
20	--	--	--	1.2	4.9	9.0	183	151	212	17.8	2.2	0.6
21	--	--	--	1.4	4.8	9.2	190	142	190	16.2	2.1	0.6
22	--	--	--	1.6	4.6	9.3	185	130	149	14.3	1.8	0.6
23	--	--	--	1.7	4.2	10.6	190	148	130	12.7	1.8	0.5
24	--	0.4	0.4	1.7	3.7	10.8	209	164	126	10.7	1.7	0.6
25	--	0.3	0.3	1.8	3.7	10.5	249	195	124	9.7	1.6	0.6
26	--	--	0.4	1.3	15.8	11.7	275	202	113	9.0	1.6	0.6
27	--	--	0.5	1.3	28.9	17.4	281	183	96.2	8.2	1.5	0.5
28	--	--	0.4	1.4	14.9	17.8	275	187	83.7	7.7	1.4	0.6
29	--	--	0.2	1.2	7.3	15.0	261	222	74.1	7.1	1.2	0.7
30	--	--	0.0	1.3		14.5	250	244	67.6	6.1	1.1	0.8
31	--	--	0.0	1.2		14.5		246		5.6	1.2	
MEAN	--	0.4	0.3	0.8	14.0	8.9	141	222	217	27.9	2.7	0.7
MAX. DAY	0.0	0	0.5	2	164	18	281	298	356	66.5	5.2	1.1
MIN. DAY	0.0	0.3	0.0	0.1	1.1	5.3	15.6	130	67.6	5.6	1.1	0.5
cfs days	0	1	2	24	407	277	4226	6891	6509	866	85	22
ac-ft	0	1	4	48	807	549	8382	13668	12910	1718	169	43

Monitor's Comments

- Data manager: Brian Hastings
- Daily mean values are based on 15-minute automated measurements of stage; stage shifts have been applied to account for changes in sedimentation of the gage over the course of the monitoring program.
 - Stage and flow are commonly affected by ice in the winter months.
 - Peak flows associated with snow-melt hydrographs commonly occur between April and June; multiple peaks are also common.
 - Daily mean flows may be affected by operations at Webber Lake (Reservoir).
 - Data are subject to revision, should additional measurement or observer account warrant adjustment of the rating curve.
 - Period of inferred ice-affected flows include 2/18/18 through 3/6/18; values are estimated.

Water Year 2019 Totals:

Mean flow	68.0	(cfs)
Max. daily flow	356	(cfs)
Min. daily flow	0.03	(cfs)
Annual total	19,309	(cfs-days)
Annual total	38,300	(ac-ft)

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Provisional and subject to revision

Water Year: 2019
Stream: Little Truckee River
Station: Upper Perazzo Meadows (LTUM)
County: Sierra County, California

Form 3. Annual Hydrologic Record, WY2019

Station Location / Watershed Descriptors

N 39° 29' 10", W 120° 22' 13" near Truckee, California.
 Located on east bank, approx. 40 feet downstream from Henness Pass Rd bridge. Subject to ice.
 Land use includes timber harvesting, recreation, open space, and rural residential
 Streamflow may be affected by Webber Lake (reservoir)
 Drainage area is 25.5 square miles.

Annual Mean Flows

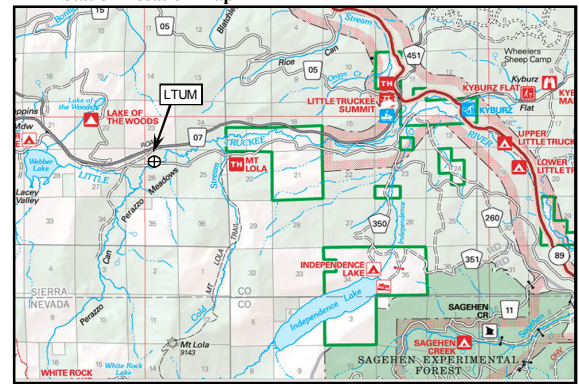
Annual mean flow for WY2019 was 120 cfs, WY2018 was 63 cfs, WY2017 was not calculated due to incomplete record from damaged gage, WY2016 was 81 cfs, WY2015 was 28 cfs, WY2014 was 25 cfs, WY2013 was 54 cfs, WY2012 was 45 cfs, WY2011 (partial) is 141 cfs.

Peak Flows (WY2019)

Date	Time (24-hr)	Gage Ht. (feet)	Discharge (cfs)	Date	Time (24-hr)	Gage Ht. (feet)	Discharge (cfs)
4-9-19	14:15	7.38	358	6-12-19	1:30	8.48	722
4-27-19	5:15	8.40	695				
5-16-19	6:00	8.67	760				
6-6-19	21:15	9.03	800				

Extreme for period of record (WY2011-WY2019) is 846 cfs on April 7, 2018

Station Location Map



Period of Record

Staff plate and water level recorder were installed on November 19, 2010.
 Gaging is sponsored by the Truckee River Watershed Council and USFS

WY2019 Daily Mean Flow (cubic feet per second)

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEPT
1	0.3	1.0	4.1	5.0	10	37	50	383	628	167	17.8	2.7
2	0.3	1.1	4.3	4.2	13	33	54	405	667	162	16.2	2.3
3	0.4	1.1	4.2	4.2	15	34	61	453	706	148	15.4	2.4
4	0.5	1.0	3.3	3.9	17	34	68	498	672	147	14.7	2.3
5	0.5	1.1	3.3	3.7	17	30	67	527	761	150	13.1	2.3
6	0.5	1.2	3.2	2.5	16	28	79	582	705	138	13.0	2.4
7	0.5	1.1	3.4	4.5	22	27	141	617	567	122	12.7	2.4
8	0.4	1.1	3.4	4.8	18	26	315	620	489	111	12.2	2.4
9	0.4	1.1	3.3	9.0	19	26	229	595	513	104	12.0	2.7
10	0.4	1.1	3.2	9.0	27	27	183	576	588	103	11.8	2.5
11	0.4	1.1	2.9	8.1	25	27	176	609	627	100	10.4	2.2
12	0.5	1.2	2.8	6.9	19	26	175	656	627	95.2	9.0	2.0
13	0.6	1.2	3.1	7.1	20	28.8	190	638	612	87.3	8.2	1.9
14	0.6	1.2	2.6	6.1	51	29.4	207	621	600	77.7	7.4	1.6
15	0.8	1.2	2.5	5.0	144	29.0	190	692	560	70.5	6.7	3.0
16	0.8	1	2.5	5.2	217	29.1	184	501	519	65.2	6.0	4.4
17	0.8	1	3.0	8.4	209	29.6	210	386	522	62.9	5.8	4.2
18	0.9	1.4	2.8	9	202	30.3	287	334	524	58.8	5.3	7.8
19	0.9	1.4	3.1	8	247	31.9	373	263	521	53.9	5.2	5.4
20	0.9	1.3	2.8	12	212	32.6	379	248	445	50.2	5.2	4.0
21	0.9	1.3	3.8	15	163	33	367	222	348	47.4	4.7	3.3
22	0.9	2.4	4.5	19	108	35	398	258	306	44.8	4.5	2.9
23	1.0	3.1	3.7	14	76	36	489	288	308	40.6	4.2	2.6
24	0.9	11.6	5.5	14	55	34	582	364	305	36.7	4.1	2.2
25	0.9	7.2	7.8	14	45	34	628	372	277	33.3	4.1	2.1
26	0.9	4.1	5.5	12	70	41	631	315	243	31.0	3.9	1.9
27	0.9	3.4	4.7	12	72	47	608	327	201	28.5	3.7	2.9
28	0.8	6.0	4.6	12	50	40	567	426	177	27.0	3.5	4.8
29	0.9	6.2	4.3	10		39	527	495	165	23.9	3.5	5.8
30	1.1	4.5	3.7	11		39	409	516	169	21.2	3.3	0.9
31	1.0		4.2	10		40.8		591		19.3	3.0	
MEAN	0.7	2.4	3.7	9	77	33	294	464	478	78.3	8.1	3.0
MAX. DAY	1.1	12	8	19	247	47	631	692	761	167	17.8	7.8
MIN. DAY	0.3	1.0	2.5	2	10	26	50	222.5	164.6	19.3	3.0	0.9
cfs-days	22	73	116	268	2158	1014	8825	14382	14351	2428	251	90
ac-ft	43	145	230	532	4281	2011	17505	28526	28466	4816	497	179

Monitor's Comments

- Data manager: Brian Hastings
- Daily mean values are based on 15-minute automated measurements of stage; stage shifts have been applied to account for changes in sedimentation of the gage over the course of the monitoring program.
 - Daily mean stage and flow are commonly affected by ice in the winter months;
 - Peak flows associated with snow-melt hydrographs commonly occur between April and June; multiple peaks are also common
 - Daily mean flows may be affected by operations at Webber Lake (Reservoir)
 - Ice-affected flows from 1/19/19 to 3/6/19

Water Year 2019 Totals:		
Mean flow	120	(cfs)
Max. daily flow	761	(cfs)
Min. daily flow	0.3	(cfs)
Annual total	43,979	(cfs-days)
Annual total	87,232	(ac-ft)

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Preliminary and subject to revision

Water Year: 2019
Stream: Cold Stream
Station: Above Perazzo Meadows (CSAP)
County: Sierra County, California

Form 4. Annual Hydrologic Record, WY2019

Station Location / Watershed Descriptors

N 39° 28' 23", W 120° 20' 30" near Independence Lake, California. Gage is located on east bank .
 Gage accessed from Cold Stream Meadow Road, approx. 500 ft downstream of Lola Trail footbridge
 Land use includes timber harvesting, recreation, and open space
 No known regulation or diversions affect flow
 Drainage area is 3.1 square miles.

Mean Flow

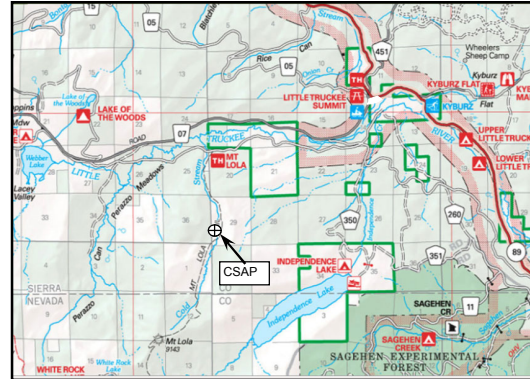
Mean daily flow for WY2019 is 8.2 cfs; WY2018 was 5.4 cfs; WY2017 was 12.0 cfs;
 WY2016 was 8.1 cfs; WY2015 was 2.7 cfs; WY 2014 was 2.8 cfs; WY 2013 was 4.2 cfs;
 WY 2012 was 5.4 cfs

Peak Flows

Date	Time (24-hr)	Gage Ht. (feet)	Discharge (cfs)	Date	Time (24-hr)	Gage Ht. (feet)	Discharge (cfs)
2-14-19	7:00	4.11	3	6-20-19	16:00	5.32	87
4-9-19	6:00	4.14	4				
5-13-19	18:45	4.57	20				
6-6-19	18:00	5.15	62				

Extreme for period of record, (Aug. 2011-Sept. 2017) is 311 cfs on 1/8/2017

Station Location Map



Period of Record

Staff plate and water level recorder were installed August 18, 2011.
 Gaging sponsored by the Truckee River Watershed Council and USFS.

WY 2019 Daily Mean Flow (cubic feet per second)

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEPT
1	0.9	0.9	1.5	1.0	1.0	1.1	1.2	6.7	17.5	35.5	9.0	2.4
2	0.9	0.9	1.5	1.0	1.1	1.1	1.3	6.5	20.0	36.9	8.5	2.2
3	1.0	0.9	1.2	1.0	1.1	1.1	1.3	7.0	24.6	37.4	7.8	2.1
4	1.0	0.9	1.0	1.0	1.1	1.1	1.3	8.1	31.3	36.5	7.1	2.2
5	1.0	0.9	1.0	1.0	1.1	1.1	1.2	9.4	38.4	37.8	6.7	2.1
6	1.0	0.9	1.0	1.0	1.1	1.1	1.2	10.9	46.4	38.1	5.9	2.0
7	1.0	0.9	1.0	1.0	1.2	1.1	1.3	12.0	41.9	36.7	6.1	2.0
8	1.0	0.9	1.1	1.1	1.0	1.1	1.9	12.9	33.1	34.7	5.8	2.0
9	1.0	0.9	1.0	1.0	1.1	1.1	3.6	13.2	30.0	33.4	5.4	2.0
10	1.0	0.9	1.0	1.0	1.1	1.1	2.7	12.6	32.0	32.9	5.2	2.0
11	1.0	0.9	1.0	1.1	1.1	1.1	2.4	12.9	39.1	33.6	5.0	1.9
12	1.0	0.9	1.0	1.1	1.0	1.1	2.2	14.5	45.7	34.0	4.7	1.8
13	1.0	0.9	1.0	1.1	1.1	1.1	2.1	17.5	53.3	33.2	4.5	1.8
14	0.9	0.9	1.0	1.0	2.3	1.1	2.2	17.0	55.1	31.3	4.4	1.8
15	0.9	0.9	0.9	1.0	1.7	1.1	2.3	15.6	59.5	28.8	4.2	1.5
16	0.9	0.9	0.9	1.0	1.5	1.2	2.2	14.8	56.3	26.9	4.1	1.9
17	0.9	0.9	1.0	1.0	1.3	1.2	2.3	12.3	56.1	25.7	4.0	1.9
18	0.9	0.9	1.0	1.0	1.2	1.2	2.9	11.3	58.9	25.2	3.9	2.0
19	0.9	0.9	1.0	1.0	1.3	1.3	3.7	10.3	65.5	24.2	3.5	2.3
20	0.9	0.9	1.0	1.0	1.2	1.2	4.2	9.0	69.2	22.6	3.5	2.0
21	0.9	0.9	1.0	1.0	1.2	1.2	4.1	8.4	59.6	21.7	3.5	1.9
22	0.9	0.9	1.2	1.1	1.2	1.2	4.0	7.5	50.9	21.0	3.4	1.7
23	0.9	0.9	1.0	1.1	1.2	1.2	4.9	7.1	47.6	20.4	3.4	1.7
24	0.9	1.6	1.0	1.1	1.1	1.2	6.3	7.3	48.0	19.1	3.1	1.6
25	0.9	1.0	1.0	1.1	1.1	1.2	8.1	8.3	46.1	17.7	3.0	1.6
26	0.9	1.0	1.0	1.0	1.1	1.1	9.6	8.3	44.5	16.2	3.1	1.6
27	0.9	1.0	1.0	1.1	1.1	1.2	10.1	7.3	40.4	15.0	3.0	1.4
28	0.9	1.0	1.0	1.1	1.1	1.1	10.1	8.2	37.2	14.0	2.8	1.6
29	0.9	2.9	1.0	1.0	1.1	1.1	9.9	10.0	35.1	12.9	2.6	1.6
30	0.9	1.4	1.0	1.1	1.2	1.2	8.9	12.2	34.9	11.4	2.5	1.6
31	0.9		1.0	1.1		1.2		14.0		9.9	2.6	
MEAN	0.9	1.0	1.0	1.0	1.2	1.1	4.0	10.7	43.9	26.6	4.6	1.9
MAX. DAY	1.0	2.9	1.5	1.1	2.3	1.3	10.1	17.5	69.2	38.1	9.0	2.4
MIN. DAY	0.9	0.9	0.9	1.0	1.0	1.1	1.2	6.5	17.5	9.9	2.5	1.4
cfs days	29	31	32	32	34	36	120	333	1318	825	142	56
ac-ft	58	62	64	64	67	70	237	661	2615	1635	282	112

Monitor's Comments

Data manager: Jonathan Owens

- Mean daily values are based on 15-minute measurements of stage; several stage shifts are applied to account for changes in the hydraulic control at the gage (changes in sediment and woody debris) over the course of the monitoring program.
- Mean daily stage and flow are commonly affected by ice in the winter months; periods have been adjusted to correct for ice.
- Italicized font indicates an estimated flow (when affected by ice).
- Values with more than 2 significant digits are the result of electronic calculations, and do not represent increased precision.
- Data are subject to revision, should additional measurements or observer accounts warrant adjustment of the rating curve.

Water Year 2019 Totals:

Mean flow	8.2	(cfs)
Max. daily flow	69	(cfs)
Min. daily flow	0.9	(cfs)
Annual total	2,988	(cfs-days)
Annual total	5,927	(ac-ft)

Balance Hydrologics, Inc. PO Box 1077, Truckee, CA 96161 phone: (530) 550-9776, Berkeley (Main Office) (510) 704-1000

www.balancehydro.com

Preliminary and subject to revision

Water Year: 2019
Stream: Little Truckee River
Station: Middle Perazzo Meadow Outlet (LTPM)
County: Sierra County, California

Form 5. Annual Hydrologic Record, WY2019

Station Location / Watershed Descriptors

N 39° 29' 42", W 120° 20' 7" near Truckee, California. Gage is located on north bank in downstream-most pond, part of the USFS plug and pond restoration project.
Land use includes timber harvesting, recreation, open space, and rural residential
Flows may be affected by Webber Lake (reservoir)
Drainage area is 32.8 square miles.

Annual Mean Flows

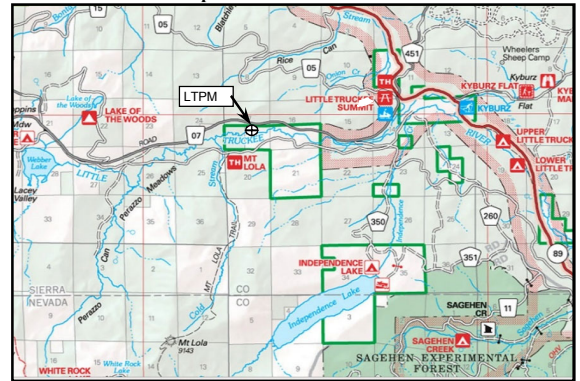
Annual mean flow for WY2019 was 124.8 cfs; WY2018 was 75.4 cfs; WY2017 was 178 cfs; WY2016 was 91.8 cfs; WY2015 was 33.1 cfs; WY2014 was 25.3 cfs; WY2013 was 66.5 cfs, WY2012 was 56.5 cfs, WY2011 was 161.6 cfs.

Peak Flows (WY2019)

Date	Time (24-hr)	Gage Ht. (feet)	Discharge (cfs)	Date	Time (24-hr)	Gage Ht. (feet)	Discharge (cfs)
4-9-19	11:30	4.57	495				
4-26-19	8:00	4.80	668				
5-16-19	6:00	5.06	762				
6-6-19	23:45	5.37	881				

Extreme for period of record (WY2010-WY2017) is 2,039 cfs on January 8, 2017

Station Location Map



Period of Record

Staff plate #1 installed Sep 23, 2010. Datalogger installed on Oct 1, 2009.
Staff plate #2 installed Sep 28, 2010.
Staff plate #3 installed Jun 8, 2011. (Staff plates 1 and 2 are no longer used)
Staff plate #4 installed June 6, 2018. (Staff plates 1, 2 and 3 are no longer used)

WY2019 Daily Mean Flow (cubic feet per second)

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEPT
1	2.4	4.0	8.3	7.1	11.3	46.8	42.4	432	569	230	29.5	5.7
2	2.5	4.0	8.5	6.7	15.7	45.7	61.1	404	610	233	28.0	5.3
3	2.9	4.1	8.3	6.5	19.7	44.7	79.7	422	647	230	24.3	4.7
4	3.9	3.8	7.3	6.3	19.3	43.8	93.2	458	703	212	22.5	5.0
5	3.8	4.1	7.1	6.0	16.9	42.8	98.2	494	761	206	21.9	4.9
6	4.0	4.2	7.0	6.1	19.4	41.8	103.2	520	808	212	19.1	4.9
7	3.9	4.0	7.4	6.4	27.3	40.9	97.5	566	743	199	18.9	4.9
8	3.5	4.2	7.3	7.4	22.3	40.0	173	597	598	177	18.0	5.1
9	3.3	4.2	7.0	8.5	19.0	39.0	423	602	523	164	17.4	5.3
10	3.4	4.1	6.8	9.0	18.3	38.2	334	581	532	151	17.6	5.7
11	3.4	4.1	6.3	9.1	17.9	37.3	252	562	598	149	17.3	5.8
12	3.4	4.2	6.3	9.0	17.8	36.4	242	588	641	144	14.8	5.2
13	3.4	4.2	6.6	9.7	17.1	35.6	248	638	642	138	13.2	4.7
14	3.6	4.2	5.9	8.8	32.8	34.7	265	621	634	128	12.2	4.4
15	3.7	4.1	5.8	8.2	103	33.9	282	607	624	115	11.1	4.0
16	3.9	4.2	5.8	9.1	183	32.3	259	692	594	103	10.5	6.2
17	3.9	4.2	6.5	12.4	210	30.9	253	517	550	95.0	10.1	7.7
18	3.9	4.3	6.1	8.6	216	31.7	277	411	554	92.0	9.7	7.3
19	3.9	4.2	6.6	9.8	251	33.8	320	367	557	87.5	9.1	11.1
20	3.9	4.1	5.8	13.3	236	39.1	400	298	557	81.0	8.8	9.5
21	3.9	4.2	7.8	17.5	168	42.0	409	286	505	74.9	8.7	7.4
22	3.9	5.8	8.4	20.0	122	41.1	406	262	410	71.9	8.4	6.2
23	4.0	8.8	7.3	19.8	91.0	40.5	416	286	363	69.4	8.1	5.8
24	4.0	17.6	9.8	20.4	67.1	41.1	484	303	359	63.7	7.5	5.3
25	4.0	13.4	12.0	23.4	51.9	37.6	572	369	366	57.0	7.1	4.8
26	3.8	8.8	9.5	19.8	49.9	37.3	620	389	342	51.7	7.1	4.4
27	3.7	7.7	8.7	17.1	48.8	47.8	624	331	311	47.8	6.9	4.2
28	3.7	10.8	8.3	15.8	47.8	62.5	604	332	272	43.3	6.6	5.5
29	3.9	12.0	7.5	13.3		60.7	568	426	244	41.5	6.4	8.3
30	4.2	9.0	6.7	12.8		61.2	535	492	226	37.1	6.3	9.6
31	4.0		7.9	12.0		48.6		507		32.3	6.3	
MEAN	3.7	6.0	7.4	11.6	75.7	41.6	318	463	528	121	13.3	6.0
MAX. DAY	4.2	18	12.0	23.4	251	62	624	692	808	233	29.5	11.1
MIN. DAY	2.4	3.8	5.8	6.0	11.3	30.9	42	262	226	32.3	6.3	4.0
cfs days	114	180	230	360	2120	1290	9541	14361	15843	3737	413	179
ac-ft	225	358	457	714	4205	2558	18925	28485	31425	7413	820	355

Monitor's Comments

Data manager: Peter Kulchawik

- Daily mean values are based on 15-minute automated measurements of stage; stage shifts have been applied to account for changes in bed conditions or ice build-up at the gage over the course of the monitoring program.
- Stage and flow are commonly affected by ice in the winter months.
- Peak flows associated with snow-melt hydrographs commonly occur between April and June; multiple peaks are also common
- Daily mean flows may be affected by operations at Webber Lake (Reservoir)
- Data are subject to revision, should additional measurement or observer account warrant adjustment of the new rating curve.
- Italics represent data that has been corrected for water level recorder inconsistencies due to ice effects

Water Year 2019 Totals:

Mean flow	132.5	(cfs)
Max. daily flow	808	(cfs)
Min. daily flow	2.4	(cfs)
Annual total	48,368	(cfs-days)
Annual total	95,939	(ac-ft)

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Provisional and subject to revision

Water Year:2019

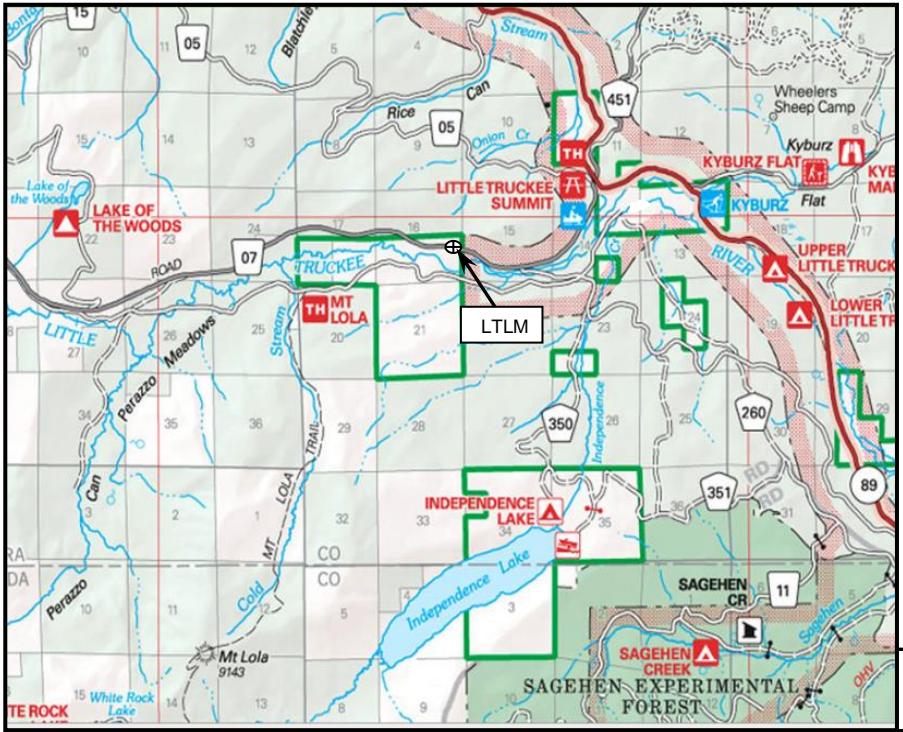
Stream:Little Truckee River

Station:Lower Perazzo Meadow outlet (LTLM)

County:Nevada County, California

Form 6. Annual Hydrologic Record, WY 2019

Station Location Map



Station Location / Watershed Descriptors

N 39° 29' 39", W 120° 19' 07" near Independence Lake, California. Gage is located on north bank
Gage is accessed from USFS Road 07 (Henness Pass Road) or Jackson Meadows Rd.
Land use includes timber harvesting, recreation, rural residential, and open space
Flow may be affected by Webber Lake (reservoir)
Drainage area is 34.2 square miles.

Mean Flow

Annual mean flow for WY2019 was 139 cfs; WY2018 was 82 cfs; WY 2017 was 193 cfs; WY 2016 was 100 cfs; WY 2015 was 33 cfs; mean flow for WY 2014 was 31 cfs; mean flow for WY 2013 was 63 cfs; mean flow for WY 2012 was 50 cfs.

Peak Flows (WY 2019)

Date	Time (24-hr)	Gage Ht. (feet)	Discharge (cfs)	Date	Time (24-hr)	Gage Ht. (feet)	Discharge (cfs)
2-19-19	9:45	2.93	337	6-7-19	0:45	4.90	1,035
4-9-19	10:45	3.01	359				
4-27-19	0:00	4.01	692				
5-16-19	6:15	4.58	899				

Extreme for period of record (Aug. 2011 to Sept 2017): 2,319 cfs on 1/9/2017

WY 2019 Daily Mean Flow (cubic feet per second)

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEPT
1	2.9	3.6	10.4	11.1	17.6	60.9	63.2	428	619	203	33.4	6.0
2	2.9	3.6	11.1	10.0	22.6	55.0	70.8	403	675	202	30.4	5.3
3	3.6	3.7	10.9	9.6	26.1	56.4	79.7	417	719	201	26.5	4.7
4	4.5	3.3	9.4	9.2	30.4	55.9	91.4	452	798	188	24.6	4.9
5	4.3	3.5	9.1	8.8	29.6	51.2	101	490	872	183	23.4	4.8
6	4.5	3.7	8.9	12.3	28.7	48.1	108	517	924	191	20.4	5.0
7	4.5	3.3	9.7	11.1	37.7	45.3	118	570	849	183	20.3	5.1
8	3.9	3.7	9.5	10.6	32.3	43.7	181	605	646	165	19.5	5.3
9	3.6	3.6	9.2	12.3	34.1	44.5	323	612	544	155	19.1	5.5
10	3.8	3.5	8.9	13.3	46.8	45.4	293	588	548	144	19.6	6.2
11	3.9	3.4	7.9	13.6	42.3	46.0	242	565	631	145	19.3	6.5
12	3.9	3.5	7.8	13.7	33.3	44.9	227	593	691	142	16.6	5.4
13	3.9	3.5	8.6	14.9	35.0	43.9	237	654	689	139	14.5	5.0
14	4.2	3.4	7.3	13.4	80.8	43.6	242	634	677	131	13.3	4.6
15	4.5	3.2	7.2	14.3	189.3	43.0	259	615	661	120	12.0	4.0
16	4.7	3.2	7.5	14.8	265	41.2	244	787	624	110	11.2	7.0
17	4.5	3.3	8.4	23.6	256	40.7	247	565	561	102	10.7	9.4
18	4.4	3.4	7.7	16.2	250	41.2	265	439	565	98.9	10.4	8.6
19	4.3	3.5	8.6	15.0	295	42.4	317	393	567	94.6	9.5	14.3
20	4.2	3.4	7.2	21.6	260	44.1	386	322	565	88.1	9.1	12.7
21	4.1	3.8	10.0	27.2	210	46.4	397	306	504	81.9	9.1	9.1
22	4.1	6.1	11.6	32.7	150	48.3	388	283	395	78.9	8.5	7.0
23	4.3	9.5	9.8	24.9	113	49.1	409	308	344	75.9	8.3	6.5
24	4.0	19.2	13.0	24.8	85.4	55.7	480	325	337	69.9	7.5	5.7
25	4.0	15.8	16.8	25.4	72.6	49.6	574	391	343	63.1	7.1	5.0
26	3.8	10.6	13.4	21.7	105	49.2	634	412	318	57.4	8.6	4.6
27	3.5	8.7	12.8	21.2	107	55.0	643	353	287	53.3	6.8	4.1
28	3.3	12.5	12.3	20.8	79.6	62.7	617	353	249	48.3	6.3	5.6
29	3.7	14.5	10.8	18.8		61.0	574	448	219	46.4	6.0	10.4
30	4.2	11.0	9.3	19.1		67.5	537	522	201	41.9	6.1	12.6
31	3.8		12.2	18.4		65.0		541		37.0	6.3	
MEAN	4.0	6.0	9.9	16.9	105	50	312	480	554	117	14.3	6.7
MAX. DAY	4.7	19	16.8	33	295	67	643	787	924	203	33.4	14.3
MIN. DAY	2.9	3.2	7.2	8.8	17.6	40.7	63	283	201	37.0	6.0	4.0
cfs days	124	181	307	524	2933	1547	9346	14894	16621	3641	444	201
ac-ft	246	359	610	1040	5818	3069	18538	29543	32967	7223	881	398

Monitor's Comments

Data manager: Peter Kulchawik
1. A continuous record of water level was recorded during the water year.
2. Stage shifts have been applied to account for changes in sedimentation and blockage by sticks, leaves, or other debris.
3. Adjustments and estimates were applied to periods heavily affected by ice; shown in italics.
4. Mean daily values are based on 15-minute measurements.
5. Italics represent data that has been corrected for water level recorder inconsistencies due to ice effects
6. Missing data for periods 2/8-2/9/2017 and 7/11-7/18/2017 due to gage damage during high flows in WY2017

Water Year 2019 Totals:		
Mean flow	139	(cfs)
Max. daily flow	924	(cfs)
Min. daily flow	2.9	(cfs)
Annual total	50,764	(cfs-days)
Annual total	100,691	(ac-ft)

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Preliminary and subject to change

TABLES

Table 1. Streamflow gaging station summary (WY2019), Perazzo Meadows, Little Truckee River Watershed, Sierra County, California

Gage	Gage Code	Location	Elevation	Drainage Area	Instrumentation	Period of Record	Extremes for Period of Record	Peak Discharge for Current Water Year	Remarks
		NAD27	ft above MSL	(mi ²)				(cfs)	
Perrazo Creek above Perazzo Meadow	PCAP	N39° 27' 53", W120° 23' 16"	6,627	6.1	Type C staff plate + Continuous water-level recorder	November 17, 2010 to current water year	502 cfs January 8, 2017 268 cfs, December 2, 2012	284	Located in bedrock reach with numerous seeps entering channel at baseflow.
Little Truckee above Perazzo Meadow	LTAP	N39° 28' 59", W120° 22' 57"	6,583	15.8	Type C staff plate + Continuous water-level recorder	November 18, 2010 to current water year	694 cfs, April 26, 2012	392	Located on south bank, approximately 130 feet upstream from USFS road 7-030 bridge; subject to ice; damaged and repaired in WY2017
Little Truckee below Upper Perazzo Meadow outlet	LTUM	N39° 29' 10", W120° 22' 13"	6,534	25.5	Type C staff plate + Continuous water-level recorder	November 19, 2010 to current water year	846 cfs, April 7, 2018	800	Located on east bank, approx. 40 feet downstream from Henness Pass Rd bridge; subject to ice; damaged and repaired in WY2017
Cold Stream above Perazzo Meadow	CSAP	N39° 28' 23", W120° 20' 30"	7,221	3.1	Type C staff plate + Continuous water-level recorder	August 18, 2011 to current water year	311 cfs January 8, 2017	87	Highest elevation station, subject to longer periods of ice and snow; typically has a delayed snowmelt peak flow; staff plate adjusted in June 2016
Little Truckee below Middle Perazzo Meadow outlet	LTPM	N39° 29' 42", W120° 20' 7"	6,463	32.8	Type C staff plate + Continuous water-level recorder	October 2009 to current water year	2,039 January 9, 2017	850	Gage relocated on September 28, 2010 and June 8, 2011 and June 6, 2018. Current location is on right bank of large pool upstream of riffle and right side secondary channel
Little Truckee below Lower Perazzo Meadow outlet	LTLM	N39° 29' 39", W120° 19' 07"	6,459	34.2	Type C staff plate + Continuous water-level recorder	August 18, 2011 to current water year	2,319 January 9, 2017	1,035	Located below Lower Meadow, north bank; damaged and repaired in WY2017

Notes:

1. Webber Lake is located on the Little Truckee River above Perazzo Meadows. The Webber Lake outlet includes a rectangular weir with fish screens. Periodic cleaning, installation, and removal of fish screens may affect flows at downstream locations.
2. LTAP and LTUM gages suffered severe damage during WY2017 high flows and had to be repaired or replaced. It is likely these stations experienced their highest respective flows during the gaging project during WY2017.
3. Extreme flows for period of record and peak discharge are estimated values based on the stage to discharge "rating curve" and are not manually measured values.

**Table 2. Historical gaging summary, Little Truckee River below Diversion Dam, near Sierraville, California
USGS station #10341950, Water Years 1993 to 1998 and 2013 to 2016**

Water Year	Annual Mean Flow	Maximum Daily Flow	Minimum Daily Flow	Peak Flow	Peak Stage	Date
	(cfs)	(cfs)	(cfs)	(cfs)	(ft)	
1993 (partial)	--	--	--	350	5.86	1993-06-26
1994	23.5	227	1.5	300	5.86	1994-04-19
1995	183.2	1,290	2.2	1,630	8.14	1995-06-27
1996	113.4	1,700	2.3	1,880	9.78	1996-05-16
1997	122.1	2,400	2.1	3,980	12.50	1997-01-02
1998	106.4	602	1.8	697	6.02	1998-06-16
2013	110.0	781	2.04	1,140	4.98	2012-12-02
2014 (partial)	--	181	2.5	235	2.8	2014-02-09
2015 (partial)	--	--	--	778	4.52	2015-02-09
2016 (partial)	--	513	3	581	4.43	2016-03-06

Notes:

1. Gaging station was located N 39° 29' 29", W120° 19' 39", approximately 1.3 miles downstream of Balance gaging station LTLM at 6,380 feet elevation with a drainage area of 36.1 square miles.
2. Little Truckee Diversion Dam is an active diversion, operated by the Sierra Valley Mutual Water Company
3. WY1993 partial: June 17 -September 30, 1993; WY2014 partial: Oct 1- July 13, 2014 (for daily mean values); WY 2015 and WY2016 incomplete data; Station discontinued in in July 2016; Data from USGS is provisional
4. This station was re-established by the USGS in the Fall of 2012 and discontinued on August 1, 2016 due to lack of funding.

Table 3. Field Observer Log
Perazzo Creek above Perazzo Meadow (PCAP), WY2019

Site Conditions				Streamflow			Water Quality Observations			High-Water Marks		Remarks
Date/Time (observer time)	Observer	Stage	Hydrograph	Measured Discharge	Instrument Used	Estimated Accuracy	Water Temperature	Field Specific Conductance	Adjusted Specific Conductance	Estimated stage at staff plate	Inferred dates?	
(mm/dd/yr)		(feet)	(R/F/S/B)	(cfs)	(AA/PY/MMB)	(e/g/f/p)	(deg C)	(μmhos/cm)	(at 25 deg C)	(feet)	(mm/dd/yr)	
2018-10-15 9:26	bt	3.96	B	--	--	--	2.6	67	116	--	--	Level loggers stuck in sediment and needed some force to remove; low flow; leaves fallen off of trees; gage pool still wet with 2-2.5 inches of water depth; downloaded and restarted level loggers at 9:45 and 10:00 respectively to sync time
2019-07-02 8:35	bt	4.97	F	57.1	MMB	g/f	3.7	14	24	--	--	Water clear and cold; snowmelt high flows; no clear evidence of high water marks; gage is a little loose
2019-07-16 10:24	bt	4.72	F	34.7	MMB	g/f	6.6	16	25	--	--	Water clear; high flows; some algae on the staff plate
2019-08-01 14:12	bt	4.37	S	8.9	MMB	g	14.3	25	32	--	--	Cleared sediment from gage location in pool; lower flows; water clear
2019-08-21 13:19	bt	4.13	S	2.6	MMB	g	16.4	40	47	--	--	Water clear; not quite baseflow; gaging pool is still connected to channel; moved some sediment out of gage pool to increase depth -no change to gage height
2019-10-10 8:59	bt	4.07	B	1.2	MMB	g/f	1.9	42	76	--	--	Water clear; baseflow; gage still wet and connected to channel-3 to 4 inches deep water; leaves falling off of trees and willows

Observer Key: (bt) is Ben Trustman

Stage: Water level observed at outside staff plate

Hydrograph: Describes stream stage as rising (R), falling (F), steady (S), baseflow (B), or uncertain (U)

Instrument: If measured, typically made using a standard (AA) or pygmy (PY) bucket-wheel ("Price-type") or (MMB) Marsh-McBirney current meter. If estimated, from rating curve (R) or visual (V).

Estimated measurement accuracy: Excellent (E) = +/- 2%; Good (G) = +/- 5%; Fair (F) = +/- 9%; Poor (P) = > 10%

High-water mark (HWM): Measured or estimated at location of the staff plate

Specific conductance: Measured in micromhos/cm in field; then adjusted to 25degC by equation $(1.8813774452 - [0.050433063928 * \text{field temp}] + [0.00058561144042 * \text{field temp}^2]) * \text{Field specific conductance}$

Additional Sampling: Qbed = Bedload, Qss = Suspended sediment, Nutr = nutrients; other symbols as appropriate

Table 4. Field Observer Log
Little Truckee River above Perazzo Meadows (LTAP), WY2019

Site Conditions				Streamflow			High-Water Marks		Water Quality Observations			Remarks
Date/Time (observer time)	Observer	Stage	Hydrograph	Measured Streamflow	Instrument Used	Estimated Accuracy	Estimated stage at staff plate	Inferred dates?	Water Temperature	Field Specific Conductance	Adjusted Specific Conductance	
(mm-dd-yr, hr:mm)		(feet)	(R/F/S/B)	(cfs)	(AA/PY/MMB)	(e/g/f/p)	(feet)	(mm/dd/yr)	(deg C)	(µmhos/cm)	(at 25 deg C)	
2018-10-15 9:59	bt	dry	B	--	--	--	--	--	--	--	--	Gage completely dry; small pool 5ft x 2ft x 0.4ft; upstream flow is a trickle and ends before gage pool; restarted one data logger to sync with time at 10:30
2019-04-19 12:30	bkh	--		45	est.	f/p						Flow estimated over Webber Lake Dam upon installation of a lake level gage. Lots of snow in meadows still, peak flow may not occur until end of May.
2019-06-05 10:50	bt,jj	--	F	--	--	--	--	--	--	--	--	Snowmelt flows very high and over topping stump that holds the staff plate and gage; top of staff plate is bent over and water too deep and swift to approach gage for fix; stilling well is underwater and was out of view
2019-07-02 9:43	bt	3.34	U	65.94	MMB	g	5.50	6/6 to 6/10?	13.9	21	27	Water clear; top of staff plate was bent over from high flows; loggers were stuck in well and needed force to dislodge
2019-07-16 11:11	bt	2.81	S	22.57	MMB	g	--	--	17.5	24	28	Water clear; soils on banks wet; vegetation lush; cut extra piece of staff plate off of the top of the gage above the wood; gage needs to be bolstered
2019-08-01 14:56	bt	2.26	S	4.54	MMB	g	--	--	20.0	29	32	Low velocity; water clear; lots of fish in gage pool
2019-08-21 14:05	bt	2.09	S	1.84	MMB	g	--	--	18.7	31	35	Low velocity; water clear; slight flow in left side channel upstream so no flow measurement above gage; gage needs to be secured
2019-10-10 10:12	bt	2.00	B	0.46	MMB	p	--	--	4.1	24	40	Very difficult to find a measurement location in upstream step pools-no velocity in gage pool and below; water is clear; leaves dropping from the trees; re-secured the gage to the stump

Observer Key: (bt) is Ben Trustman, (jj) is Jack Jacquet, (bkh) is Brian Hastings

Stage: Water level observed at outside staff plate

Hydrograph: Describes stream stage as rising (R), falling (F), steady (S), or baseflow (B)

Instrument: If measured, typically made using a Marsh McBurney (MMB), standard (AA), pygmy (PY) bucket-wheel ("Price-type") current meter, or an Acoustic Doppler Current Profiler (ADCP) at high flows. If estimated, from rating curve (R) or visual (V).

Estimated measurement accuracy: Excellent (E) = +/- 2%; Good (G) = +/- 5%; Fair (F) = +/- 9%; Poor (P) = > 10%

High-water mark (HWM): Measured or estimated at location of the staff plate

Specific conductance: Measured in micromhos/cm in field; then adjusted to 25degC by equation $(1.8813774452 - [0.050433063928 * \text{field temp}] + [0.00058561144042 * \text{field temp}^2]) * \text{Field specific conductance}$

Measured discharge reflects flow out of pool. During the fall surface flows were observed entering the pool but not exiting.

Table 5. Field Observer Log
Little Truckee River below Upper Perazzo Meadow (LTUM), WY2019

Site Conditions				Streamflow			Water Quality Observations			High-Water Marks		Remarks
Date/Time (observer time)	Observer	Stage	Hydrograph	Measured Discharge	Instrument Used	Estimated Accuracy	Water Temperature	Field Specific Conductance	Adjusted Specific Conductance	Estimated stage at staff plate	Inferred dates?	
(mm/dd/yr)		(feet)	(R/F/S/B)	(cfs)	(AA/PY/MMB)	(e/g/t/p)	(deg C)	(µmhos/cm)	(at 25 deg C)	(feet)	(mm/dd/yr)	
2018-10-15 16:05	bt	4.81	B	0.60	MMB	g/f	10.7	62	85	--	--	Water slightly murky; small fingerling fish in gage pool; some algae on streambed; low flow
2018-11-16 14:48	bt	Ice	B	--	--	--	--	--	--	--	--	Gage was frozen; downloaded barologger
2019-06-05 12:00	bt, jj	8.4	F	702	ADCP	f	--	--	--	--	--	ADCP measurement at gage; water was very turbulent on gage side of channel; water was above roots and gage surrounded by water
2019-06-05 17:25	bt, jj	8.5	R	--	--	--	10.4	21	29	--	--	Downloaded loggers and baro logger; data loggers were off by 10 plus minutes and were restarted to sync time after download; stage is rising after earlier measurement
2019-06-18 14:44	bt	7.65	S	--	--	--	--	--	--	--	--	Download baro logger for groundwater
2019-07-02 17:31	bt	6.55	U	138	MMB	g/f	15.1	24	29	--	--	Water clear; still high flows; overbank above downstream riffle before bend
2019-08-01 15:32	bt	5.55	S	17.8	MMB	g	19.9	37	41	--	--	Water clear; fish in the gage pool; lots of wildflowers on the stream banks and grasses very green
2019-08-28 11:00	bt	5.11	B	3.54	MMB	g	18.8	51	58	--	--	Water clear; baseflow; grasses are green; small fish in gaging pool
2019-10-10 16:20	bt	5.06	B	2.46	MMB	g	10.4	51	71	--	--	Baseflow; water clear; leaves falling off of trees and willows; lots of small fish in the gaging pool

Observer Key: (bt) is Ben Trustman, (jj) is Jack Jacquet

Stage: Water level observed at outside staff plate

Hydrograph: Describes stream stage as rising (R), falling (F), steady (S), baseflow (B), or uncertain (U)

Instrument: If measured, typically made using a Marsh-McBurney (MMB), standard (AA), pygmy (PY) bucket-wheel ("Price-type") or Acoustic Doppler Current Profiler (ADCP); If estimated, from rating curve (R) or visual (V).

Estimated measurement accuracy: Excellent (E) = +/- 2%; Good (G) = +/- 5%; Fair (F) = +/- 9%; Poor (P) estimated percent accuracy given

High-water mark (HWM): Measured or estimated at location of the staff plate

Specific conductance: Measured in micromhos/cm in field; then adjusted to 25degC by equation $(1.8813774452 - [0.050433063928 * \text{field temp}] + [0.00058561144042 * \text{field temp}^2]) * \text{Field specific conductance}$

**Table 6. Field Observer Log:
Cold Stream above Middle Perazzo Meadows (CSAP), WY2019**

Site Conditions				Streamflow			Water Quality Observations			High-Water Marks		Remarks
Date/Time (observer time)	Observer(s)	Stage	Hydrograph	Measured Discharge	Instrument Used	Estimated Accuracy	Water Temperature	Field Specific Conductance	Adjusted Specific Conductance	Estimated stage at staff plate	Inferred dates?	
(mm/dd/yr)		(feet)	(R/F/S/B)	(cfs)	(AA/PY/ MMB)	(e/g/f/p)	(deg C)	(µmhos/cm)	(at 25 deg C)	(feet)	(mm/dd/yr)	
2018-10-15 14:22	bt	3.78	B	0.87	MMB	g/f	5.4	41	65	...	...	Side channel on left bank has water but little to no flow; water clear; no algae on the streambed; some mud on tip of logger when removed from well; plants dying and leaves falling off of deciduous trees
2018-11-16 12:57	bt	3.77	B	...	...	...	...	...	...	...	...	There is 2 to 3 inches of ice around gage; ice spanning the gaging pool; new loggers added; final logger downloads on 11/27/18
2019-07-02 15:21	bt	4.75±0.01	R	38.66	MMB	f	7.8	21.8	32.6	6.0	...	High flow; side channel was completely connected to the main channel; small pile of snow along right bank upstream of gage; water clear ; no debris or evidence of high-water mark, but snow suggests possibly 6.0 on staff plate; broken branches on top of staff plate suggest gage was not over topped with high flow
2019-07-16 8:25	bt	4.67	F	27.36	MMB	g/f	4.6	20.6	33.7	...	...	Flows still high; side channel is still connected to the main channel; water clear; all snow melted from the gaging site; soils are wet
2019-08-01 9:03	bt	4.35	B	10.17	MMB	f	6.6	23.9	36.9	...	...	Side channel just barely disconnected from main channel; flows still elevated from last remaining high elevation snow
2019-08-21 11:16	bt	4.17	B	3.56	MMB	g/f	10.2	26.7	37.3	...	...	Lower flow; steady; not quite baseflow; water clear; left side channel more defined
2019-10-04 14:20	jo	4.07	F, B	1.5	PY	f	...	...	...	...	...	water very clear; snow patches on banks and trail, lupins knocked over by snow; some floating snow bits in creek

Observer Key: (bt) is Ben Trustman, (jo) is Jonathan Owens -from Balance Hydrologics;

Stage: Water level observed at outside staff plate

Hydrograph: Describes stream stage as rising (R), falling (F), steady (S), baseflow (B), or uncertain (U)

Instrument: If measured, typically made using a standard (AA) or pygmy (PY) bucket-wheel ("Price-type") current meter, (MMB) Marsh-McBirney. If estimated, from rating curve (R) or visual (V).

Estimated measurement accuracy: Excellent (E) = +/- 2%; Good (G) = +/- 5%; Fair (F) = +/- 9%; Poor (P) = > 10%

High-water mark (HWM): Measured or estimated at location of the staff plate

Specific conductance: Measured in micromhos/cm in field; can be adjusted to 25 deg.C by equation $(1.8813774452 - [0.050433063928 * \text{field temp}] + [0.00058561144042 * \text{field temp}^2]) * \text{Field specific conductance}$

Table 7. Field Observer Log
Little Truckee River at Perazzo Meadow (LTPM), WY2019

Site Conditions					Streamflow			Water Quality Observations			High-Water Marks		Remarks
Date/Time (observer time)	Observer	Stage	Stage (new gage)	Hydrograph	Measured Discharge	Instrument Used	Estimated Accuracy	Water Temperature	Field Specific Conductance	Adjusted Specific Conductance	Estimated stage at staff plate	Inferred dates?	
(mm/dd/yr)		(feet)	(feet)	(R/F/U/B)	(cfs)	(AA/PY/MMB)	(e/g/f/p)	(deg C)	(µmhos/cm)	(at 25 deg C)	(feet)	(mm/dd/yr)	
2018-10-15 10:41	bt	0.24	2.28	B	3.67	MMB	f	6.6	61	94	--	--	Low flow; water is slightly murky; less algae in downstream section from previous visit; water cold; thin layer of ice on top of old gage pool; old gage pool still cut off from main channel by the sand bar est. 30ft upstream on bank
2018-11-16 9:02	bt	Ice	Ice	B	--	--	--	--	--	--	--	--	Removed old gage to use loggers in groundwater wells; gaging pool completely frozen solid with 4 inches of ice
2019-05-14 11:50	bt, jj	2.61	4.63±0.02	F	--	MMB	p	--	--	--	--	--	Tag line was broken at downstream site; water clear; middle island between channels is 3/4 underwater with the downstream tree separating the channels (see pictures); measured velocity as far as we could safely wade ≈ 0.75 of the main channel above the riffle
2019-06-05 16:29	bt, jj	--	4.93	R	--	--	--	15.2	28	34	--	--	Downloaded data loggers and restarted both to sync time with PC; new gage was surrounded by water ≈ 1.5 ft deep that extended 20 feet behind gage; center island between secondary channel was under water; possible peak snowmelt flows
2019-07-02 11:10	bt	--	3.64	U	208.30	MMB	g/f	11.3	24	33	--	--	Water clear; sand bar near old gage est. 0.8ft under water; secondary channel has high velocity; no over bank flow at gage but soil is saturated
2019-07-16 12:18	bt	--	3.33	U	96.41	MMB	g	13.5	28	36	--	--	Water clear; velocity in secondary channel has slowed with drop in level; measured at downstream low flow site; vegetation is lush near gage; lots of fish activity in the gage pool
2019-08-01 12:40	bt	--	2.85	U	26.27	MMB	g	17.1	39	46	--	--	Downloaded loggers and replaced baro with regular logger; water clear; lower stage; sand bar near old gage is out of the water; lots of fish in gage pool
2019-08-28 10:05	bt	--	2.46	B	7.17	MMB	g	17.5	57	67	--	--	Low flow; low velocity at the edges of the channel; lots of minnows in the gage pool; grasses green; riffle is partially dry with secondary channel full and flowing
2019-10-10 11:22	bt	--	2.39	B	5.34	MMB	f	5.9	48	76	--	--	Low flow measurement location downstream of riffle is backwatered and roughly 1-2 feet deeper than normal at this time of year and typical flowrate; measured at the top of the riffle and secondary channel; water is clear; grasses are drying and there is ice on the sand bar

Observer Key: (bt) is Ben Trustman, (jj) is Jack Jacquet

Stage: Water level observed at outside staff plate

Hydrograph: Describes stream stage as rising (R), falling (F), uncertain (U), or baseflow (B)

Instrument: If measured, typically made using a Marsh-McBirney (MMB), standard (AA) or pygmy (PY) bucket-wheel ("Price-type") current meter. If estimated, from rating curve (R) or visual (V).

Estimated measurement accuracy: Excellent (E) = +/- 2%; Good (G) = +/- 5%; Fair (F) = +/- 9%; Poor (P) = > 10%

High-water mark (HWM): Measured or estimated at location of the staff plate

Specific conductance: Measured in micromhos/cm in field; then adjusted to 25degC by equation $1.8813774452 - [0.050433063928 * \text{field temp}] + [0.00058561144042 * \text{field temp}^2]$ * Field specific conductance

Table 8. Field Observer Log
Little Truckee River at Lower Meadow (LTLM), WY2019

Site Conditions				Streamflow			Water Quality Observations			High-Water Marks		Remarks
Date/Time (observer time)	Observer	Stage (new)	Hydrograph	Measured Discharge	Instrument Used	Estimated Accuracy	Water Temperature	Field Specific Conductance	Adjusted Specific Conductance	Estimated stage at staff plate	Inferred dates?	
(mm/dd/yr)		(feet)	(R/F/S/B)	(cfs)	(AA/PY/MMB)	(e/g/f/p)	(deg C)	(µmhos/cm)	(at 25 deg C)	(feet)	(mm/dd/yr)	
2018-10-15 12:18	bt	0.97	B	3.05	MMB	g	8	66.6	97.2	--	--	Baseflow; water is slightly murky; some algae on streambed; all leaves have changed color and are falling
2018-11-16 8:09	bt	0.97	B	--	--	--	--	--	--	--	--	Downloaded old logger; replaced with new logger LTLMc started 11/16/18 8:30; restarted the LTLMb logger in continuous mode and to sync time
2019-05-14 14:21	bt, jj	3.68	R	602.6	ADCP	g	6.7	21.8	33.2	--	--	ADCP measurement just downstream of gage; some snow patches on the south side of the stream towards the hill; water clear; do not think this is the snowmelt peak yet.
2019-06-05 14:05	bt,jj	4.27	F	770.2	ADCP	g	13.3	25.7	33.2	--	--	Watch time is 10 minutes slower than ADCP time; water clear; high snowmelt flows and possible peak; meadows are full of water
2019-07-02 12:43	bt	2.46	S	180.75	MMB	g	12.5	26	34.1	--	--	Water clear; soil on banks wet; grasses green and robust; still high flows
2019-08-01 11:33	bt	1.45	S	30.26	MMB	g	16.9	40.3	48	--	--	Water clear and smooth; grasses on right bank of measurement in very low water (0.1 ft) with minimal velocity; algae on rocks; wildflowers abundant on stream banks
2019-08-28 9:15	bt	1.08	B	7.24	MMB	g/f	17.7	57.9	67.3	--	--	Water clear; no evidence of effects from upstream restoration activity; stream diversion is working, possible changes in flow record
2019-10-10 12:50	bt	1.05	B	5.81	MMB	g	8.4	53.6	78.6	--	--	Water is slightly hazy; baseflow; leaves falling off of willows; can see water flowing through the meadow upstream; diversion has been removed

Observer Key: (bt) is Ben Trustman, (jj) is Jack Jaquet

Stage: Water level observed at outside staff plate

Hydrograph: Describes stream stage as rising (R), falling (F), steady (S), baseflow (B), or uncertain (U)

Instrument: If measured, typically made using a Marsh-McBirney (MMB), standard (AA), pygmy (PY) bucket-wheel ("Price-type") or Acoustic Doppler Current Profiler (ADCP) current meter. If estimated, from rating curve (R) or visual (V).

Estimated measurement accuracy: Excellent (E) = +/- 2%; Good (G) = +/- 5%; Fair (F) = +/- 9%; Poor (P) = > 10%

High-water mark (HWM): Measured or estimated at location of the staff plate

Specific conductance: Measured in micromhos/cm in field; then adjusted to 25degC by equation $(1.8813774452 - [0.050433063928 * \text{field temp}] + [0.00058561144042 * \text{field temp}^2]) * \text{Field specific conductance}$

Table 9. Estimated Annual Runoff, Perazzo Meadows, Little Truckee River Watershed, Sierra County, California, WY2019

Gaging Station	Gage ID	Drainage Area	Measured Runoff	Estimated Runoff	Unit Runoff	Unit Runoff	Remarks
		(mi ²)	(acre-feet)	(acre-feet)	(acre-feet/square mile)	(cfs/square mile)	
Perrazo Creek above Upper Perazzo Meadow	PCAP	6.1	25,129	--	4,120	5.7	Unregulated perennial tributary to the Upper Perazzo Meadow
Little Truckee above Upper Perazzo Meadow	LTAP	15.8	38,300	--	2,424	3.3	Streamflow is regulated by Webber Lake (reservoir); tributary to the Upper Perazzo Meadow; Gage damaged during WY2017 and did not have a complete record in that year
<i>Remaining ungaged contributing area above LTUM</i>	--	3.6	--	23,803	6,612	--	This area includes lower Perazzo Creek canyon (~70%) and portions of the Upper Perazzo Meadow (~30%); lower estimated unit-runoff may be associated with lower snowpack in the meadow or lower elevations
Little Truckee, below Upper Perazzo Meadow	LTUM	25.5	87,232		--	--	Outlet from Upper Perazzo Meadow
Cold Stream, above Middle Perazzo Meadows	CSAP	3.1	5,927	--	1,912	2.6	Unregulated perennial tributary to the Middle Perazzo Meadow
<i>Remaining ungaged contributing area above LTPM</i>	--	4.2	--	2,780	662	--	Lower Cold Stream canyon and unnamed tributaries
Little Truckee, below Middle Perazzo Meadow	LTPM	32.8	95,939	--	2,925	4.0	Outlet from Middle Perazzo Meadow
<i>Remaining ungaged contributing area</i>	--	1.4	--	4,752	3,394	--	Unregulated area between outlet of the Middle Meadow and the Lower Meadow
Little Truckee, below Lower Perazzo Meadow	LTLM	34.2	100,691	--	2,944	4.1	Outlet to the Lower Perazzo Meadow

Notes:

1. Webber Lake Reservoir is located on the Little Truckee River above LTAP gaging station;
2. Estimated values in *italics* indicate calculated values computed from other data.

All data is provisional and subject to change

Table 10. Snowmelt recession runoff, Perazzo Meadows, Little Truckee River Watershed, Sierra County, California, May through September 2019

Gaging Station	Gage ID	Drainage Area	Monthly Runoff					Remarks
			May	June	July	August	September	
		(mi ²)	(acre-feet)	(acre-feet)	(acre-feet)	(acre-feet)	(acre-feet)	
Perrazo Creek above Upper Perazzo Meadow	PCAP	6.1	6,881	8,528	2,436	284	79	Maintained flow through summer
Little Truckee above Upper Perazzo Meadow	LTAP	15.8	13,668	12,910	1,718	169	43	Went dry in late August 2018; continuous flow returned in December 2019
Little Truckee, below Upper Perazzo Meadow	LTUM	25.5	28,526	28,466	4816	497	179	Includes an ungaged area of 3.6 square miles
Cold Stream, above Middle Perazzo Meadows	CSAP	3.1	661	2,615	1635	282	112	Maintained flow through summer
Little Truckee, below Middle Perazzo Meadow	LTPM	32.8	28,485	31,425	7,413	820	355	Includes an ungaged area of 4.2 square miles
Little Truckee, below Lower Perazzo Meadow	LTLM	34.2	29,543	32,967	7,223	881	398	Includes an ungaged area of 1.4 square miles

Notes:

1. New gage installed at LTPM in June 2018

Table 11. Groundwater monitoring observations, Water Years 2010 to 2019
Perazzo Meadows Restoration, Sierra County, California

Site Conditions				Water Quality Observations					Remarks	
Date/Time	Observer	Top-of-casing to water (ft)	Depth to water (ft, bgs)	Water Surface Elevation ft, NGVD/NAVD	Temperature (°C)	Specific Conductance (at field temp.) (µS/cm)	Specific Conductance (at 25 °C) (µS/cm)	Bailed?	Soil crack size/moisture	
Piezometer 09-1 - Head of Upper Meadow										
Total Depth		5.34 ft bgs								
Depth to bottom =		8.30 ft btoc								
Total Stickup =		2.96 ft above gs								
Elevation =		6567.5 ft								
8-21-09 0:00	ds,bc	6.75	3.79	6563.7	--	--	--	--	--	Piezometer installed; DTW does not necessarily reflect static water level
2009-09-23 17:16	ds	7.1	4.14	6563.3	8.8	66	97	--	--	Stratified: 122uS at top (82@9.4°C)
2009-10-23 9:43	bc	4.64	1.68	6565.8	7.9	73	108	n	--	Labelled top of casing
2009-12-04 12:39	bc	4.60	1.64	6565.8	4.3	62	102	n	--	Water clear, no odor
2010-05-21 16:00	ds,rw	3.04	0.08	6567.4	2.8	31	55	--	--	DTSW=2.83 (several inches deep and flowing), SCTsw=20@2.9°C, 35@25°C
2010-07-19 13:45	bc	3.64	0.68	6566.8	11.0	47	65	n	--	Ground is wet
2010-08-23 16:40	bc	4.78	1.82	6565.7	12.5	68	90	y	--	Water clear
2010-09-28 15:40	bc	4.98	2.02	6565.5	11.0	90	124	n	--	Water clear, no odor
2010-11-02 9:50	ds	3.89	0.93	6566.6	6.1	75	116	n	--	Not stratified; flowing water in depression just NW of piezo; main channel is now SE of piezo, ponds and plugs in original channel; sfc water SCT = 50@25°C; downloaded datalogger
2011-07-08 7:41	ds, bc	2.71	-0.25	6567.7	3.2	16	27	n	--	Top section of pipe buried and unable to recover LL. Filled with s and g, 1" of water on surface
2011-08-11 10:40	bc	--	--	--	--	--	--	--	--	Silted in, no standing water, ground dry
2011-09-12 11:25	bc	--	--	--	--	--	--	--	--	Silted in
2011-10-09 0:00	bc	--	--	--	--	--	--	--	--	Silted in
2011-11-03 0:00	ds	--	--	--	--	--	--	--	--	Unable to locate
2011-12-05 0:00	bc	--	--	--	--	--	--	--	--	Silted in
2012-05-18 0:00	bc, ds	--	--	--	--	--	--	--	--	Silted in
2012-06-15 0:00	bc	--	--	--	--	--	--	--	--	Silted in
2012-07-17 0:00	bc	--	--	--	--	--	--	--	--	Silted in
2012-08-14 0:00	bc	--	--	--	--	--	--	--	--	Silted in
2014-05-02 0:00	bc, ds	--	--	--	--	--	--	--	--	Silted in
2014-07-29 0:00	bc	--	--	--	--	--	--	--	--	Silted in
2014-09-11 0:00	bc	--	--	--	--	--	--	--	--	Silted in
2014-10-30 0:00	bc, ds	--	--	--	--	--	--	--	--	Silted in
2015-04-17 0:00	bc	--	--	--	--	--	--	--	--	Silted in
2015-05-22 0:00	bc, ds	--	--	--	--	--	--	--	--	Silted in
2015-06-26 10:30	bc	3.67	--	--	9.9	102	144	n	--	
2015-08-14 9:25	bc	4.16	--	--	12.2	100	132	y	--	
2015-10-14 15:28	bt, ds	3.99	1.03	6566.5	10.5	88	121	y	--	Very muddy until no more water; restarted logger at 15:45; changed name and project on logger; retired logger so it was suspended; reinstalled spring 2015
2016-05-27 14:30	ds,bc	2.48	-0.48	6568.0	8.1	45	67	y	--	Stratified at depth; C 41 @5.0°C SC 67 @25°C
2016-07-29 15:00	bc	3.83	0.87	6566.6	10.0	71	99	y	--	No stratification
2016-10-12 15:10	ds,bc	4.16	1.20	6566.3	9.7	73	102	y	--	
2017-07-11 12:04	bt	3.00	0.04	6567.4	13.4	41	53	y	--	No stratification; string was broken but was able to recover and replace; ground dry but veg was very green; evidence of high flows from sediment in willows next to well; 1.5 bails clear water
2017-08-11 13:30	bc	3.94	0.98	6566.5	10.5	44	62	y	--	
2017-09-22 14:05	bc	4.08	1.12	6566.4	11.3	59	80	y	--	
2017-10-24 11:28	bt	4.09	1.13	6566.4	10.0	56	79	y	--	Took 3 tries to download logger; leaves have fallen off of willows; grass is dry; 1 (3/4) bail and 4(1/2) bails clean

Table 11. Groundwater monitoring observations, Water Years 2010 to 2019
Perazzo Meadows Restoration, Sierra County, California

Site Conditions			Water Quality Observations							Remarks
Date/Time	Observer	Top-of-casing to water (ft)	Depth to water (ft, bgs)	Water Surface Elevation (ft, NGVD/NAVD)	Temperature (°C)	Specific Conductance (at field temp.) (µS/cm)	Specific Conductance (at 25 °C) (at 25 °C)	Bailed?	Soil crack size/moisture	
2018-05-23 9:18	bt	2.78	-0.18	6567.7	7.3	50	74	y	--	Stratified at depth T 4.6°C, C 55, SC 90; soil wet from rain; sediment in nearby willows suggests substantial flow at some point-possibly WY17; 5 1/4 bails clear
2018-07-03 9:45	bc	4.06	1.10	6566.4	9.9	42	59	y	--	No stratification
2018-08-16 10:55	bc	4.59	1.63	6565.9	12.3	65	87	y	--	
2018-10-19 13:50	bt	4.41	1.45	6566.0	12.6	37	49	y	--	Stratified at depth: T 10.9°C, C 70.6, SC 96.7; water slightly dirty; grass dry and soil dry; evidence of cattle and grazing near well
2019-06-18 11:01	bt	2.55	-0.41	6567.9	13.3	57	74	y	--	No stratification; 5.5 bails clean water; ground is damp' water ponded in low spots around willows
2019-07-27 10:29	bc	3.81	0.85	6566.6	11.5	53	71	n	--	
2019-08-23 16:10	bc	4.66	1.70	6565.8	11.4	59	79	y	--	Cap knocked off and data logger out of water
2019-10-18 13:00	bt	4.62	1.66	6565.8	9.9	65	91	y	--	Cap knocked off and hanging-check level; put logger back in for DTW measurement; soil dry; grass dry; 3.25 bails mostly just half full bails slightly dirty

Table 11. Groundwater monitoring observations, Water Years 2010 to 2019
Perazzo Meadows Restoration, Sierra County, California

Site Conditions				Water Quality Observations					Remarks	
Date/Time	Observer	Top-of-casing to water (ft)	Depth to water (ft, bgs)	Water Surface Elevation ft, NGVD/NAVD	Temperature (°C)	Specific Conductance (at field temp.) (µS/cm)	Specific Conductance (at 25 °C)	Bailed?	Soil crack size/moisture	
Piezometer 09-2 - East side of Upper Meadow										
Total Depth		4.24 ft bgs								
Depth to bottom =		6.00 ft btoc								
Total Stickup =		1.76 ft above gs								
Elevation =		6556.8 ft								
2009-08-21 0:00	ds, bc	4.34	2.58	6554.3	--	--	--	--	--	Piezometer installed; DTW does necessarily reflect static water level
2009-09-23 15:51	ds	4.02	2.26	6554.6	8.0	105	157	--	--	Wp230
2009-10-23 10:03	bc	2.43	0.67	6556.2	5.8	107	168	n	--	
2009-12-04 11:45	bc	2.26	0.50	6556.3	2.8	112	194	n	--	Water clear, no odor
2010-05-21 13:30	ds, rw	2.06	0.30	6556.5	4.4	24	40	--	--	
2010-06-12 14:10	bc	2.26	0.50	6556.3	6.9	33	50	--	--	
2010-07-19 12:15	bc	2.72	0.96	6555.9	8.3	53	74	n	--	
2010-08-23 15:00	bc	2.97	1.21	6555.6	6.6	98	150	y	--	Water clear, no odor
2010-09-28 16:05	bc	2.68	0.92	6555.9	6.3	114	176	n	--	Water clear, no odor
2010-11-02 10:20	ds	2.31	0.55	6556.3	3.9	110	184	n	--	Gradual increase in SC with depth, SC=225 at bottom of piezo
2011-07-08 10:06	ds, bc	2.22	0.46	6556.4	7.1	118	177	y	--	Water clear, turbid at bottom, no odor, SCT (top) = 44.1@10.2°C, 62.3@25°C
2011-08-11 10:50	bc	2.48	0.72	6556.1	8.3	154	227	n	--	No stratification, water clear
2011-09-12 11:30	bc	2.36	0.60	6556.2	8.0	137	203	y	--	No stratification
2011-10-09 11:35	bc	2.13	0.37	6556.5	6.6	133	206	y	--	Water clear
2011-11-03 11:00	ds	2.29	0.53	6556.3	4.0	142	237	y	--	Dry at surface
2011-12-05 11:20	bc	2.04	0.28	6556.6	1.7	154		n	--	
2012-05-18 10:25	ds, bc	2.13	0.37	6556.5	5.1	92	148	n	--	No stratification
2012-06-15 11:00	bc	2.41	0.65	6556.2	4.7	133	217	y	--	Water clear. SCT (depth) 174.6@3.2°C, 301.2@25°C
2012-07-17 0:00	bc	--	--	--	--	--	--	--	--	Couldn't get cap off.
2012-08-14 0:00	bc	--	--	--	--	--	--	--	--	Couldn't get cap off.
2012-09-17 12:30	bc	3.43	1.67	6555.2	7.3	124	188	y	--	Slightly muddy
2012-10-18 0:00	ds	2.67	0.91	6555.9	5.0	121	196	n	--	Ground is dry, slight strat. SC @ 25°C = 210 at depth
2013-05-24 13:40	ds, bc	2.29	0.53	6556.3	6.6	135	210	n	--	Stratified: SC @ 25 = 250 at depth, 5.5°C
2013-06-20 12:30	bc	2.51	0.75	6556.1	4.9	131	213	y	--	Stratified: SC = 53@8.1°C, 250@25°C at depth
2013-07-24 11:00	bc	2.82	1.06	6555.8	9.6	162	229	n	--	No stratification
2013-08-30 11:55	bc	3.02	1.26	6555.6	5.7	139	221	y	--	Stratified: SC = 149@4.5°C, 247@25°C
2013-09-18 12:45	ds	2.95	1.19	6555.7	8.4	150	218	n	--	No stratification
2014-05-02 14:00	bc, ds	2.25	0.49	6556.4	-0.8	40		y	--	Stratified: SC = 153@1.2°C, 297@25°C
2014-07-29 11:35	bc	3.23	1.47	6555.4	4.6	165	269	y	--	Not stratified
2014-09-11 11:30	bc	3.63	1.87	6555.0	4.2	151	252	y	--	Clear not stratified
2014-10-30 14:45	bc, ds	2.28	0.52	6556.3	0.9	92	169	y	--	Stratified: 137.8 @ 1.1°C, 252 @ 25°C
2015-04-17 12:35	bc	2.18	0.42	6556.4	3.4	39	67	y	--	SCT (@depth) 132.7@3.1°C, 227.5@25°C
2015-05-22 13:55	bc, ds	2.08	0.32	6556.5	5.6	96	154	y	--	SCT (@depth) 197@4.6°C, 320@25°C
2015-06-26 9:35	bc	2.68	0.92	6555.9	8.1	181	266	n	--	
2015-08-14 10:00	bc	2.96	1.20	6555.6	8.7	155	225	y	--	No strat
2015-10-14 13:21	bt, ds	2.5	0.74	6556.1	7.4	137	200	y	--	Dry fields; no stratification; saturated swale between FS-13 and 09-2
2016-05-27 15:30	ds, bc	2.12	0.36	6556.5	6.1	58	91	y	--	Stratified at depth; C 123 @ 5.0°C SC 199 @ 25°C
2016-07-29 13:45	bc	2.92	1.16	6555.7	7.7	143	209	y	--	
2016-10-12 13:30	ds, bc	2.26	0.50	6556.3	6.2	125	200	y	--	
2017-07-11 13:18	bt	2.71	0.95	6555.9	11.2	46	63	y	--	Stratified at depth, T7.1°C, C 154.5, SC 232.6; lots of inundation in the meadow;
2017-08-11 12:20	bc	2.85	1.09	6555.8	10.6	127	175	y	--	ground spongy; grass lush at well; 2.75 bails clear water
2017-09-24 13:00	bc	3.42	1.66	6555.2	7.2	131	198	y	--	clear

Table 11. Groundwater monitoring observations, Water Years 2010 to 2019
Perazzo Meadows Restoration, Sierra County, California

Site Conditions			Water Quality Observations							Remarks
Date/Time	Observer	Top-of-casing to water (ft)	Depth to water (ft, bgs)	Water Surface Elevation (ft, NGVD/NAVD)	Temperature (°C)	Specific Conductance (at field temp.) (µS/cm)	Specific Conductance (at 25 °C) (µS/cm)	Bailed?	Soil crack size/moisture	
2017-10-24 12:48	bt	2.26	0.50	6556.3	5.4	155	237	y	--	Stratified at depth: T 5.4°C, C 188.9, SC 299.8; grass is dry; soil is damp; restarted the logger at 13:15; diagnostic check OK Battery at 3.49V
2018-05-23 10:29	bt	2.13	0.37	6556.5	7.7	41	61	y	--	Stratified at depth: T 3.7°C, C 214, SC 357.3; 5 bails clear water; meadow saturated in places; many small channels are active
2018-07-03 10:25	bc	3.01	1.25	6555.6	8.2	212	311	y	--	No stratification
2018-08-16 11:30	bc	4.13	2.37	6554.5	9.8	110	156	y	--	
2018-10-20 11:11	bt	2.67	0.91	6555.9	7.5	106	158	y	--	4 bails clean water; restarted logger in continuous mode; grass dry; soil damp
2019-06-18 12:08	bt	2.18	0.42	6556.4	11.9	81	108	y	--	Stratified at depth: T 6.4°C, C 155.2, SC 238.9; soil damp; grass green; 4 bails clear water; meadow has lots of ponding and small active channels
2019-07-27 10:55	bc	2.94	1.18	6555.7	9.0	153	218	n	--	
2019-08-23 16:45	bc	3.83	2.07	6554.8	10.0	132	185	y	--	
2019-10-21 11:20	bt	2.49	0.73	6556.1	6.5	91	140	y	--	Stratified at depth T 6.0°C, C 159, SC 248; 3.5 bails clear; grass is dry; soil dry

Table 11. Groundwater monitoring observations, Water Years 2010 to 2019
Perazzo Meadows Restoration, Sierra County, California

Site Conditions				Water Quality Observations					Remarks	
Date/Time	Observer	Top-of-casing to water (ft)	Depth to water (ft, bgs)	Water Surface Elevation (ft, NGVD/NAVD)	Temperature (°C)	Specific Conductance (at field temp.) (µS/cm)	Specific Conductance (at 25 °C) (at 25 °C)	Bailed?	Soil crack size/moisture	
Piezometer 09-3 - Lower Upper Meadow, near confluence Upper Truckee / Perazzo Cr										
Total Depth		8.00 ft bgs	New Well	1-15-18						
Depth to bottom =		10.10 ft btoc	7.25	ft btoc						
Total Stickup =		2.10 ft above gs	1.34	ft above gs						
Ground Elevation =		6544.2 ft								
2009-08-21 0:00	ds, bc	8.33	6.23	6538.0	--	--	--	--	--	Piezometer installed; DTW does necessarily reflect static water level
2009-09-23 12:50	--	--	--	--	--	--	--	--	--	Piezo is filled with sediment to depth 3.52 below toc; adjacent to constr. Access road
2009-10-23 11:25	bc	1.7	-0.40	6544.6	7.5	77	117	n	--	Water ponded on ground surface
2009-12-04 11:04	bc	--	--	--	--	--	--	--	--	Water ponded on surface and frozen solid
2010-05-21 14:30	ds, rw	0.93	-1.17	6545.4	2.1	83	142	n	--	Water flowing at sfc, SCT(sw) = 18@3°C, 31@25°C; depth to SW = 1.16
2010-06-12 15:30	bc	--	--	--	--	--	--	--	--	Unable to access due to high water
2010-07-19 10:40	bc	1.15	-0.95	6545.2	12.7	101	132	n	--	Water ponded at sfc
2010-08-23 14:00	bc	1.49	-0.61	6544.8	12.2	102	136	y	--	Water ponded at sfc; water clear, no odor
2010-09-28 15:00	bc	1.89	-0.21	6544.4	10.3	122	170	n	--	Water ponded at sfc; water clear, no odor
2010-11-02 12:48	ds	1.59	-0.51	6544.7	40.7	114	182	n	--	Water ponded at sfc, slightly lower elevation (by 0.10') than groundwater implying downward hydraulic gradient; sfc water SC=64@25°C
2011-07-08 13:13	ds, bc	0.38	-1.73	6545.9	4.5	74	122	--	--	Depth to SW = .53', SCT (top) = 58.5@11°C, 80.1@25°C
2011-08-11 10:15	bc	1.57	-0.53	6544.7	9.2	169	243	n	--	Depth to SW = 1.5, water clear, SCT (top) = 107.4@10.7°C, 144.7@25°C
2011-09-12 0:00	bc	--	--	--	--	--	--	--	--	Couldn't find, water on surface 1-4" deep, grasses really tall
2011-10-09 13:00	bc	1.31	-0.79	6545.0	8.0	100	146	y	--	Water clear, depth to SW = 1.31
2012-11-03 13:30	ds	1.63	-0.47	6544.7	5.0	133	212	n	--	SCT (sfc) 73@25°C, 42@3.1°C
2011-12-05 12:46	bc	1.30	-0.80	6545.0	0.8	120		n	--	
2012-05-18 12:25	ds, bc	0.37	-1.74	6545.9	10.4	59	82	n	--	No stratification, SCT (sfc) 23@10.5°C, 32.9@25°C. Depth to surface 6.75", water higher in well than in streams water surface. No cap
2012-06-15 10:10	bc	0.91	-1.19	6545.4	10.1	63	88	y	--	In standing water, water clear.
2012-07-17 0:00	bc	--	--	--	--	--	--	--	--	Couldn't locate, carex waist high, water ponded on surface
2012-08-14 12:00	bc	1.74	-0.36	6544.6	10.3	94	131	y	--	Muddy, no strat
2012-09-17 11:45	bc	2.69	0.59	6543.6	7.9	112	166	y	--	Muddy, well almost dry
2012-10-18 0:00	ds	2.96	0.86	6543.3	6.7	108	168		--	Meadow is driest I have seen since initial visit, pre-restoration. Water ponded in ponds. Little Truckee Q = 0
2013-05-24 12:45	ds, bc	0.60	-1.50	6545.7	7.9	41	60	n	--	No stratification; water level is ~2' higher on meadow than in well.
2013-06-20 11:25	bc	0.90	-1.20	6545.4	9.5	47	66	y	--	Minor stratification: SC=53@8.1°C, 78@25°C
2013-07-24 12:00	bc	--	-0.80	--	--	--	--	--	--	Could not locate, sedges waist high; standing water on ground
2013-08-30 12:00	bc	--	0.10	--	--	--	--	--	--	Could not locate, ground is moist, but no standing water
2013-09-18 13:45	ds	--	1.50	--	--	--	--	--	--	Could not locate; DTW value is estimated based on nearby water ponded in channels
2014-05-02 14:00	bs, ds	0.78	-1.32	6545.5	7.0	46	68	y	--	No stratification; surface water @ approx. 1ft
2014-07-29 0:00	--	--	--	--	--	--	--	--	--	Could not locate
2014-09-11 10:45	bc	2.13	0.03	6544.2	5.6	151	252	y	--	Very muddy; not stratified
2014-10-30 13:37	bc, ds	1.86	-0.24	6544.4	0.9	117	215	y	--	No strat, surface water SC=65.2 @3.1°C
2015-04-17 11:50	bc	1.35	-0.75	6545.0	6.3	66	101	y	--	In standing water
2015-05-22 16:00	bc, ds	1.49	-0.61	6544.8	5.6	96	154	y	--	Water higher on surface than in the well; SCT (@depth) 194@6.8°C, 298@25°C
2015-10-14 16:13	bt, ds	2	-0.10	6544.3	8.5	145	212	y	--	Not stratified; muddy and silted in; restarted logger at 16:30; grass over well and hard to find; some water on road and ground saturated but over all dry around
2016-06-01 13:00	bt	0.53	-1.57	6545.8	10.5	103	144	n	--	Pond completely inundated; DTW is at water level; well is barely above water; marked with a t-post for easier location; slate mode and restarted logger at 13:30; stratified-C 218 @6.0°C SC 342.7@ 25°C

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Perazzo Meadows Restoration, Sierra County, California

Site Conditions					Water Quality Observations					Remarks
Date/Time	Observer	Top-of-casing to water (ft)	Depth to water (ft, bgs)	Water Surface Elevation t, NGVD/NAVD	Temperature (°C)	Specific Conductance (at field temp.) (µS/cm)	Specific Conductance (at 25 °C) (µS/cm)	Bailed?	Soil crack size/moisture	
2016-07-29 13:00	bc	1.81	-0.29	6544.5	13.2	194	252	y	--	
2016-10-12 12:10	ds,bc	2.68	0.58	6543.6	7.4	47	70	y	--	Unable to download logger-would not connect
2017-07-11 15:34	bt	0.41	-1.69	6545.9	16.5	57	68	n	--	Well was leaning and damaged; completely inundated with 6 inches of water and visible flow at well; pipe was damaged at the top and had to be bent with pliers
2017-08-11 11:40	bc	0.55	-1.55	6545.8	14.3	76	95	y	--	Clear; no strat
2017-09-24 12:10	bc	1.44	-0.66	6544.9	9.7	97	138	y	--	Hard to bail because of bent well
2017-10-24 14:31	bt	1.15	-0.95	6545.2	9.4	93	132	n	--	Ground inundated and spongy; lots of ducks on nearby pond; grass green; diagnostics check Batt level 3.44V; restarted logger 14:45; re-enforced logger with extra string
2018-01-15 10:30	bt	3	1.66	6542.5	3.9	57	95	n	--	Installed new well; Total length of new well is 7.28 ft with 2.7 ft of screen; New stickup is 1.34 ft; meadow was inundated and water surface was 0.83 ft btoc; removed water level recorder from old well at 10:08 and downloaded; re-inserted water level recorder in new well at 10:26
2018-05-23 13:13	bt	0.62	-0.72	6544.9	5.1	33	53	n	--	Well inundated with ≈8 inches of water; DTW at water surface; adjacent channel flowing and meadow completely inundated
2018-07-03 9:20	bc	1.69	0.35	6543.9	11.7	46	61	y	--	No stratification
2018-08-16 10:24	bc	2.62	1.28	6542.9	12.9	74	97	y	--	
2018-10-19 14:16	bt	2.62	1.28	6542.9	10.2	88	122	y	--	Stratified at depth: T 8.1°C, C 235, SC 344; 4.5 bails with last 0.5 dirty; meadow dry; soil damp; grasses dry; active channels just south of well; restarted logger in continuous mode
2019-06-21 14:43	bt,ds	0.36	-0.98	6545.2	9.0	20	28	n	--	Stratified at very bottom of well: T 4.3°C, C 50, SC 82.4; well in flowing water 1 to 2 feet deep; meadow completely inundated
2019-07-27 9:55	bc	1.15	-0.19	6544.4	12.9	33	43	n	--	
2019-08-23 15:40	bc	2.07	0.73	6543.5	14.6	46	56	y	--	Water clear
2019-10-18 13:28	bt	2.17	0.83	6543.4	8.2	69	102	y	--	Stratified at depth T 7.1°C, C 371, SC 561; 5 bails last 2.5 were dirty; ground saturated; all nearby channels have water; not inundated

Table 11. Groundwater monitoring observations, Water Years 2010 to 2019
Perazzo Meadows Restoration, Sierra County, California

Site Conditions				Water Quality Observations					Remarks	
Date/Time	Observer	Top-of-casing to water (ft)	Depth to water (ft, bgs)	Water Surface Elevation (ft, NGVD/NAVD)	Temperature (°C)	Specific Conductance (at field temp.) (µS/cm)	Specific Conductance (at 25 °C) (µS/cm)	Bailed?	Soil crack size/moisture	
Piezometer 09-4 - North Side lower upper meadow, adjacent to volcanic bedrock outcrop and relic channels										
Total Depth		7.34 ft bgs								
Depth to bottom =		10.10 ft btoc								
Total Stickup =		2.76 ft above gs								
Elevation =		6546.2 ft								
2009-08-21 0:00	ds,bc	6.92	4.16	6542.0	--	--	--	--	--	Piezometer installed; DTW does necessarily reflect static water level
2009-09-23 14:59	ds	7.43	4.67	6541.5	8.7	69	101	--	--	Wp228; installed levellogger
2009-10-23 12:02	bc	3.18	0.42	6545.7	7.1	99	150	--	--	
2009-12-04 10:32	bc	3.18	0.42	6545.7	1.7	68	122	--	--	
2010-05-21 17:25	ds, rw	2.23	-0.53	6546.7	3.7	56	95	--	--	SCTsfc=23@4.9°C, 38@25°C
2010-06-12 16:00	bc	--	--	--	--	--	--	--	--	Unable to access due to deep water and channels at well
2010-07-19 13:15	bc	2.85	0.09	6546.1	11.6	67	90	n	--	Ground saturated but no standing water
2010-08-23 17:15	bc				12.0	65	87	y	--	Water clear, no odor
2010-09-28 16:50	bc	3.26	0.50	6545.7	9.4	79	113	n	--	Water clear, no odor
2010-11-02 12:10	ds	2.65	-0.11	6546.3	6.8	64	99	n	--	Not stratified; surface water is 76@25°C
2011-07-08 12:05	ds, bc	1.79	-0.97	6547.1	4.2	58	96	y	--	Water clear, depth to SW = 1.78. SCT (top) = 54@7.4°C, 81.1@25°C
2011-08-11 12:20	bc	2.90	0.14	6546.0	9.0	121	175	n	--	Ground wet, but no standing water, SCT (top) 99.9@12.7°C, 130.3@25°C
2011-09-12 12:50	bc	3.03	0.27	6545.9	10.3	85	119	y	--	No stratification
2011-10-09 12:20	bc	2.87	0.11	6546.1	8.0	98	146	y	--	Water clear, no strat
2011-11-03 12:50	ds	3.05	0.29	6545.9	6.7	107	165	n	--	Saturated just below SFC, LL time 1250 PC time 1247
2011-12-05 12:00	bc	3.09	0.33	6545.8	2.1	111	196	y	--	
2012-05-18 11:10	ds, bc	1.98	-0.78	6546.9	6.2	55	85	n	--	DTS 1.98'. SCT (depth) 140@1.3°C, SCT (sfc) 21.6@5.8°C
2012-06-15 11:40	bc	2.62	-0.14	6546.3	8.5	68	100	y	--	No stratification, water clear, surface water at ground level
2012-07-17 12:40	bc	3.38	0.62	6545.5	11.9	122	163	y	--	Water slightly muddy. SCT (depth) 142.2@8.7°C, 200.4@25°C
2012-08-14 13:15	bc	3.98	1.22	6544.9	10.7	180	251	y	--	SCT (depth) 173.6@7.7°C, 258.3@25°C
2012-09-17 13:05	bc	5.44	2.68	6543.5	8.4	125	183	y	--	Slightly muddy. Stream dry, island pools.
2012-10-18 16:15	ds	5.57	2.81	6543.4	5.8	152	238	n	--	LL time = 1632, PC time = 16:31. data downloaded.
2013-05-24 14:15	ds, bc	2.61	-0.15	6546.3	9.8	58	82	n	--	Stratified; SC = 255 @ 25°C, 4.9°C at bottom of well.
2013-06-20 13:15	bc	3.08	0.32	6545.8	8.6	65	94	y	--	Not stratified
2013-07-24 11:45	bc	3.07	0.31	6545.9	14.0	127	158	n	--	Stratified; SC = 162@10.3°C; 226@25°C at bottom of well
2013-08-30 12:35	bc	3.98	1.22	6544.9	7.9	117	174	y	--	No stratification
2013-09-18 13:20	ds	4.17	1.41	6544.8	10.5	208	287	n	--	Minor stratification: SC=215@8.6°C, 312@25°C at bottom of well
2014-05-02 15:45	bc, ds	0.78	-1.98	6548.1	7.2	71	110	--	--	Stratified: SC=156@0.3°C, 291@25°C
2014-07-29 12:25	bc	2.86	0.10	6546.1	7.9	149	218	y	--	Clear
2014-09-11 12:10	bc	3.7	0.94	6545.2	4.9	163	263	y	--	Clear; stratified: 206 @ 4.4°C, 340.1@25°C
2014-10-30 15:50	bc, ds	2.69	-0.07	6546.2	1.2	170	310	y	--	Stratified: sc=200 @ 2.2°C, 357@ 25°C
2015-04-17 13:15	bc	2.44	-0.32	6546.5	7.1	53	80	y	--	Clear. SCT (@ depth) 223.5@5.5°C, 356.9@25°C
2015-05-22 15:15	bc, ds	2.4	-0.36	6546.5	7.7	166	251	y	--	SCT (@ depth) 245@6.6°C, 376@25°C
2015-06-26 10:00	bc	3.17	0.41	6545.8	10.5	167	233	n	--	No strat
2015-08-14 10:40	bc	3.57	0.81	6545.4	10.0	157	221	y	--	
2015-10-14 14:32	bt, ds	3.39	0.63	6545.5	8.7	149	215	y	--	Stratified 239@8.0°C, 354 @25°C bailed clear and recovered quickly; channel half full no observed flow
2016-06-01 11:49	bt	1.84	-0.92	6547.1	11.1	29	40	n	--	Completely in a pool ≈ 1.25 ft deep; channels surrounding the pool are deep and active (waist deep)
2016-07-29 14:30	bc	3.2	0.44	6545.7	11.0	45	61	y	--	Stratified 38.5@8.1°C, 56.8 @25°C
2016-10-12 14:25	ds,bc	3.69	0.93	6545.2	6.3	136	211	y	--	

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Date/Time	Observer	Top-of-casing to water (ft)	Depth to water (ft, bgs)	Water Surface Elevation (ft, NGVD/NAVD)	Temperature (°C)	Specific Conductance (at field temp.) (µS/cm)	Specific Conductance (at 25 °C) (µS/cm)	Bailed?	Soil crack size/moisture	
2017-07-11 14:30	bt	2.42	-0.34	6546.5	9.0	30	43	y	--	Well inundated with 2-4 inches of water; all channels are full around well; 10 bails clear water
2017-08-11 13:00	bc	2.62	-0.14	6546.3	13.0	107	140	y	--	Stratification at depth T 10.2°C, C 218.9, SC 303.8@25°C
2017-09-22 13:35	bc	2.78	0.02	6546.1	7.7	171	254	y	--	
2017-10-24 13:49	bt	3.17	0.41	6545.8	7.7	165	245	y	--	Grass is dry; no stratification; soil is damp; 7.5 bails clear; diagnostics all check OK Battery level is 3.57V
2018-05-23 12:00	bt	2.07	-0.69	6546.9	7.8	36	53	y	--	Stratified at depth: T 4.6°C, C 150.5, SC 245.4; 15 bails clear; well inundated in ≈4 inches of water; adjacent channel flowing
2018-07-03 11:05	bc	3.47	0.71	6545.5	10.4	124	207	y	--	Stratified at depth: T 8.2°C, C 144.2, SC 211.2
2018-08-16 12:10	bc	4.42	1.66	6544.5	9.7	150	214	y	--	
2018-10-20 12:22	bt	4	1.24	6544.9	8.3	87	125	y	--	Stratified at depth: T 7.0°C, C 202, SC 304; 10 bails clear water; grass dry
2018-11-16 11:13	bt	4.01	1.25	6544.9	--	--	--	--	--	Installed new logger with 1 hour timestep
2018-06-18 13:48	bt	1.71	-1.05	6547.2	12.2	98	129	y	--	Well inundated in 1 plus feet of water; water flowing over the meadow
2019-07-27 11:30	bc	2.81	0.05	6546.1	11.8	125	166	n	--	
2019-08-23 17:20	bc	3.13	0.37	6545.8	9.5	130	185	y	--	Water Clear
2019-10-21 12:27	bt	3.58	0.82	6545.3	7.0	125	191	y	--	Stratified at depth T 6.2°C, C 160, SC 249; soil wet; grasses dry; 10 bails clear

Table 11. Groundwater monitoring observations, Water Years 2010 to 2019
Perazzo Meadows Restoration, Sierra County, California

Site Conditions				Water Quality Observations					Remarks	
Date/Time	Observer	Top-of-casing to water (ft)	Depth to water (ft, bgs)	Water Surface Elevation t, NGVD/NAVD	Temperature (°C)	Specific Conductance (at field temp.) (µS/cm)	Specific Conductance (at 25 °C) (at 25 °C)	Bailed?	Soil crack size/moisture	
Piezometer 09-5 - North side, lower upper meadow, upland terrace										
Total Depth		5.26 ft bgs	New Stickup	5-23-18						
Depth to bottom =		10.01 ft btoc								
Total Stickup =		4.75 ft above gs	0.79	ft above gs						
Elevation =		6553.8 ft								
2009-08-21 0:00	ds,bc	dry	--	--	--	--	--	--	--	Piezometer installed
2009-09-23 14:46	ds	9.78	5.03	6548.8	11.2	145	197	y	--	Wp227; very little water in bottom of well.
2009-10-23 12:12	bc	9.65	4.90	6548.9	9.3	362	517	n	--	Murky brown color, water level near bottom of well
2009-12-04 10:18	bc	8.91	4.16	6549.6	6.8	298	459	n	--	Water clear, no odor; capped
2010-06-12 15:45	bc	4.77	0.02	6553.8	9.2	174	250	n	--	
2010-07-19 13:05	bc	5.80	1.05	6552.7	10.6	171	237	n	--	
2010-08-23 17:00	bc	7.87	3.12	6550.7	10.1	194	270	y	--	Water clear, no odor
2010-09-28 16:40	bc	8.62	3.87	6549.9	9.9	280	393	n	--	Water clear, no odor
2010-11-02 11:58	ds	6.18	1.43	6552.4	7.3	96	145	n	--	Stratified: 374@25°C at depth
2011-07-08 11:48	ds, bc	4.85	0.10	6553.7	7.1	154	233	y	--	Water clear, SCT (top) = 127.1@15.4°C, 155.7@25°C
2011-08-11 12:05	bc	5.71	0.96	6552.8	8.6	112	163	n	--	SCT (top) = 128.3@12.3°C, 169@25°C
2011-09-12 12:40	bc	7.31	2.56	6551.2	10.1	112	158	y	--	Water clear, no stratification
2011-10-09 12:10	bc	8.23	3.48	6550.3	9.0	756	1080	y	--	Water clear, no stratification
2011-11-03 12:20	ds	8.33	3.58	6550.2	7.9	1092	1620	n	--	Ground is dry, stratified, SCT (top) 250@25°C
2011-12-05 11:50	bc	7.98	3.23	6550.6	5.6	124	197	n	--	
2012-05-18 11:35	ds, bc	4.91	0.16	6553.6	8.2	105	154	n	--	
2012-06-15 11:50	bc	5.41	0.66	6553.1	8.4	105	152	y	--	Water clear, no stratification
2012-07-17 13:00	bc	7.50	2.75	6551.0	7.7	98	147	y	--	A little clear, no strat
2012-08-14 13:25	bc	8.71	3.96	6549.8	7.5	101	152	y	--	Water muddy, no strat
2012-09-17 13:15	bc	9.47	4.72	6549.1	7.5	127	187	y	--	Muddy
2012-10-18 0:00	ds	9.75	5.00	6548.8	6.7	107	165	n	--	
2013-05-24 14:25	ds, bc	5.44	0.69	6553.1	9.4	71	101	n	--	
2013-06-20 13:30	bc	6.82	2.07	6551.7	7.5	70	104	y	--	No stratification
2013-07-24 11:50	bc	8.22	3.47	6550.3	10.4	75	105	n	--	No stratification
2013-08-30 12:45	bc	9.26	4.51	6549.3	6.6	119	184	y	--	
2013-09-18 13:35	ds	9.51	4.76	6549.0	10.5	127	178	n	--	
2014-05-02 16:05	bc, ds	4.94	0.19	6553.6	3.0	154	264	--	--	Stratified: 142.6 @ 1.9°C, 255@25°C
2014-07-29 12:35	bc	8.91	4.16	6549.6	5.0	149	241	y	--	Clear, no strat
2014-09-11 12:25	bc	9.39	4.64	6549.1	6.0	151	238	y	--	Clear, no strat
2014-10-30 16:10	bc, ds	9.24	4.49	6549.3	3.7	155	266	y	--	No strat
2015-04-17 13:30	bc	5.36	0.61	6553.2	5.8	100	157	NR	--	
2015-05-22 15:30	bc, ds	5.98	1.23	6552.6	7.3	139	209	y	--	No strat
2015-06-26 10:10	bc	7.39	2.64	6551.1	--	--	--	--	--	
2015-08-14 10:55	bc	8.8	4.05	6549.7	--	--	--	n	--	
2015-10-14 14:54	bt, ds	9.38	4.63	6549.2	NR	--	--	n	--	No reading until removed logger; no SC
2016-06-01 11:21	bt	4.82	0.07	6553.7	14.7	109	135	y	--	Not stratified but also hard to get SC probe too deep; re-started logger at 11:15 because it is in slate mode; ground is saturated with some ponding starting 50 yds from the road; bailed and water clear
2016-07-29 14:40	bc	7.76	3.01	6550.8	11.1	117	160	y	--	
2016-10-12 14:45	ds,bc	dry	--	--	--	--	--	--	--	
2017-07-11 14:08	bt	5.26	0.51	6553.3	15.5	68	83	y	--	Stratified at depth, T 11.0°C, C 126.8, SC 171.6@°C; soil is slightly damp; grasses shorter with some tall grass in mix; 4.5 bails of clear water
2017-08-11 13:10	bc	7.1	2.35	6551.4	13.6	107	136	y	--	Clear; not stratification

Table 11. Groundwater monitoring observations, Water Years 2010 to 2019
Perazzo Meadows Restoration, Sierra County, California

Site Conditions			Water Quality Observations							Remarks
Date/Time	Observer	Top-of-casing to water (ft)	Depth to water (ft, bgs)	Water Surface Elevation (ft, NGVD/NAVD)	Temperature (°C)	Specific Conductance (at field temp.) (µS/cm)	Specific Conductance (at 25 °C) (µS/cm)	Bailed?	Soil crack size/moisture	
2017-09-22 13:45	bc	8.68	3.93	6549.9	10.8	195	269	n	--	Could not get bailor in well deep enough
2017-10-24 14:06	bt	8.79	4.04	6549.7	10.6	204	278	n	--	Grasses and soil are dry; restarted logger at 14:30
2018-05-23 11:22	bt	5	0.25	6553.5	9.7	54	77	y	--	Well broken at coupler roughly 8 inches above ground surface; DTW measurement made standing well up where it was broken so could be slightly off; stratified at depth: T 6.4°C, C 113.2, SC 174.6; replaced string with estimated measurement of length below broken section and attached below coupling; 4.5 bails clear
2018-07-03 11:15	bc	2.7	1.91	6551.9	10.7	109	149	y	--	No stratification
2018-08-16 12:25	bc	dry	--	--	--	--	--	--	--	
2018-10-20 11:50	bt	dry	--	--	--	--	--	--	--	Restarted logger in continuous mode; grass is dry; soil damp
2019-06-18 14:11	bt	0.75	-0.04	6553.8	12.5	142	186	y	--	Time on logger way off; restarted to sync; changed broken string; 3.5 bails clean water; ground is soft and saturated with some ponding
2019-07-27 11:40	bc	1.83	1.04	6552.7	12.9	121	158	n	--	
2019-08-23 17:35	bc	3.61	2.82	6551.0	--	--	--	n	--	Could not get SC probe past well coupler
2019-10-21 12:43	bt	dry	--	--	--	--	--	n	--	Grasses dry; soil dry; restarted logger to sync time at 13:00 for 60 minute intervals

Table 11. Groundwater monitoring observations, Water Years 2010 to 2019
Perazzo Meadows Restoration, Sierra County, California

Site Conditions				Water Quality Observations					Remarks	
Date/Time	Observer	Top-of-casing to water (ft)	Depth to water (ft, bgs)	Water Surface Elevation (ft, NGVD/NAVD)	Temperature (°C)	Specific Conductance (at field temp.) (µS/cm)	Specific Conductance (at 25 °C) (µS/cm)	Bailed?	Soil crack size/moisture	
Piezometer 09-6 - S Side Middle Meadow, just east of willow line, upstream of Cold Creek fan										
Total Depth		5.35 ft bgs								
Depth to bottom =		8.60 ft bloc								
Total Stickup =		3.25 ft above gs								
Elevation =		6492.6 ft								
2009-08-27 0:00	ds, tb	4.23	0.98	6491.7	--	--		--	--	Piezometer installed; water level not static, but fairly stable
2009-09-23 10:35	ds	4.01	0.76	6553.0	9.3	95	137	y	--	Replaced SCT meter battery just prior to measurement; installed levellogger after bailing well
2009-10-01 9:30	ds,bc	4.00	0.75	6553.0	7.3	82	124	n	--	Downloaded levellogger
2009-10-23 12:58	bc	3.69	0.44	6553.3	6.4	82	127	n	--	Water clear, no odor
2009-12-04 13:56	bc	3.83	0.58	6553.2	2.8	79	137	n	--	Water clear, no odor
2010-06-11 15:00	ds	3.28	0.03	6553.8	4.6	98	160	n	--	Stratified; SCT at water table = 94.4@9.3°C, 135@25°C; downloaded DL; saturated at sfc
2010-07-19 9:24	bc	3.47	0.22	6553.6	10.4	116	161	n	--	
2010-08-23 12:35	bc	4.21	0.96	6552.8	8.3	100	148	y	--	Water clear, no odor; cap replaced with loose oversized cap
2010-09-28 13:45	bc	3.71	0.46	6553.3	6.4	86	133	n	--	Water clear, no odor
2010-11-02 13:43	ds	3.41	0.16	6553.6	5.2	83	131	n	--	Stratified: 88@25°C in upper portion of well; water ponded in nearby depressions, evidence of surface flow in willows; downloaded datalogger
2011-07-08 13:50	ds, bc	2.72	-0.53	6554.3	4.8	93	150	y	--	Depth to sw=2.72, SCT (top) = 90.4@12.5°C, 118@25°C
2011-08-11 9:02	bc	3.25	0.00	6553.8	9.6	83	117	n	--	No stratification, water clear
2011-09-12 9:30	bc	3.61	0.36	6553.4	8.6	112	163	y	--	Water clear, SCT (top) = 95.4@8.6°C, 126.5@25°C
2011-10-09 13:40	bc	3.32	0.07	6553.7	7.0	108	165	y	--	No stratification
2011-11-03 14:00	ds	3.44	0.19	6553.6	6.3	103	160		--	Minimal stratification
2011-12-05 13:35	bc	3.45	0.20	6553.6	2.8	89	154	n	--	
2012-05-18 12:55	ds, bc	2.82	-0.43	6554.2	9.5	117	165	n	--	In standing water. SCT (depth) 120@1.6°C
2012-06-06 11:28	merced	3.02	-0.23	6554.0	--	--		--	--	
2012-06-15 9:00	bc	3.20	-0.05	6553.8	6.2	103	161	y	--	Water slightly muddy. SCT (depth) 139.4@4.7°C, 226.9@25°C
2012-07-17 10:30	bc	3.63	0.38	6553.4	7.5	128	193	y	--	No stratification
2012-08-14 13:50	bc	3.60	0.35	6553.4	7.5	138	211	y	--	No strat, water clear
2012-09-17 10:55	bc	3.29	0.04	6553.7	6.9	101	155	y	--	No strat, water slightly muddy
2012-10-18 12:58	ds	3.24	-0.01	6553.8	6.9	113	177	n	--	Downloaded
2013-05-24 11:35	ds, bc	2.98	-0.27	6554.1	7.7	97	146	n	--	Stratified; SCT = 220@25°C, 137@5.4°C at depth
2013-06-20 10:10	bc	3.07	-0.18	6554.0	7.1	91	138	y	--	Wet at surface, bailed water is slightly muddy; stratified: 110@5.9°C, 173@25°C
2013-07-24 12:45	bc	3.10	-0.15	6553.9	12.5	103	136	n	--	No stratification
2013-08-30 10:05	bc	3.17	-0.08	6553.9	6.2	108	168	y	--	Water clear; stratified: SC = 162@5.4°C, 259@25°C
2013-09-18 14:05	ds	3.20	-0.05	6553.8	9.4	142	203	n	--	No stratification; downloaded
2014-05-02 12:45	bc, ds	2.91	-0.34	6554.1	5.1	79	127	y	--	Stratified; SC = 171 @ 0.5°C, 317@ 25°C
2014-07-29 13:25	bc	3.40	0.15	6553.6	6.5	167	258	y	--	No strat; clear
2014-09-11 9:25	bc	3.27	0.02	6553.8	3.8	120	202	y	--	No strat; clear
2014-10-30 12:00	bc, ds	3.14	-0.11	6553.9	1.4	105	190	y	--	Clear; stratification: C = 112 @ 1.0°C , SC = 205 @ 25°C ; ground moist
2015-04-17 10:40	bc	3.01	-0.24	6554.0	4.9	120	195	y	--	Clear, no strat
2015-05-22 11:40	bc, ds	2.93	-0.32	6554.1	7.3	139	209	y	--	No strat
2015-06-26 11:00	bc	3.42	0.17	6553.6	10.8	118	159	n	--	
2015-08-14 11:30	bc	3.52	0.27	6553.5	9.4	119	166	y	--	
2015-10-21 10:41	bt	3.37	0.12	6553.7	6.8	103	155	y	--	No stratification; bailed clear water; marsh very wet and sloppy with ponding and saturated mud
2016-05-27 12:42	ds,bc	2.69	-0.56	6554.3	10.4	111	153	n	--	4" of standing water; stratified at depth; C 100 @ 7.2°C
2016-07-29 15:46	bc	3.82	0.57	6553.2	8.8	96	138	y	--	

Table 11. Groundwater monitoring observations, Water Years 2010 to 2019
Perazzo Meadows Restoration, Sierra County, California

Site Conditions					Water Quality Observations					Remarks
Date/Time	Observer	Top-of-casing to water (ft)	Depth to water (ft, bgs)	Water Surface Elevation (ft, NGVD/NAVD)	Temperature (°C)	Specific Conductance (at field temp.) (µS/cm)	Specific Conductance (at 25 °C) (at 25 °C)	Bailed?	Soil crack size/moisture	
2016-10-07 12:17	bt	3.52	0.27	6553.5	5.8	82	130	y	--	Grass very green knee to waist high; soggy under foot walking to well; willows starting to lose leaves; lots of waterfowl
2017-07-13 13:58	bt	2.94	-0.31	6554.1	14.2	66	82	y	--	Meadow inundated with water; very muddy and spongy; no stratification; 10 bails clear; grass waist high
2017-08-11 14:00	bc	3.49	0.24	6553.5	11.1	133	179	y	--	No stratification
2017-09-22 13:30	bc	3.16	-0.09	6553.9	7.1	91	138	y	--	
2017-10-25 12:08	bt	3.26	0.01	6553.8	7.7	93	138	y	--	Grass is drying out; soil inundated <1 inch of water; 10 bails clear water; diagnostics check battery 3.43V
2018-05-23 13:48	bt	2.87	-0.38	6554.2	10.8	45	61	y	--	Stratified at depth: T 4.4°C, C 127, SC 208; well inundated in ≈6-8 inches of water; 10 bails clear
2018-07-03 11:50	bc	3.1	-0.15	6553.9	11.5	129	172	y	--	
2018-08-16 13:05	bc	2.99	-0.26	6554.0	14.0	136	171	y	--	
2018-10-19 12:18	bt	2.96	-0.29	6554.1	8.7	136	196	y	--	No stratification; meadow inundated with 2-6 inches of water; 10 bails clear water; restarted logger to sync time
2018-11-16 11:31	bt	2.88	-0.37	6554.2	--	--		--	--	Installed new logger with 1 hour timestep
2019-06-21 12:46	bt,ds	2.62	-0.63	6554.4	14.3	85	107	n	--	Stratified at depth: T 6.0°C, C 104, Sc 163; inundated in 8 to 10 inches of water; well loose and pushed to an angle; unable to bail
2019-07-27 12:15	bc	2.57	-0.68	6554.5	12.3	92	121	n	--	Water clear
2019-08-24 12:15	bc	3.01	-0.24	6554.0	13.2	97	124	y	--	
2019-10-18 11:29	bt	2.96	-0.29	6554.1	5.2	123	197	y	--	Meadow inundated; grasses turning brown; 10 bails clear

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Perazzo Meadows Restoration, Sierra County, California

Site Conditions				Water Quality Observations					Remarks	
Date/Time	Observer	Top-of-casing to water (ft)	Depth to water (ft, bgs)	Water Surface Elevation (ft, NGVD/NAVD)	Temperature (°C)	Specific Conductance (at field temp.) (µS/cm)	Specific Conductance (at 25 °C) (µS/cm)	Bailed?	Soil crack size/moisture	
Piezometer 09-7 - S Side lower middle meadow										
Total Depth		6.26 ft bgs								
Depth to bottom =		10.00 ft btoc								
Total Stickup =		3.74 ft above gs								
Elevation =		6472.7 ft								
2009-08-27 0:00	ds, tb	7.19	3.45	6469.3	11.2	101	139	--	--	Coupler driven onto pipe, could not remove, no cap installed
2009-09-23 11:16	ds	7.01	3.27	6469.5	9.7	102	72	y	--	SC rises slightly after purging, ~10uS; water slightly turbid after bailing
2009-10-01 11:55	ds,bc	6.97	3.23	6469.5	9.5	81	115	--	--	Downloaded levellogger; measurement from top of inside casing, not coupling
2009-10-23 14:30	bc	6.50	2.76	6470.0	8.1	73	107	--	--	Water clear in color, no odor
2009-12-05 10:44	bc	6.38	2.64	6470.1	4.5	68	113	n	--	Water clear, no odor; no cap installed; bird droppings
2010-06-11 16:00	ds	4.23	0.49	6472.3	8.5	95	142	n	--	Temperature stratified, 4.1degC at bottom of well; downloaded DL
2010-07-19 8:13	bc	5.96	2.22	6470.5	8.3	96	142	n	--	No cap
2010-08-23 11:20	bc	6.59	2.85	6469.9	8.9	92	133	y	--	Water clear, no odor, replaced cap
2010-09-28 0:00	--	--	--	--	--	--	--	--	--	Unable to located piezo
2010-11-03 16:23	ds	--	--	--	6.6	119	183	--	--	Well stickup is broken off, replaced; downloaded and removed datalogger to avoid damage.
2011-07-08 16:47	ds, bc	--	--	--	7.2	453	691	--	--	SCT (top) 66.5@25
2011-08-11 7:55	bc	4.26	0.52	6472.2	10.9	359	489	n	--	Water clear, SCT (top) = 263.7@12.1, 328.5@25
2011-09-12 8:45	bc	4.05	0.31	6472.4	11.6	110	148	y	--	No stratification, slightly muddy water
2011-10-09 15:30	bc	3.74	0.00	6472.7	9.2	100	143	y	--	Water clear
2011-11-03 16:00	ds	3.98	0.24	6472.5	5.4	93	149	--	--	Did not download UC Merced LL, Stickup = 3.5'
2011-12-05 10:00	bc	3.99	0.25	6472.5	2.7	94	163	n	--	
2012-05-18 15:15	ds, bc	--	--	--	7.9	126	187	n	--	Levellogger embedded in mud. Removed but is now resting on top of mud.
2012-06-06 12:22	merced	3.48	--	--	--	--	--	--	--	
2012-06-15 8:10	bc	3.78	0.04	6472.7	8.0	135	200	y	--	Water muddy, no stratification
2012-07-17 9:45	bc	4.66	0.92	6471.8	7.2	106	161	y	--	Muddy, no strat
2012-08-14 15:40	bc	4.57	0.83	6471.9	8.2	111	164	y	--	Very muddy
2012-09-17 10:15	bc	4.22	0.48	6472.3	7.9	102	154	y	--	Water clear, no strat
2012-10-18 14:06	ds	4.08	0.34	6472.4	5.6	89	140	n	--	Downloaded
2013-05-24 10:35	ds, bc	3.55	-0.19	6472.9	5.8	86	135	n	--	Minimal stratification but 4.8 degC at bottom of well
2013-06-20 9:25	bc	4.09	0.35	6472.4	5.2	82	131	y	--	Water clear, with a little turbidity at bottom, no stratification
2013-07-24 9:00	bc	4.52	0.78	6472.0	10.4	99	138	n	--	No stratification
2013-08-30 9:25	bc	4.23	0.49	6472.3	6.0	89	140	y	--	Water clear, no strat
2013-09-18 11:15	ds	4.25	0.51	6472.2	9.2	82	119	n	--	Not stratified; downloaded levellogger
2014-05-02 11:00	bc, ds	3.54	-0.20	6472.9	1.6	na		y	--	Not stratified
2014-07-29 9:40	bc	4.88	1.14	6471.6	6.4	85	132	y	--	No strat; muddy
2014-09-11 8:40	bc	4.81	1.07	6471.7	4.5	69	114	y	--	Muddy, no strat
2014-10-30 11:00	bc, ds	4.12	0.38	6472.4	1.3	71	128	y	--	No strat
2015-04-17 10:00	bc	3.79	0.05	6472.7	2.6	81	142	y	--	No strat, muddy near bottom, mostly clear
2015-05-22 10:45	bc, ds	3.43	-0.31	6473.1	5.7	73	116	y	--	No strat, clear, little bit muddy about halfway through bailing.
2015-06-26 8:25	bc	4.51	0.77	6472.0	9.3	82	117	n	--	
2015-08-14 8:20	bc	4.36	0.62	6472.1	10.1	80	111	y	--	
2015-10-14 11:24	bt,ds	4.25	0.51	6472.2	9.1	70	100	y	--	No strat; ponding to the SSE; soils dry and moist "Dave-I have seen it a lot dryer at this point in the season-reflecting a wet summer."; !! Reset data logger to measure in ft not cm next visit!!!!
2016-05-27 11:25	ds,bc	3.35	-0.39	6473.1	10.1	113	153	y	--	Stratified at depth; C 100 @7.2 degC; clear water not odor; possibly silting in
2016-07-29 12:15	bc	4.99	1.25	6471.5	10.0	101	142	y	--	No stratification

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Site Conditions					Water Quality Observations					Remarks
Date/Time	Observer	Top-of-casing to water (ft)	Depth to water (ft, bgs)	Water Surface Elevation (ft, NGVD/NAVD)	Temperature (°C)	Specific Conductance (at field temp.) (µS/cm)	Specific Conductance (at 25 °C) (µS/cm)	Bailed?	Soil crack size/moisture	
2016-10-07 11:16	bt	4.74	1.00	6471.7	7.0	62	94	y	--	Grasses at well are dry because it is at a high point; grasses in lower areas around pools and channels are very green
2017-07-11 10:59	bt	3.46	-0.28	6473.0	13.0	112	147	y	--	No stratification; ground saturated with 1 plus inches of water; all channels active on walk from 09-10
2017-08-11 16:45	bc	4.53	0.79	6472.0	10.4	96	133	y	--	Clear; no stratification
2017-09-24 11:30	bc	4.25	0.51	6472.2	8.0	67	99	y	--	
2017-10-24 10:29	bt	4.14	0.40	6472.3	6.5	64	99	y	--	Grass dry; soil damp; 9.5 bails clear water; logger in cm but leaving it to continue monitoring; diagnostic check battery 3.57V
2018-05-22 15:25	bt,ds	3.42	-0.32	6473.1	8.8	107	156	y	--	No stratification-only temp; soil saturated; installed backup string; 10 bails clear
2018-07-03 8:40	bc	4.37	0.63	6472.1	8.6	89	130	y	--	No stratification; water slightly muddy in last bail
2018-08-16 9:35	bc	4.92	1.18	6471.6	9.3	76	109	y	--	Water slightly muddy
2018-10-20 9:40	bt	4.52	0.78	6472.0	5.7	64	102	y	--	No stratification; 8 bails of clear water; grass is dry; soils damp; meadow has some inundation and saturated soils
2018-11-16 9:45	bt	4.54	0.80	6471.9	--	--		--	--	Installed logger from old LTPM gage SN1057507; set for 1 hour measurements
2019-06-18 10:00	bt	3.21	-0.53	6473.3	12.0	113	151	y	--	No stratification; 10 bails with first few slightly dirty; some inundation ≈1-3 inches of water at well
2019-07-27 9:05	bc	4.39	0.65	6472.1	10.6	103	141	n	--	
2019-08-24 15:03	bc	5.18	1.44	6471.3	12.5	54	71	y	--	
2019-10-21 9:59	bt	4.57	0.83	6471.9	6.8	66	101	y	--	5 bails moderately dirty water; ground damp; grasses drying

Table 11. Groundwater monitoring observations, Water Years 2010 to 2019
Perazzo Meadows Restoration, Sierra County, California

Site Conditions				Water Quality Observations					Remarks	
Date/Time	Observer	Top-of-casing to water (ft)	Depth to water (ft, bgs)	Water Surface Elevation (ft, NGVD/NAVD)	Temperature (°C)	Specific Conductance (at field temp.) (µS/cm)	Specific Conductance (at 25 °C) (µS/cm)	Bailed?	Soil crack size/moisture	
Piezometer 09-8 - Upper end middle meadow, north side										
Total Depth		4.80 ft bgs								
Depth to bottom =		9.75 ft btoc								
Total Stickup =		4.95 ft above gs								
Elevation =		6497.4 ft								
2009-08-27 0:00	ds,tb	8.53	3.58	6493.8	--	--	--	--	--	Piezometer installed; not static, fairly steady
2009-09-23 16:05	ds	8.42	3.47	6493.9	10.6	115	160	y	--	Wp238; no stratification
2009-10-01 9:01	ds,bc	8.41	3.46	6493.9	10.4	97	135	n	--	
2009-10-23 13:20	bc	7.96	3.01	6494.4	9.4	104	149	n	--	Water clear; no odor
2009-12-04 13:29	bc	7.82	2.87	6494.5	6.6	93	144	n	--	Water clear no odor; capped
2010-06-12 16:30	bc	5.14	0.19	6497.2	9.7	149	209	n	--	
2010-07-19 9:45	bc	7.52	2.57	6494.8	9.4	117	167	n	--	
2010-08-23 13:00	bc	7.03	2.08	6495.3	10.7	101	140	y	--	Water muddy at bottom, next to active construction
2010-09-28 14:15	bc	5.50	0.55	6496.8	10.2	98	134	n	--	Water clear, no odor
2010-11-02 14:54	ds	4.97	0.02	6497.4	8.6	140	206	--	--	Not stratified; no evidence of overland flow at this location
2011-07-08 14:30	ds, bc	4.69	-0.26	6497.6	6.0	104	163	y	--	SCT (top) = 62.4@12.6°C, 80.6@25°C
2011-08-11 9:20	bc	5.46	0.51	6496.9	9.6	136	192	n	--	SCT (top) = 64.1@10.8°C, 84.8@25°C
2011-09-12 10:10	bc	5.81	0.86	6496.5	11.0	155	211	y	--	Water clear, no stratification
2011-10-09 14:05	bc	5.41	0.46	6496.9	9.1	161	232	n	--	Couldn't get bailer in deep enough to bail.
2011-11-03 14:28	ds	5.95	1.00	6496.4	7.0	127	193	n	--	Meadow dry, UC Merced levellogger pulled and replaced but not downloaded
2011-12-05 13:45	bc	5.95	1.00	6496.4	3.8	137	231	n	--	
2012-04-24 0:00	ds	4.54	-0.41	6497.8	10.8	158	210	--	--	SCT (depth) 113@1.6°C SCT (sfc) 53.4@ 15.9°C, 64.7@25°C; new cap installed with levellogger
2012-04-24 0:00	ds	4.50	-0.45	6497.8	--	--	--	--	--	
2012-05-18 13:30	ds, bc	4.71	-0.24	6497.6	6.2	124	194	--	--	No stratification
2012-06-06 13:27	merced	4.89	-0.06	6497.4	--	--	--	--	--	
2012-06-15 9:25	bc	5.23	0.28	6497.1	7.2	136	205	y	--	Slightly muddy, SCT (depth) 127.8@4.9°C, 208.6@25°C
2012-07-17 10:55	bc	6.47	1.52	6495.9	7.3	133	200	y	--	Water clear, no strat
2012-08-14 14:10	bc	6.80	1.85	6495.5	8.8	127	182	y	--	No stratification
2012-09-17 11:15	bc	6.62	1.67	6495.7	8.5	135	196	y	--	Water clear, no strat
2012-10-18 12:20	ds	6.64	1.69	6495.7	7.1	135	206	n	--	Downloaded
2013-05-24 11:55	ds, bc	5.29	0.34	6497.0	7.2	53	80	n	--	Stratified: SC = 106.8@6.2°C, 166@25°C at depth
2013-06-20 10:35	bc	5.95	1.00	6496.4	6.9	105	161	y	--	Stratified: SC = 112@5.6°C, 179@25°C at depth
2013-07-24 13:15	bc	6.79	1.84	6495.5	10.3	142	196	n	--	
2013-08-30 10:35	bc	6.74	1.79	6495.6	7.9	145	216	y	--	Water muddy, no stratification
2014-05-02 12:15	bc, ds	5.04	0.09	6497.3	4.9	111	183	y	--	Stratified: SC 122 @ 1.1°C, 223 @ 25°C
2014-07-29 14:05	bc	6.99	2.04	6495.3	7.3	122	180	y	--	No strat; slightly muddy
2014-09-11 5:55	bc	7	2.05	6495.3	6.0	122	191	y	--	No strat; slightly muddy
2014-10-30 12:40	bc, ds	6.36	1.41	6496.0	2.8	130	225	y	--	No strat
2015-04-17 11:12	bc	5.49	0.54	6496.8	3.1	100	171	y	--	No strat
2015-05-22 12:21	bc, ds	5.27	0.32	6497.1	5.9	104	164	y	--	Extra rise in pipe from pvc fitting, 0.15 stick up.
2015-06-26 11:20	bc	6.56	1.61	6495.8	9.2	108	156	n	--	
2015-08-14 12:00	bc	6.87	1.92	6495.5	10.6	117	162	y	--	
2015-10-21 11:30	bt	6.48	1.53	6495.8	9.1	112	161	y	--	Hard to get SC probe down well
2016-05-27 13:30	bt	4.79	-0.16	6497.5	11.8	77	105	y	--	Stratified at depth; C 70 @9.1°C SC 102 @ 25°C
2016-07-29 16:20	bc	7.21	2.26	6495.1	10.7	121	166	y	--	
2016-10-07 12:59	bt	7.02	2.07	6495.3	8.6	92	135	y	--	Grasses dry but soil damp; restarted logger to measure in hourly time step

Table 11. Groundwater monitoring observations, Water Years 2010 to 2019
Perazzo Meadows Restoration, Sierra County, California

Site Conditions				Water Quality Observations						Remarks
Date/Time	Observer	Top-of-casing to water (ft)	Depth to water (ft, bgs)	Water Surface Elevation ft, NGVD/NAVD)	Temperature (°C)	Specific Conductance (at field temp.) (µS/cm)	Specific Conductance (at 25 °C) (at 25 °C)	Bailed?	Soil crack size/moisture	
2017-07-13 14:45	bt	5.39	0.44	6496.9	12.1	86	113	y	--	No stratification; hard to get bailer down well; 3 bails clear; grass knee high and soil wet
2017-08-11 14:30	bc	6.48	1.53	6495.8	11.8	136	182	y	--	
2017-09-22 13:55	bc	6.21	1.26	6496.1	9.3	127	182	y	--	Water clear
2017-10-25 12:45	bt	6.29	1.34	6496.0	9.0	128	185	n	--	Grass dry; soil damp; diagnostic check battery 3.51V could not get bailor down the well
2018-05-23 14:22	bt	4.67	-0.28	6497.7	12.8	77	97	y	--	Stratified at depth: T 5.6°C, C 109.4, SC 172.7; soil saturated with slight ponding at well <1 inch of water; 10 bails clear
2018-07-03 12:20	bc	6.36	1.41	6496.0	10.1	122	170	y	--	
2018-08-16 13:30	bc	7.3	2.35	6495.0	11.1	130	177	y	--	
2018-10-19 12:57	bt	6.75	1.80	6495.6	9.5	133	187	y	--	No stratification; grass dry; 5.5 bails clear water
2018-11-16 10:32	bt	6.63	1.68	6495.7	--	--	--	--	--	Installed new logger; 1 hour timestep
2019-06-21 13:39	bt,ds	4.35	-0.60	6498.0	7.4	101	152	y	--	Well inundated with 3 to 5 inches of water; 6 bails clear water
2019-07-27 12:40	bc	6.1	1.15	6496.2	11.3	111	150	n	--	
2019-08-24 12:40	bc	6.94	1.99	6495.4	11.7	137	185	y	--	Water clear
2019-10-18 12:05	bt	6.53	1.58	6495.8	8.1	67	98	y	--	Stratified at depth T8.0°C, C 134, SC 198; 10 bails slightly dirty; grass very dry; soil dry; lots of cows in meadow

Table 11. Groundwater monitoring observations, Water Years 2010 to 2019
Perazzo Meadows Restoration, Sierra County, California

Site Conditions				Water Quality Observations					Remarks	
Date/Time	Observer	Top-of-casing to water (ft)	Depth to water (ft, bgs)	Water Surface Elevation (ft, NGVD/NAVD)	Temperature (°C)	Specific Conductance (at field temp.) (µS/cm)	Specific Conductance (at 25 °C) (µS/cm)	Bailed?	Soil crack size/moisture	
Piezometer 09-9 - Upper end middle meadow, north side near lone double pine in meadow										
Total Depth		4.34 ft bgs								
Depth to bottom =		5.97 ft btoc								
Total Stickup =		1.63 ft above gs								
Elevation =		6493.2 ft								
2009-08-29 0:00	ds,tb	4.04	2.42	6490.8	13.6	90	116	n	--	Piezometer installed; water level not static
2009-09-23 18:00	ds	--	--	--	11.7	162	216	--	--	Stratified: 147uS at top (111@12.3°C); installed levellogger
2009-10-01 8:48	ds,bc	3.87	2.25	6491.0	11.1	88	123	n	--	Changed levellogger id to "09-9"; downloaded data
2009-10-23 13:12	bc	3.36	1.74	6491.5	9.4	102	145	n	--	Water clear, no odor
2009-12-04 13:22	bc	3.20	1.58	6491.7	4.7	88	143	n	--	Water clear, no odor
2010-06-11 14:07	ds	--	--	--	9.4	76	108	n	--	
2010-07-19 9:40	bc	3.50	1.88	6491.4	11.8	121	162	n	--	
2010-08-23 13:15	bc	4.47	2.85	6490.4	12.4	94	124	y	--	Water clear, no odor
2010-09-27 11:00	ds	2.29	0.67	6492.6	10.7	103	142	n	--	Downloaded levellogger
2010-09-28 14:10	bc	2.38	0.76	6492.5	11.2	101	137	n	--	Water clear, no odor
2010-11-02 14:27	ds	1.92	0.30	6492.9	7.1	100	150	n	--	Not stratified, downloaded datalogger, HWM is 0.55' above ground surface
2011-07-08 14:14	ds, bc	1.07	-0.56	6493.8	7.8	76	113	--	--	Depth to SW same as in well. SCT (top) = 69@10.5°C, 95.1@25°C
2011-08-11 9:15	bc	1.86	0.24	6493.0	12.1	126	167	n	--	Water clear, SCT (top) 144.4@12.7°C, 185.6@25°C
2011-09-12 9:50	bc	2.11	0.49	6492.8	12.6	182	238	y	--	No stratification
2011-10-09 13:55	bc	2.08	0.46	6492.8	9.3	190	270	y	--	Water clear
2011-11-03 14:20	ds	2.19	0.57	6492.7	7.1	173	262	--	--	No stratification, meadow surface dry
2011-12-05 13:15	bc	2.12	0.50	6492.7	2.7	144	250	n	--	
2012-04-24 12:57	ds	0.94	-0.69	6493.9	3.4	112	192	n	--	SCT (depth) 102@0.6°C, SCT (sfc water) 21.4@4.3°C, 35@25, downloaded levellogger. Depth to surface water 11.25"
2012-05-18 13:20	ds, bc	1.04	-0.59	6493.8	7.7	131	195	n	--	SCT (sfc) 27@11.3°C, 36@25°C. in flowing water, no stratification, datalogger downloaded
2012-06-06 13:22	merced	1.38	-0.25	6493.5	--	--	--	--	--	
2012-06-15 9:15	bc	1.81	0.19	6493.1	10.5	147	203	y	--	No stratification
2012-07-17 10:40	bc	2.48	0.86	6492.4	11.8	206	276	y	--	Water clear, SCT(depth) 204.9@10.1°C, 285.4@25°C
2012-08-14 14:05	bc	2.58	0.96	6492.3	12.1	214	283	y	--	Water clear
2012-09-17 11:05	bc	2.45	0.83	6492.4	10.2	192	267	y	--	No strat, water slightly muddy
2012-10-18 11:50	ds	2.32	0.70	6492.5	7.3	161	242	n	--	Cap is off and missing, SCT at 25°C = 234 at bottom, downloaded
2013-05-24 11:50	ds, bc	1.76	0.14	6493.1	9.2	141	202	n	--	No stratification
2013-06-20 10:20	bc	2.20	0.58	6492.7	9.1	178	256	y	--	No stratification
2013-07-24 13:00	bc	2.58	0.96	6492.3	13.4	179	230	n	--	No stratification
2013-08-30 10:20	bc	2.35	0.73	6492.5	8.8	164	238	y	--	No stratification
2013-09-18 14:30	ds	2.54	0.92	6492.3	11.3	168	227	n	--	No stratification
2014-05-02 12:00	bc, ds	1.58	-0.04	6493.3	3.8	60	100	y	--	No stratification
2014-07-29 13:50	bc	2.63	1.01	6492.2	8.6	206	301	y	--	No stratification
2014-09-11 10:05	bc	2.32	0.70	6492.5	6.0	158	247	y	--	No stratification, clear
2014-10-30 12:25	bc, ds	2.08	0.46	6492.8	0.3	143	267	y	--	Stratification: sc= 153 @ 2.1°C , 272@25°C
2015-04-17 11:00	bc	1.99	0.37	6492.9	3.3	114	194	y	--	SCT @depth 104.9@3.4°C 187.0@25°C
2015-05-22 12:05	bc, ds	1.81	0.19	6493.1	6.7	116	178	y	--	SCT @depth 122@5.2°C 196@25°C
2015-06-26 11:10	bc	2.57	0.95	6492.3	10.8	144	193	n	--	
2015-08-14 11:45	bc	2.53	0.91	6492.3	11.9	149	198	y	--	
2015-10-21 11:05	bt	2.27	0.65	6492.6	8.1	149	221	y	--	
2016-05-27 13:15	ds,bc	1.23	-0.40	6493.6	10.4	38	53	n	--	SCT @ depth 147@8.0°C, 217@25°C; soil moist but grasses dry; bailed clear
2016-07-29 16:05	bc	2.97	1.35	6491.9	11.2	151	202	y	--	Stratified at depth; C 36 @8.5°C SC 54 @ 25°C

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Perazzo Meadows Restoration, Sierra County, California

Site Conditions					Water Quality Observations					Remarks
Date/Time	Observer	Top-of-casing to water (ft)	Depth to water (ft, bgs)	Water Surface Elevation (ft, NGVD/NAVD)	Temperature (°C)	Specific Conductance (at field temp.) (µS/cm)	Specific Conductance (at 25 °C) (at 25 °C)	Bailed?	Soil crack size/moisture	
2016-10-07 12:39	bt	2.64	1.02	6492.2	7.1	160	242	y	--	Grasses dry but soil wet; some ice in areas near pools from overnight freezing temps; not stratified
2017-07-13 14:28	bt	2.25	0.63	6492.6	13.3	45	56	y	--	Stratified at depth, T 11.0°C, C 143.3, SC 195.0@25°C; grasses knee high; soil damp; 8.5 bails clear
2017-08-11 14:15	bc	2.84	1.22	6492.0	13.0	144	187	y	--	Water clear
2017-09-22 13:45	bc	2.02	0.40	6492.8	8.4	136	199	y	--	
2017-10-25 12:29	bt	2.57	0.95	6492.3	8.7	66	95	y	--	Stratified at depth: T 6.5°C, C 135.3, SC 207.1@°C; 10 bails clear water; grass dry; soil wet; diagnostic check battery 3.48V
2018-05-23 14:07	bt	1.4	-0.23	6493.5	11.2	124	167	y	--	Stratified at depth: T 7.2°C, 135.9, SC 204.5; soil saturated with ≈1 inch of water ponded at well; 15 bails clear
2018-07-03 12:05	bc	2.92	1.30	6491.9	11.9	124	165	y	--	No stratification
2018-08-16 13:15	bc	3.66	2.04	6491.2	13.2	136	175	y	--	Stratified at depth: T 7.4°C, C 187.6, SC 280.6; 10 bails clear water
2018-10-19 12:40	bt	2.95	1.33	6491.9	8.1	116	171	y	--	
2018-11-16 10:27	bt	2.88	1.26	6492.0	--	--	--	--	--	Installed new logger 1 hour time step
2019-06-21 13:17	bt,ds	0.99	-0.64	6493.9	10.4	62	86	y	--	Stratified at depth: T 7.2°C, C 116.7, SC 174.0; 7 bails clean water; inundated with 6 to 10 inches of water; meadow is inundated
2019-07-27 12:30	bc	2.73	1.11	6492.1	11.9	139	185	n	--	Stratified at depth T 6.0°C, T 168, SC 266; 10 bails clear; soil wet; grasses dry
2019-08-24 12:30	bc	3.14	1.52	6491.7	11.5	131	176	y	--	
2019-10-18 11:49	bt	2.72	1.10	6492.1	6.4	113	175	y	--	

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Perazzo Meadows Restoration, Sierra County, California

Site Conditions				Water Quality Observations					Remarks	
Date/Time	Observer	Top-of-casing to water (ft)	Depth to water (ft, bgs)	Water Surface Elevation t, NGVD/NAVD	Temperature (°C)	Specific Conductance (at field temp.) (µS/cm)	Specific Conductance (at 25 °C) (µS/cm)	Bailed?	Soil crack size/moisture	
Piezometer 09-10 - Lower Middle Meadow, N side Middle Meadow										
Total Depth		6.70 ft bgs								
Depth to bottom =		10.01 ft btoc								
Total Stickup =		3.31 ft above gs								
Elevation =		6477.1 ft								
2009-08-29 0:00	ds,tb	5.76	2.45	6474.7	13.2	127	165	n	--	Piezometer installed; water level not static
2009-09-23 12:35	ds	5.21	1.90	6475.2	9.0	120	174	y	--	
2009-10-01 11:04	ds,bc	5.11	1.80	6475.3	9.2	103	148	y	--	
2009-10-23 14:47	bc	4.38	1.07	6476.1	7.4	102	154	n	--	Water clear, no odor
2009-12-05 10:13	bc	4.40	1.09	6476.1	2.6	91	158	n	--	Water clear, no odor
2010-06-11 13:35	ds	3.85	0.54	6476.6	9.5	102	144	n	--	Temp stratified; 5.3°C at depth
2010-07-19 8:30	bc	5.00	1.69	6475.5	11.4	101	136	n	--	
2010-08-23 10:55	bc	5.80	2.49	6474.7	10.4	91	126	y	--	Water clear, no odor
2010-09-28 12:00	bc	--	--	--	--	--	--	--	--	Destroyed by cows
2010-11-03 16:00	ds	--	0.55	6476.6	7.9	75	111	n	--	Well is destroyed, DTW reading is in remnant hole, was able to replace stickup, but well is filled with gravel; need to replace.
2011-07-08 16:20	ds, bc	--	--	--	15.6	25	30	n	--	Knocked over by cows, water .75' deep at well, SCT is of SW
2011-08-11 8:30	bc	--	--	--	--	--	--	n	--	Ground damp, no standing water
2011-09-12 8:20	bc	2.88	-0.43	6477.6	10.7	83	114	y	--	Water clear, brown at bottom, no stratification
2011-10-09 15:10	bc	2.88	-0.43	6477.6	7.9	87	129	y	--	water clear
2012-11-03 15:00	ds	2.93	-0.38	6477.5	6.2	77	120	--	--	SCT (sfc) 160@25°C, UC Merced LL pulled but not downloaded, could not get LL back to bottom due to silt/mud
2011-12-05 10:17	bc	2.78	-0.53	6477.7	2.0	90	160	n	--	
2012-05-18 14:55	ds, bc	2.03	-1.28	6478.4	8.7	105	154	--	--	SCT (depth) 97.8@6.5°C, 151.6@25°C
2012-06-06 14:05	merced	2.66	-0.65	6477.8	--	--	--	--	--	
2012-06-15 7:50	bc	2.82	-0.49	6477.6	10.4	146	203	y	--	A little muddy, no odor, no strat
2012-07-17 9:25	bc	2.99	-0.32	6477.5	9.7	133	188	y	--	Water clear, no strat
2012-08-14 15:20	bc	2.55	-0.76	6477.9	9.6	150	212	y	--	Slightly muddy, no strat
2012-09-17 9:55	bc	2.86	-0.45	6477.6	7.6	122	182	y	--	Water clear. SCT at depth = 115.9@7°C, 177@25°C
2012-10-18 11:13	ds	2.95	-0.36	6477.5	4.8	126	207	n	--	SCT at bottom = 172@25°C. Downloaded
2013-05-24 10:20	ds, bc	2.72	-0.59	6477.7	8.1	128	188	n	--	No stratification
2013-06-20 9:00	bc	2.91	-0.40	6477.5	5.9	117	184	y	--	Water clear with some muddy water at very bottom; no stratification
2013-07-24 8:40	ds	3.08	-0.23	6477.4	11.0	136	186	n	--	No stratification
2013-08-30 9:05	bc	2.99	-0.32	6477.5	6.2	117	182	y	--	Water clear, no stratification
2014-05-02 10:40	bc, ds	2.57	-0.74	6477.9	2.0	122	217	y	--	No stratification
2014-07-29 9:20	bc	3.09	-0.22	6477.4	7.3	146	220	y	--	No stratification; clear then slightly muddy
2014-09-11 8:15	bc	3.05	-0.26	6477.4	4.2	142	236	y	--	No stratification; clear
2014-10-30 10:35	bc, ds	2.88	-0.43	6477.6	0.8	110	203	y	--	No stratification; clear then muddy at bottom
2015-04-17 9:40	bc	2.8	-0.51	6477.7	3.3	117	198	y	--	No strat
2015-05-22 12:05	bc, ds	2.72	-0.59	6477.7	5.2	105	170	y	--	No strat, no odor, clear
2015-06-26 8:05	bc	2.99	-0.32	6477.5	10.4	120	167	n	--	
2015-08-14 8:00	bc	2.97	-0.34	6477.5	10.7	134	184	y	--	Clear
2015-10-14 10:57	bt,ds	2.78	-0.53	6477.7	9.2	116	166	y	--	No stratification; some spring fed swales flowing from north between 9-10 and 9-11; ponding in nearby depressions; soil saturated; logger data in meters-change next visit
2016-05-27 10:45	ds,bc	2.2	-1.11	6478.3	12.3	131	173	y	--	Stratified at depth: C 122 @8.7°C SC 177 @ 25°C; level in well same as ponded water on surface
2016-07-29 11:45	bc	3	-0.31	6477.5	11.0	127	176	y	--	

Table 11. Groundwater monitoring observations, Water Years 2010 to 2019
Perazzo Meadows Restoration, Sierra County, California

Site Conditions					Water Quality Observations					Remarks
Date/Time	Observer	Top-of-casing to water (ft)	Depth to water (ft, bgs)	Water Surface Elevation t, NGVD/NAVD	Temperature (°C)	Specific Conductance (at field temp.) (µS/cm)	Specific Conductance (at 25 °C) (at 25 °C)	Bailed?	Soil crack size/moisture	
2016-10-07 10:46	bt	2.95	-0.36	6477.5	5.2	114	182	y	--	Some small channels still active and soggy spots in meadow between 09-11 and 09-10; not stratified
2017-07-11 10:20	bt	2.58	-0.73	6477.9	14.2	138	174	y	--	T-posts knocked down and cap with logger was off and on the ground next to well (logger outside of well); fixed t-posts; no stratification; vegetation was waist high and ground saturated; looked at downloaded record and pt changed on 1/9/17; attached a back up string because wire is degraded
2017-08-11 10:25	bc	2.76	-0.55	6477.7	12.1	48	156	y	--	Clear ; no stratification
2017-09-24 11:10	bc	2.76	-0.55	6477.7	8.3	107	157	y	--	
2017-10-24 10:01	bt	2.8	-0.51	6477.7	6.5	88		y	--	No stratification; grass is still green; ground wet spongy; diagnostic check battery 3.38V
2018-05-22 14:57	bt,ds	2.51	-0.80	6477.9	11.7	140	190	y	--	Stratified at depth: T 5.4°C, C 148, SC 233; soil saturated with heavy grasses; 10 bails slightly colored
2018-07-03 8:15	bc	2.83	-0.48	6477.6	9.3	118	168	y	--	No stratification
2018-08-16 9:05	bc	2.97	-0.34	6477.5	10.8	129	177	y	--	No stratification
2018-10-20 8:37	bt	3.03	-0.28	6477.4	4.1	95	158	y	--	No stratification; logger would not connect until warmed up; logger was stuck in well-possibly frozen; initial view of data shows faulty readings in beginning of October 2018; logger removed
2018-11-16 9:29	bt	2.86	-0.45	6477.6	--	--		n	--	Installed new logger; no cap; needed to secure to the t-post
2019-06-18 9:26	bt	1.74	-1.57	6478.7	11.5	28	38	y	--	Stratified at depth: T 6.3°C, C 100.5, SC 155.5; 10 bails slightly dirty water; well is inundated in 1 plus feet of water; meadow is completely inundated; string attached to t-post need hose clamp
2019-07-27 8:45	bc	2.59	-0.72	6477.9	11.7	117	157	n	--	Replaced cap and reconnected logger to cap string
2019-08-24 15:10	bc	3.16	-0.15	6477.3	10.5	106	146	y	--	
2019-10-21 9:33	bt	2.92	-0.39	6477.5	6.0	107	167	y	--	Cap off and hanging-pulled logger up-check data; put logger back in for DTW measurement; 10 bails clear; ground wet; grasses drying

Table 11. Groundwater monitoring observations, Water Years 2010 to 2019
Perazzo Meadows Restoration, Sierra County, California

Site Conditions				Water Quality Observations					Remarks	
Date/Time	Observer	Top-of-casing to water (ft)	Depth to water (ft, bgs)	Water Surface Elevation t, NGVD/NAVD	Temperature (°C)	Specific Conductance (at field temp.) (µS/cm)	Specific Conductance (at 25 °C) (µS/cm)	Bailed?	Soil crack size/moisture	
Piezometer 09-11 - N Side lower middle meadow, just N USFS boundary										
Total Depth		7.17 ft bgs								
Depth to bottom =		10.00 ft btoc								
Total Stickup =		2.83 ft above gs								
Elevation =		6474.7 ft								
2009-08-29 0:00	ds,tb	9.88	7.05	6467.7	11.9	199	267	--	--	Piezometer installed, water level not static, still rising
2009-09-23 12:00	ds	5.16	2.33	6472.4	10.8	111	151	y	--	
2009-10-01 11:26	ds,bc	5.01	2.18	6472.5	10.5	116	160	--	--	No stratification
2009-10-23 15:03	bc	3.98	1.15	6473.6	8.7	103	150	n	--	Water clear, no odor
2009-12-05 10:28	bc	3.23	0.40	6474.3	2.6	81	141	n	--	
2010-06-11 12:52	ds	2.38	-0.45	6475.2	19.5	140	157	n	--	Water ponded in depressions; downloaded DL; red-tail hawk; stratified: 131@4.9°C; 211@25°C at depth; depth to SW from TOC = 2.65, suggests upward vertical hydraulic gradient
2010-07-19 7:50	bc	3.92	1.09	6473.6	12.8	178	137	n	--	
2010-08-23 10:35	bc	5.15	2.32	6472.4	11.6	148	198	y	--	Water clear, 'oily' odor
2010-09-28 12:10	bc	4.85	2.02	6472.7	9.6	157	223	n	--	Water clear, no odor
2010-11-03 15:15	ds	2.92	0.09	6474.6	9.1	154	223	n	--	Ground is moist; no evidence of overland flow; water is flowing swale ~400' N of piezo, SC=164@25°C, appears to be spring fed from base of N hillside alluvial fan
2011-07-08 15:51	ds, bc	2.30	-0.53	6475.2	20.3	185	203	y	--	Depth to SW = 2.62. No stratification
2011-08-11 7:30	bc	3.59	0.76	6474.0	12.4	135	180	n	--	No stratification
2011-09-12 8:00	bc	4.38	1.55	6473.2	11.9	118	157	y	--	Water clear, no stratification
2011-10-09 14:50	bc	3.23	0.40	6474.3	10.3	113	157	y	--	
2011-11-03 15:30	ds	3.14	0.31	6474.4	6.7	99	151	--	--	No stratification
2011-12-05 10:30	bc	2.99	0.16	6474.6	3.2	80	136	n	--	
2012-05-18 14:40	ds, bc	2.40	-0.43	6475.1	8.4	83	121	n	--	No stratification, datalogger downloaded
2012-06-06 13:56	merced	2.49	-0.34	6475.1	--	--	--	--	--	
2012-06-15 7:35	bc	2.98	0.15	6474.6	7.6	90	134	y	--	Water clear, no odor, no strat
2012-07-17 9:10	bc	4.46	1.63	6473.1	8.6	100	146	y	--	Water clear, no strat
2012-08-14 15:05	bc	4.97	2.14	6472.6	8.7	109	159	y	--	Water clear, no strat
2012-09-17 9:40	bc	4.75	1.92	6472.8	8.6	122	176	y	--	Water clear, no strat
2012-10-18 10:50	ds	4.25	1.42	6473.3	7.1	128	196	n	--	Downloaded
2013-05-24 10:05	ds, bc	2.57	-0.26	6475.0	7.5	91	136	n	--	stratified: SC = 86@5.4°C, 137@25°C at depth
2013-06-20 8:40	bc	3.81	0.98	6473.7	7.3	87	131	y	--	
2013-07-24 8:20	bc	4.84	2.01	6472.7	11.3	131	177	n	--	Minor temperature stratification: 9.3°C at depth
2013-08-30 8:45	bc	4.90	2.07	6472.6	7.5	121	181	y	--	Not stratified
2013-09-18 10:30	ds	4.79	1.96	6472.8	10.5	141	195	n	--	9.4°C at bottom, no SCT stratification; downloaded levellogger
2014-05-02 10:20	bc, ds	2.73	-0.10	6474.8	1.8	98	176	y	--	Not stratified
2014-07-29 9:00	bc	5.17	2.34	6472.4	6.9	146	221	y	--	Clear; Stratified: 135 @ 5.0°C , 217.8 @25°C
2014-09-11 8:00	bc	5.24	2.41	6472.3	6.0	146	229	y	--	Clear, not stratified
2014-10-30 10:10	bc, ds	3.96	1.13	6473.6	2.4	124	218	y	--	Clear; Stratified: 128 @ 3.7°C , 218 @25°C
2015-04-17 9:20	bc	2.98	0.15	6474.6	4.7	95	154	y	--	Clear. SCT @depth 116.5@4.7°C 190.7@25°C
2015-05-22 9:50	bc, ds	2.5	-0.33	6475.0	5.2	105	170	y	--	No strat, clear, no odor
2015-06-26 7:50	bc	4.33	1.50	6473.2	10.6	141	195	n	--	
2015-08-14 7:45	bc	4.78	1.95	6472.8	11.5	154	208	y	--	Clear
2015-10-14 10:36	bt,ds	4.28	1.45	6473.3	10.1	164	229	y	--	No stratification, clear
2016-05-27 10:15	ds,bc	2.21	-0.62	6475.3	16.7	136	162	y	--	No stratification; in standing water; nearby staff plate needs to be replaced
2016-07-29 11:25	bc	4.91	2.08	6472.6	12.1	158	206	y	--	No stratification

Table 11. Groundwater monitoring observations, Water Years 2010 to 2019
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Site Conditions					Water Quality Observations					Remarks
Date/Time	Observer	Top-of-casing to water (ft)	Depth to water (ft, bgs)	Water Surface Elevation ft, NGVD/NAVD)	Temperature (°C)	Specific Conductance (at field temp.) (µS/cm)	Specific Conductance (at 25 °C) (at 25 °C)	Bailed?	Soil crack size/moisture	
2016-10-07 10:21	bt	4.82	1.51	6475.6	9.3	131	187	y	--	Lots of waterfowl in pools; grasses in meadow very dry and soil dry near well; not stratified
2017-07-11 9:53	bt	3.11	-0.20	6477.3	13.6	106	135	y	--	No stratification; meadow is green and ground is saturated; lots of water in channels; 7.5 bails clear water
2017-08-11 10:10	bc	3.96	0.65	6476.5	14.4	134	168	y	--	Clear; no stratification
2017-09-24 10:50	bc	3.97	0.66	6476.5	10.4	117	162	y	--	Water clear
2017-10-24 9:32	bt	3.11	-0.20	6477.3	8.8	119	171	y	--	No stratification; grass is dry; soil damp; 9 bails clear water; diagnostics check battery 3.475V
2018-05-22 14:34	bt,ds	2.25	-1.06	6478.2	18.2	121	138	y	--	Stratified at depth: T 5.1°C, C 136, SC 216; ground saturated; lots of active channels in meadow area; 10 bails clear
2018-07-03 8:00	bc	3.38	0.07	6477.1	10.3	123	171	y	--	Stratified at depth: T 8.2°C, C 129.2, SC 190
2018-08-16 8:47	bc	5.18	1.87	6475.3	11.4	139	188	y	--	No Stratification
2018-10-20 8:11	bt	4.35	1.04	6476.1	5.9	118	187	y	--	No stratification; 6 bails of clear water; grass and meadow dry
2018-11-16 9:02	bt	3.92	0.61	6476.5	--	--	--	--	--	Replaced logger with logger from old LTPM gage SN1056792
2019-06-18 8:53	bt	2.32	-0.99	6478.1	13.4	109	139	y	--	Stratified at depth: T 6.4°C, C 125.6, SC 194.0; 10 bails clear-bailor was not working some of the time; ground wet and some ponding
2019-07-27 8:20	bc	3.8	0.49	6476.7	14.1	130	164	n	--	Stratified at depth: T 11.7°C, C 135.4, SC 181.9
2019-08-24 14:55	bc	4.9	1.59	6475.6	13.0	134	174	y	--	
2019-10-21 9:08	bt	3.74	0.43	6476.7	8.8	112	162	y	--	Stratified at depth T 8.5°C, C 263, SC 379; 8.5 bails clear; grasses dry

Table 11. Groundwater monitoring observations, Water Years 2010 to 2019
Perazzo Meadows Restoration, Sierra County, California

Site Conditions				Water Quality Observations						Remarks
Date/Time	Observer	Top-of-casing to water (ft)	Depth to water (ft, bgs)	Water Surface Elevation (ft, NGVD/NAVD)	Temperature (°C)	Specific Conductance (at field temp.) (µS/cm)	Specific Conductance (at 25 °C) (at 25 °C)	Bailed?	Soil crack size/moisture	
Piezometer FS-12 - West (left) side Upper Meadow										
Total Depth		4.43 ft bgs								
Depth to bottom =		8.10 ft btoc								
Total Stickup1 =		3.67 ft above gs								
Total Stickup2 =		3.58 ft above gs								
Elevation =		6553.8 ft								
2009-07-19 0:00	ds	7.14	3.47	6550.3	9.5	102	145	n	--	
2009-09-23 16:19	ds	5.3	1.63	6552.1	9.9	90	122	n	--	Stratified: 49 uS/cm at top (37@10.8°C)
2009-10-23 10:22	bc	6.98	--	--	7.6	85	127	n	--	Stinky; well seems disturbed and data point is an outlier, omitted from the record
2009-12-04 12:18	bc	5.60	1.93	6551.8	4.7	36	59	n	--	Water clear, no odor
2010-05-21 15:30	ds, rw	7.77	4.10	6549.7	--	--	--	--	--	SCT reading Lerr
2010-06-12 0:00	bc	--	--	--	--	--	--	--	--	Unable to remove cap
2010-07-19 11:55	bc	--	--	--	--	--	--	--	--	Unable to remove cap
2010-08-23 15:35	bc	4.54	0.96	6552.8	12.2	59	78	y	--	Water light brown; cut cap off well, new stickup = 43" (see 'Total Stickup2)
2010-09-28 15:50	bc	4.32	0.74	6553.0	9.7	64	90	n	--	Water clear, no odor
2010-11-02 11:17	ds	3.96	0.38	6553.4	6.5	62	40	--	--	Stratified: 112@25°C in bottom 1-2" of well; 78@25°C in adjacent pond
2011-07-08 11:10	ds, bc	6.18	2.60	6551.2	3.6	47	79	y	--	Water slightly turbid. Depth to SW = 41". SCT (top) = 19.1@3.8°C, 31.9@25°C
2011-08-11 11:20	bc	3.65	0.07	6553.7	10.4	35	47	n	--	Ground wet, but no standing water, no stratification
2011-09-12 12:20	bc	4.06	0.48	6553.3	10.5	41	57	y	--	No stratification
2011-10-09 11:15	bc	3.97	0.39	6553.4	8.0	42	63	y	--	Water clear, no strat
2011-11-03 11:20	ds	4.01	0.43	6553.3	5.2	41	66	--	--	
2011-12-05 11:05	bc	4.30	0.72	6553.1	3.3	37	64	n	--	
2012-05-18 10:05	ds, bc	7.87	4.29	6549.5	4.3	22	36	n	--	No stratification, water ponded in depression at sfc
2012-06-15 10:40	bc	4.25	0.67	6553.1	10.8	45	61	y	--	Water clear, no strat
2012-07-17 11:50	bc	4.59	1.01	6552.8	12.2	48	64	y	--	Water clear, no strat
2012-08-14 12:25	bc	4.60	1.02	6552.8	13.8	75	95	y	--	Slightly muddy, SCT (depth) 65.4@11°C, 89.8@25°C
2012-09-17 12:10	bc	4.63	1.05	6552.7	11.0	69	95	y	--	Water clear
2012-10-18 12:00	ds	4.57	0.99	6552.8	8.0	71	105	n	--	Not stratified
2013-05-24 13:30	ds, bc	7.88	4.30	6549.5	8.5	30	44	n	--	Not stratified
2013-06-20 12:00	bc	4.32	0.74	6553.0	10.8	41	56	y	--	Water clear, not stratified
2013-07-24 10:40	bc	4.50	0.92	6552.9	16.1	61	73	n	--	No stratification
2013-08-30 11:35	bc	4.60	1.02	6552.8	9.9	67	94	y	--	Water clear, no strat
2013-09-18 12:15	ds	4.61	1.03	6552.7	12.3	71	94	n	--	Not stratified
2014-05-02 14:20	bc, ds	4.01	0.43	6553.3	2.5	33	58	y	--	Not stratified
2014-07-29 11:15	bc	4.75	1.17	6552.6	10.3	69	97	y	--	Not stratified, clear
2014-09-11 11:10	bc	4.62	1.04	6552.7	9.4	82	118	y	--	Not stratified, clear
2014-10-30 14:10	bc, ds	4.43	0.85	6552.9	4.1	67	113	y	--	
2015-04-17 12:10	bc	4.45	0.87	6552.9	4.5	42	70	y	--	No strat, a little bit muddy.
2015-05-22 13:15	bc, ds	4.3	0.72	6553.1	7.4	31	47	y	--	
2015-06-26 9:20	bc	4.5	0.92	6552.9	13.0	62	81	n	--	
2015-08-14 9:40	bc	4.68	1.10	6552.7	13.2	81	105	y	--	No strat
2015-10-14 12:32	bt, ds	4.65	1.07	6552.7	10.7	82	112	y	--	No stratification; sandy in well; pond stagnant and turbid; willows have no leaves
2016-05-27 15:00	ds, bc	4.06	0.48	6553.3	7.1	36	54	y	--	Logger in slate mode stopped 12/20/15; restarted at 15:30

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2016-07-29 13:25	bc	4.69	1.11	6552.7	13.1	63	81	y	--	No stratification
2016-10-12 13:00	ds,bc	4.62	1.04	6552.7	8.4	63	93	y	--	Clear
2017-07-11 12:39	bt	3.94	0.36	6553.4	11.9	28	38	y	--	No stratification; well inundated with 1-2 inches of water; vegetation very green; 2.5 bails clear water
2017-08-11 12:00	bc	4.37	0.79	6553.0	14.1	59	74	y	--	Clear; no stratification
2017-09-24 12:40	bc	4.39	0.81	6553.0	10.0	58	81	y	--	Water clear
2017-10-24 12:07	bt	4.01	0.43	6553.3	9.5	46	65	y	--	Grass dry; meadow inundated with ~1 inch of water; 10 bails clear; slate mode restarted logger at 12:30
2018-05-23 9:49	bt	3.52	-0.06	6553.8	5.4	33	52	y	--	No stratification; well inundated with ~4 inches of water with ~0.05 of flow around it; lots of active channels in the area; 10 bails clear
2018-07-03 10:05	bc	3.83	0.25	6553.5	15.6	42	52	y	--	No stratification
2018-08-16 11:15	bc	4.7	1.12	6552.7	16.0	91	109	y	--	
2018-10-20 10:38	bt	4.3	0.72	6553.1	7.4	44	66	y	--	10 bails of clear water; grass is drying out; soil is wet; restarted logger now in continuous mode
2019-06-18 11:23	bt	3.46	-0.12	6553.9	7.7	18	27	y	--	Well is in 5-6 inches of flowing water; multiple channels active in area; meadow inundated
2019-07-27 10:35	bc	3.68	0.10	6553.7	11.7	26	35	n	--	No stratification
2019-08-23 16:23	bc	4.85	1.27	6552.5	17.0	54	63	y	--	Water slightly muddy; beavers have built dam down stream and there is standing water at the well
2019-10-21 10:46	bt	3.96	0.38	6553.4	7.3	47	70	y	--	10 bails rust colored water; ground inundated with 1 to 3 inches of water; grasses drying

Table 11. Groundwater monitoring observations, Water Years 2010 to 2019
Perazzo Meadows Restoration, Sierra County, California

Site Conditions				Water Quality Observations						Remarks
Date/Time	Observer	Top-of-casing to water (ft)	Depth to water (ft, bgs)	Water Surface Elevation (ft, NGVD/NAVD)	Temperature (°C)	Specific Conductance (at field temp.) (µS/cm)	Specific Conductance (at 25 °C)	Bailed?	Soil crack size/moisture	
Piezometer FS-13 - East (right) side Upper Meadow										
Total Depth		4.10 ft bgs								
Depth to bottom =		7.35 ft btoc								
Total Stickup =		3.25 ft above gs								
Elevation =		6555.2 ft								
2009-07-19 0:00	ds	5.69	2.44	6552.8	8.4	102	145	n	--	Stratified: 75 uS/cm at top of water table
2009-09-23 16:04	ds	4.88	1.63	6553.6	8.2	104	152	y	--	Stratified: 62 uS/cm at top of water table; installed levellogger programmed for 09-03
2009-10-23 10:14	bc	3.09	-0.16	6555.4	6.5	41	63	n	--	Labeled well; standing water at base of well
2009-12-04 12:09	bc	--	--	--	--	--	--	--	--	Frozen
2010-05-21 14:20	ds, rw	7.49	4.24	6551.0	4.4	24	39	n	--	1" water on sfc, SCTsfc same as piezo; checked measurement several times.
2010-06-12 14:40	bc	3.59	0.34	6554.9	7.0	26	38	n	--	Water ponded on sfc
2010-06-16 12:30	ds	2.53	-0.72	6556.0	--	--	--	n	--	Water flowing at sfc; downloaded LL
2010-07-19 11:55	bc	2.66	-0.59	6555.8	11.7	30	46	n	--	Water ponded on sfc
2010-08-23 15:45	bc	3.54	0.29	6555.0	15.4	177	216	y	--	Ground wet, no standing water; water brown, no odor
2010-09-28 15:55	bc	3.48	0.23	6555.0	10.8	151	207	n	--	Water clear, no odor
2010-11-02 11:00	ds	3.00	-0.25	6555.5	4.1	40	67	y	--	Conductance same as sfc water ponded at base of well 0-3" deep; downloaded datalogger
2011-07-08 10:45	ds, bc	6.86	3.61	6551.6	4.2	17	28	y	--	Water clear, turbid at bottom, cut off stuck cap, in 3-4" standing water and needs cap.
2011-08-11 11:30	bc	2.65	-0.60	6555.8	11.3	27	37	n	--	SCT (top) = 18.1@4.9°C, 29.3@25°C
2011-09-12 12:15	bc	2.85	-0.40	6555.6	14.7	50	63	n	--	Depth to SW = 2.65', no stratification
2011-10-09 11:25	bc	2.75	-0.50	6555.7	8.6	44	63	y	--	Ground wet, no stratification
2011-11-03 11:10	ds	2.78	-0.47	6555.7	2.4	38	67	y	--	Water slightly muddy, depth to SW = 2.75'
2011-12-05 11:15	bc	2.64	-0.61	6555.9	--	--	--	--	--	File downloaded, cap missing
2012-05-18 10:10	ds, bc	2.45	-0.80	6556.0	3.8	21	36	n	--	Frozen depth to ice
2012-06-15 10:45	bc	2.61	-0.64	6555.9	9.6	30	43	y	--	Depth to surface 29.375", water flowing on surface, datalogger downloaded
2012-07-17 11:55	bc	3.34	0.09	6555.2	12.5	137	180	y	--	In standing water. 2.48' to surface water
2012-08-14 12:35	bc	3.41	0.16	6555.1	12.5	143	189	y	--	Water clear, no strat
2012-09-17 12:20	bc	3.54	0.29	6555.0	10.4	152	208	y	--	Light brown, no strat
2012-10-18 0:00	ds	3.39	0.14	6555.1	7.8	141	208	--	--	Slightly muddy
2013-05-24 13:30	ds, bc	2.59	-0.66	6555.9	7.0	22	34	n	--	Not stratified, downloaded
2013-06-20 12:10	bc	2.73	-0.52	6555.8	10.1	35	48	y	--	Not stratified
2013-07-24 10:45	bc	3.34	0.09	6555.2	12.9	146	190	n	--	Water muddy, not stratified, ponded at surface
2013-08-30 11:45	bc	3.45	0.20	6555.0	7.3	131	198	y	--	Not stratified
2013-09-18 12:20	ds	3.47	0.22	6555.0	9.6	136	193	n	--	Not stratified
2014-05-02 14:25	bc, ds	2.58	-0.67	6555.9	5.4	26	41	y	--	Slightly stratified at bottom: SC=154@5.8°C, 218@25°C; downloaded logger
2014-07-29 11:25	bc	3.52	0.27	6555.0	8.1	118	174	y	--	Not stratified
2014-09-11 11:20	bc	3.67	0.42	6554.8	5.4	116	185	y	--	Slightly muddy; stratified: 123 @ 7.6°C, 184.4 @25°C
2014-10-30 14:30	bc, ds	3.26	0.01	6555.2	2.2	115	204	y	--	Slightly muddy
2015-04-17 12:20	bc	2.74	-0.51	6555.8	8.8	29	41	y	--	Stratified: sc= 152 @ 3.4°C , 261 @ 25°C
2015-05-22 13:35	bc, ds	2.22	-1.03	6556.3	7.9	29	43	y	--	In standing water.
2015-06-26 9:25	bc	3.35	0.10	6555.1	15.4	55	67	n	--	Muddy; visual depth measurement.
2015-08-14 9:50	bc	3.55	0.30	6554.9	11.0	140	191	y	--	No Strat; clear
2015-10-14 12:50	bt, ds	3.42	0.17	6555.1	9.1	145	208	y	--	No stratification cap; channel inlet to pond between FS-12 and FS-13 red with iron
2016-05-27 13:30	ds,bc	2.14	-1.11	6556.4	9.6	26	37	y	--	bacteria interaction by the plug zone
2016-07-29 13:35	bc	3.53	0.28	6555.0	12.9	124	163	y	--	No stratification

Table 11. Groundwater monitoring observations, Water Years 2010 to 2019
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Site Conditions					Water Quality Observations					Remarks
Date/Time	Observer	Top-of-casing to water (ft)	Depth to water (ft, bgs)	Water Surface Elevation (ft, NGVD/NAVD)	Temperature (°C)	Specific Conductance (at field temp.) (µS/cm)	Specific Conductance (at 25 °C) (µS/cm)	Bailed?	Soil crack size/moisture	
2016-10-12 13:10	ds,bc	3.94	0.69	6554.6	7.5	120	177	y	--	
2017-07-11 12:56	bt	2.54	-0.71	6556.0	11.7	23	31	y	--	Well inundated with 5-6 inches of water with visible flow; 3.5 bails dirty water
2017-08-11 12:10	bc	3.06	-0.19	6555.4	13.7	68	87	y	--	Muddy colored water in bail
2017-09-24 12:45	bc	3.33	0.08	6555.2	8.9	42	62	y	--	Water slightly dirty
2017-10-24 12:30	bt	3.21	-0.04	6555.3	6.9	76	117	y	--	Stratified at depth: T 6.1°C, C 118.5, SC 184.8@25°C; ground saturated; grasses drying; leaves have fallen off of willows; 2(1/5) bails of dirty water; no odor
2018-05-23 10:09	bt	2.55	-0.70	6555.9	6.4	20	31	y	--	No stratification; well inundated with ≈2-3 inches of water; meadow channels active; 11 bails clear
2018-07-03 10:15	bc	3.32	0.07	6555.2	11.8	107	143	y	--	No stratification; water muddy
2018-08-16 11:20	bc	3.71	0.46	6554.8	11.1	79	108	y	--	
2018-10-20 10:56	bt	3.32	0.07	6555.2	7.5	108	161	y	--	No stratification; 10.75 bails partially dirty water; grass dry; soil wet
2018-11-16 10:57	bt	3.33	0.08	6555.2	--	--	--	--	--	Installed new logger with 1 hour timestep
2019-06-18 11:44	bt	2.37	-0.88	6556.1	7.2	18	27	y	--	Well is in 7-8 inches of flowing water; meadow is inundated; restarted logger to change logger name from FS-12 to FS-13
2019-07-27 10:40	bc	2.81	-0.44	6555.7	14.0	78	98	n	--	
2019-08-23 16:35	bc	3.21	-0.04	6555.3	10.4	70	97	y	--	Water is muddy
2019-10-21 11:01	bt	3.09	-0.16	6555.4	6.8	73	112	y	--	10 bails clear; ground is saturated but no ponding

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Perazzo Meadows Restoration, Sierra County, California

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Date/Time	Observer	Top-of-casing to water (ft)	Depth to water (ft, bgs)	Water Surface Elevation (ft, NGVD/NAVD)	Temperature (°C)	Specific Conductance (at field temp.) (µS/cm)	Specific Conductance (at 25 °C)	Bailed?	Soil crack size/moisture	
Piezometer FS-14 - West (left) side Upper Meadow, upstream bedrock reach, on upland terrace										
Total Depth		5.28 ft bgs								
Depth to bottom =		8.08 ft btoc								
Total Stickup =		2.80 ft above gs								
Elevation =		6553.8 ft								
2009-07-19 0:00	ds	7.64	4.84	6549.0	9.5	471	671	n	--	
2009-09-23 16:33	ds	7.05	4.25	6549.6	9.6	413	580	y	--	Stratified: 412 uS at bottom (413@9.6°C); smells bad, like feces or rotting flesh; no levellogger installed
2009-10-23 10:37	bc	4.50	--	--	8.3	41	60	n	--	Water clear, no odor; data point is an outlier, omitted from the record
2009-12-04 11:21	bc	7.93	5.13	6548.7	4.5	63	104	n	--	Water clear, no odor, no cap
2010-06-12 15:00	bc	7.02	4.22	6549.6	6.5	23	36	--	--	No cap
2010-07-19 11:40	bc	4.33	1.53	6552.3	10.7	36	50	n	--	No cap
2010-08-23 15:15	bc	4.7	1.90	6551.9	11.8	59	79	y	--	Water clear, no odor, replaced cap
2010-09-28 16:25	bc	4.68	1.88	6552.0	10.8	72	99	n	--	Water clear, no odor
2010-11-02 10:45	ds	4.31	1.51	6552.3	7.6	68	102	--	--	Terrace is now surrounded by remnant channels with flowing sw; terrace sfc appears to be 2-4' higher than meadow/floodplain; this piezo probably better reflects changes from surface flow and restoration activities than other gw-influenced areas.
2011-07-08 10:25	ds, bc	3.89	1.09	6552.7	6.2	113	177	y	--	Water clear, needs pvc cap. SCT (top) = 54@10.2°C, 75@25°C
2011-08-11 11:05	bc	4.17	1.37	6552.5	8.1	50	73	n	--	SCT (top)= 52.3@9.2°C, 74.8@25°C
2011-09-12 11:45	bc	4.38	1.58	6552.3	9.3	70	100	y	--	A little sediment in water (light tan), no stratification
2011-10-09 11:50	bc	4.25	1.45	6552.4	8.7	81	118	y	--	Water clear
2011-11-03 11:35	ds	4.38	1.58	6552.3	6.1	40	62	y	--	Beaver dam u/s, stratified 8" below sfc, SCT (depth) 86.6@6.9°C, 132@25°C
2011-12-05 11:30	bc	4.42	1.62	6552.2	4.0	75	125	n	--	
2012-05-18 10:40	ds, bc	4.02	1.22	6552.6	2.4	73	128	n	--	Dry ground, missing cap
2012-06-15 11:15	bc	4.32	1.52	6552.3	5.6	71	114	y	--	Do strat, water clear/slightly muddy
2012-07-17 12:20	bc	4.89	2.09	6551.7	6.2	65	102	y	--	Water clear, no strat
2012-08-14 12:55	bc	5.09	2.29	6551.5	7.5	80	122	y	--	Water clear, no strat
2012-09-17 12:45	bc	5.32	2.52	6551.3	7.7	65	97	y	--	Water clear
2012-10-18 0:00	ds	5.05	2.25	6551.6	6.4	65	100	n	--	Minimal strat, SCT at bottom = 110@25°C
2013-05-24 13:30	ds	4.45	1.65	6552.2	8.4	72	106	n	--	Stratification: 107@6°C, 168@25°C at depth
2013-06-20 12:40	bc	4.69	1.89	6551.9	6.6	90	138	y	--	No stratification
2013-07-24 11:10	bc	4.96	2.16	6551.7	10.6	97	133	n	--	No stratification
2013-08-30 12:10	bc	5.12	2.32	6551.5	6.4	79	122	y	--	Water clear, no strat
2013-09-18 13:00	ds	5.25	2.45	6551.4	9.8	68	95	n	--	Not stratified; willows have dropped leaves
2014-05-02 14:55	bc, ds	4.06	1.26	6552.6	1.8	49	89	y	--	Stratified, 62.4@ 0.3°C, 116@25°C
2014-07-29 11:50	bc	5.13	2.33	6551.5	6.4	89	138	y	--	Clear to slightly muddy; no strat
2014-09-11 11:50	bc	5.37	2.57	6551.3	6.6	85	131	y	--	Muddy; no stratification
2014-10-30 15:05	bc, ds	4.77	1.97	6551.9	3.6	96	162	y	--	No strat
2015-04-17 12:50	bc	4.32	1.52	6552.3	5.6	80	127	y	--	Clear, no strat
2015-05-22 14:30	bc, ds	4.17	1.37	6552.5	8.3	36	53	y	--	SCT @depth: 81@7.2°C, 124@25°C
2015-06-26 9:42	bc	4.79	1.99	6551.8	10.4	101	139	n	--	
2015-08-14 10:15	bc	5.06	2.26	6551.6	11.4	101	137	y	--	No strat; clear
2015-10-14 13:49	bt, ds	4.87	2.07	6551.8	9.7	81	115	y	--	Turbid after first few bails; restarted logger at 14:15
2016-05-27 14:15	ds, bc	3.89	1.09	6552.7	7.2	45	68	y	--	Muddy water
2016-07-29 14:00	bc	4.86	2.06	6551.8	9.5	98	139	y	--	
2016-10-12 13:50	ds, bc	4.86	2.06	6551.8	8.5	91	132	y	--	
2017-07-11 13:37	bt	4.53	1.73	6552.1	11.9	75	100	y	--	Ground dry and grass short; 2 bails of clean water and 1.25 bails of dirty water

Table 11. Groundwater monitoring observations, Water Years 2010 to 2019
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Site Conditions			Water Quality Observations							Remarks
Date/Time	Observer	Top-of-casing to water (ft)	Depth to water (ft, bgs)	Water Surface Elevation t, NGVD/NAVD	Temperature (°C)	Specific Conductance (at field temp.) (µS/cm)	Specific Conductance (at 25 °C) (µS/cm)	Bailed?	Soil crack size/moisture	
2017-08-11 12:40	bc	4.83	2.03	6551.8	12.0	100	134	y	--	Clear
2017-09-24 13:10	bc	4.84	2.04	6551.8	9.7	96	136	y	--	Water clear
2017-10-24 13:10	bt	4.82	2.02	6551.8	8.7	94	130	y	--	No stratification; grass dry; soil dry; 10 bails clear water; slate mode restarted logger 13:30
2018-05-23 10:48	bt	4.2	1.40	6552.4	7.6	69	103	y	--	Stratified at depth: t 4.7°C, C 83.3, SC 135.6; soil damp from recent rain; adjacent channel full and flowing; 10 bails slightly dirty
2018-07-03 10:40	bc	4.95	2.15	6551.7	9.4	101	144	y	--	
2018-08-16 11:45	bc	5.52	2.72	6551.1	11.3	103	139	y	--	
2018-10-20 11:28	bt	5.05	2.25	6551.6	9.3	78	110	y	--	No stratification; 5 bails clear water; restarted logger in continuous mode
2019-06-18 12:25	bt	3.97	1.17	6552.7	12.5	52	68	y	--	No stratification; soil dry at well; multiple channels active in the area; pond full and overflowing; 10 bails with dirty water at start
2019-07-27 11:05	bc	4.65	1.85	6552.0	10.9	64	88	n	--	
2019-08-23 17:00	bc	5.12	2.32	6551.5	11.6	99	133	y	--	
2019-10-21 11:35	bt	4.79	1.99	6551.8	9.0	100	144	y	--	10 bails clear; grass dry; soil dry

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Site Conditions				Water Quality Observations					Remarks	
Date/Time	Observer	Top-of-casing to water (ft)	Depth to water (ft, bgs)	Water Surface Elevation (ft, NGVD/NAVD)	Temperature (°C)	Specific Conductance (at field temp.) (µS/cm)	Specific Conductance (at 25 °C) (µS/cm)	Bailed?	Soil crack size/moisture	
Piezometer FS-15 - Upper Meadow, immediately downstream of bedrock reach										
Total Depth		5.52 ft bgs								
Depth to bottom =		7.72 ft btoc								
Total Stickup =		2.20 ft above gs								
Elevation =		6548.3 ft								
2009-07-19 0:00	ds									Not measured (locking cap)
2009-09-23 15:20	ds	7.58	5.38	6542.9	--	--		--	--	Wp229 unable to get SC reading due to mud at bottom; equipped with FS water level recorder
2009-10-23 11:04	bc	4.04	1.84	6546.5	9.6	54	79	--	--	Water clear, no odor; added label
2009-12-04 10:47	bc	3.88	1.68	6546.6	6.7	53	83	n	--	Water clear, no odor;
2010-06-12 15:15	bc	3.74	1.54	6546.8	4.7	43	70	n	--	
2010-07-19 11:07	bc	3.93	1.73	6546.6	9.9	53	74	n	--	
2010-08-23 14:30	bc	4.13	1.33	6547.0	14.6	59	73	y	--	Clear on top, brown on bottom, no odor
2010-09-28 15:10	bc	4.05	1.25	6547.0	12.7	63	83	n	--	Water clear, no odor
2011-07-08 12:35	ds, bc	3.46	0.66	6547.6	5.8	44	70	y	--	Very turbid water with no odor. Cap stuck so cut off top, took off 1.875". SCT (top) = 44.8@7.2°C, 67.2@25°C
2011-08-11 12:45	bc	3.58	0.78	6547.5	9.2	57	82	n	--	SCT (top) = 57.1@11.7°C, 76.8@25°C
2011-09-12 13:00	bc	4.08	1.28	6547.0	11.4	62	84	y	--	Water brown, no stratification
2011-10-09 12:30	bc	3.39	0.59	6547.7	11.7	50	67	y	--	Water clear
2011-11-03 13:00	ds	3.9	1.10	6547.2	9.1	50	71	n	--	Ground dry, not stratified
2011-12-05 12:10	bc	3.92	1.12	6547.2	6.1	44	69	n	--	
2012-05-18 10:50	ds, bc	3.4	0.60	6547.7	3.0	58	101	n	--	Missing cap, SCT (depth) 430@2.2°C, 750@25°C.
2012-06-15 11:30	bc	3.74	0.94	6547.4	5.5	69	110	y	--	Medium muddy. SCT (depth) 98.1@4.9°C, 159.8@25°C
2012-07-17 12:30	bc	4.56	1.76	6546.5	9.5	92	130	y	--	Water muddy, no strat
2012-08-14 13:05	bc	5.02	2.22	6546.1	10.8	105	146	y	--	Very muddy, no strat
2012-09-17 13:00	bc	5.61	2.81	6545.5	11.3	92	125	y	--	Muddy, well just about dry
2012-10-18 0:00	ds	5.03	2.99	6545.3	10.6	84	115	n	--	Not stratified, PVC broken, stickup = 24.5" on N side.
2013-05-24 14:05	ds, bc	3.91	1.87	6546.4	8.2	65	96	n	--	Stratified: SC=75@6.3°C, 117@25°C
2013-06-20 13:00	bc	4.08	2.04	6546.3	10.7	65	89	y	--	No stratification
2013-07-24 11:30	bc	4.54	2.50	6545.8	14.8	103	127	n	--	No stratification
2013-08-30 12:25	bc	5.07	3.03	6545.3	12.4	107	135	y	--	Water muddy, no strat
2013-09-18 13:20	ds	4.92	2.88	6545.4	15.3	103	126	n	--	Some of the transplanted willows still have leaves
2014-05-02 15:20	bc, ds	3.71	1.67	6546.6	1.4	67	121	y	--	Stratified SC: 84 @ 0.9°C, 154 @ 25°C
2014-07-29 12:15	bc	4.58	2.54	6545.8	11.4	108	147	y	--	Clear; no strat
2014-09-11 12:00	bc	5.2	3.16	6545.1	10.9	114	153	y	--	Muddy
2014-10-30 15:30	bc, ds	3.86	1.82	6546.5	6.4	72	111	y	--	No stratification
2015-04-17 15:00	bc	3.89	1.85	6546.5	6.3	69	107	y	--	No stratification
2015-05-22 14:50	bc, ds	3.66	1.62	6546.7	9.4	73	104	y	--	No stratification
2015-06-26 9:50	bc	4.48	2.44	6545.9	13.9	107	136	n	--	No stratification
2015-08-14 10:30	bc	4.74	2.70	6545.6	16.3	125	150	y	--	No strat
2015-10-14 14:13	bt, ds	4.4	2.36	6545.9	13.1	119	151	y	--	No stratification; turbid water; no screen
2016-05-27 16:40	ds,bc	3.67	1.63	6546.7	5.9	71	112	y	--	No stratification
2016-07-29 14:20	bc	4.52	2.48	6545.8	13.8	111	140	y	--	
2016-10-12 14:05	ds,bc	4.3	2.26	6546.0	12.4	96	127	y	--	
2017-07-11 14:51	bt	4.24	2.20	6546.1	12.8	82	107	y	--	Ground is dry and grasses are short; string is frayed and was reinforced with second string; 9.75 bails of dirty water
2017-08-11 12:50	bc	4.64	2.60	6545.7	14.7	97	120	y	--	Muddy water in bail

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2017-09-24 13:25	bc	4.03	1.99	6546.3	13.9	90	114	y	--	Loose dirt by well possible gopher activity
2017-10-24 13:31	bt	4.02	1.98	6546.3	12.6	70	92	y	--	Grass dry; soil damp; 7(3/4) bails dirty water with no odor; slate mode restarted logger at 13:45
2018-05-23 12:21	bt	3.8	1.76	6546.5	7.9	80	118	y	--	Stratified at depth: T 5.7°C, C 93.7, SC 147.1; soil damp; well is located at a high point with short grasses; 10 bails dirty
2018-07-03 10:55	bc	4.87	2.83	6545.5	10.6	103	143	y	--	
2018-08-16 12:00	bc	6.03	3.99	6544.3	--	--		y	--	Could not get SCT measurement; could be dry
2018-10-20 12:07	bt	5.52	3.48	6544.8	12.6	119	154	y	--	No stratification; 1/8 bail dirty water; restarted logger in continuous mode; grass dry; soil dry
2019-06-18 13:11	bt	3.85	1.81	6546.5	11.5	60	82	y	--	No stratification; 10 bails dirty water; replaced string on logger; soil dry with several varmint holes near well
2019-07-27 11:20	bc	4.84	2.80	6545.5	12.4	52	69	n	--	
2019-08-23 17:10	bc	5.45	3.41	6544.9	--	--		n	--	Pond really low next to well
2019-10-21 12:12	bt	4.18	2.14	6546.2	12.0	79	104	y	--	Stratified at depth T 11.5°C, C 93.6, SC 125.4; 5.5 bails dirty water; ground dry; grasses dry

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Site Conditions					Water Quality Observations					Remarks
Date/Time	Observer	Top-of-casing to water (ft)	Depth to water (ft, bgs)	Water Surface Elevation t, NGVD/NAVD	Temperature (°C)	Specific Conductance (at field temp.) (µS/cm)	Specific Conductance (at 25 °C) (at 25 °C)	Bailed?	Soil crack size/moisture	
Piezometer LP-P1 - Lower Meadow, on upland meadow south of Little Truckee River near Henness Pass Road										PVC well pipe and cap
Total Depth		ft bgs	Tall							
Depth to bottom =		ft btoc								
Total Stickup =		1.50 ft above gs								
Elevation =		6445.0 ft								
2015-04-01 16:40	bkh, kb	NR	NR	NR	NR	NR	NR	n	--	
2015-04-03 11:19	kb	3.75	2.25	6442.8	-3.7	56	116	n	--	
2015-05-05 11:11	kb	4.21	2.71	6442.3	3.4	140	241	n	--	
2015-10-21 14:13	bt	6.08	4.58	6440.4	8.0	123	182	y	--	
2016-06-01 14:10	bt	3.35	1.85	6443.2	12.2	77	102	y	--	
2016-07-29 18:05	bc	6.26	4.76	6440.2	9.2	99	142	--	--	
2016-10-12 11:05	ds,bc	5.89	4.39	6440.6	8.0	104	153	--	--	
2017-07-13 12:53	bt	3.58	2.08	6442.9	15.6	66	80	y	--	
2017-08-11 15:10	bc	4.17	2.67	6442.3	13.2	117	151	y	--	
2017-09-22 12:55	bc	3.68	2.18	6442.8	9.1	125	179	y	--	
2017-10-25 9:36	bt	3.80	2.30	6442.7	7.2	156	236	y	--	
2018-05-22 10:06	bt,ds	3.36	1.86	6443.1	9.5	88	125	y	--	
2018-07-03 13:50	bc	4.18	2.68	6442.3	8.3	229	336	y	--	
2018-08-16 15:30	bc	5.94	4.44	6440.6	9.6	219	310	y	--	
2018-10-19 9:53	bt	4.76	3.26	6441.7	8.1	228	339	y	--	
2018-11-16 13:53	bt	4.96	3.46	6441.5	--	--	--	--	--	
2019-06-21 11:05	bt,ds	3.33	1.83	6443.2	12.9	96	125	y	--	
2019-07-27 14:35	bc	3.62	2.12	6442.9	10.3	209	291	n	--	
2019-08-24 14:05	bc	5.53	4.03	6441.0	9.2	197	281	y	--	
2019-10-18 8:48	bt	3.23	1.73	6443.3	5.1	168	274	y	--	

APPROXIMATE TOTAL STICKUP
APPROXIMATE ELEVATION:
PIEZOMETER FROZEN, LEVELLOGGER LODGED IN WELL.
SCT meter needs recalibration--reading only negative temp values.

SC@depth 172@7.5 258@25
Stratified SC@ depth 142.4@6.9 degC, 216.5 @25 degC; discovered the logger were set to slate mode and had stopped on 4/1/16; restarted logger in continuous mode at 14:30; bailed at 14:40-water clear until bottom

Stratified at depth, T 8.9°C, C 142.9, SC 203.5; some ponding near well cluster both towards road and meadow; pockets with 6 inches of water inundation; 4 (1/2) bails clear

Grass partially dry; other veg dry and dead; 4(1/2) bails clear
Stratified at depth: T 3.2°C, C 182, SC 311; saturated soils; water ponded in adjacent channels; sporadic rain for last two weeks and overnight; 7.5 bails-3 through 7.5 were dirty with dark color
Water slightly muddy

No stratification; grass dry; no ponding in meadow; 5.5 bails with last bail slightly dirty
Installed new logger with 1 hour timestep
Stratified at depth: T 4.8°C, C 173, SC 281; bailed until empty; see LP-P2 comments

First bails clear then slightly muddy
Stratified at depth T 6.6°C, C 191, SC 294; 8.5 bails clear; frost on ground; ground wet; nearby relic channels full and some inundation and ponding

Table 11. Groundwater monitoring observations, Water Years 2010 to 2019
Perazzo Meadows Restoration, Sierra County, California

Site Conditions				Water Quality Observations						Remarks
Date/Time	Observer	Top-of-casing to water (ft)	Depth to water (ft, bgs)	Water Surface Elevation (ft, NGVD/NAVD)	Temperature (°C)	Specific Conductance (at field temp.) (μS/cm)	Specific Conductance (at 25 °C)	Bailed?	Soil crack size/moisture	
Piezometer LP-P2 - Lower Meadow, on upland meadow south of Little Truckee River near Henness Pass Road										PVC well pipe and threaded PVC cap.
Total Depth		ft bgs	Short							
Depth to bottom =		ft btoc								
Total Stickup =		1.00 ft above gs								APPROXIMATE TOTAL STICKUP
Elevation =		6447.0 ft								APPROXIMATE ELEVATION;
2015-04-03 10:56	kb	1.50	0.50	6446.5	-3.4	119	246	n	--	DTW indeterminant; Solinst tape #s are worn off. 1.5 feet BTOC is an approximation. SCT meter needs recalibration--reading only negative temp values.
2015-05-05 11:23	kb	1.93	0.93	6446.1	4.1	148	249	n	--	
2015-10-21 14:22	bt	3.68	2.68	6444.3	7.7	125	189	y	--	SC@depth 152@7.5 229@25; turbid
2016-06-01 14:14	bt	0.93	-0.07	6447.1	11.2	80	108	y	--	Stratified SC@depth 147.1 @6.6 degC, 226.7 @25 degC; logger was in slate mode and stopped at 4/1/16; restarted logger at 14:30 in continuous mode; ground saturated with some inundation and ponding in the meadow on the north side; bailed water clean
2016-10-12 11:05	ds,bc	3.47	2.47	6444.5	8.2	149	211	y	--	
2017-07-13 13:06	bt	1.10	0.10	6446.9	13.7	67	85	y	--	Stratified at depth, T 9.1°C, C 127.8, SC 183.1; 2.5 bails clear; see notes for LP_P1 for other info as this is in a cluster of wells
2017-08-11 15:10	bc	1.68	0.68	6446.3	11.6	153	206	y	--	clear
2017-09-22 12:55	bc	1.21	0.21	6446.8	9.0	183	263	y	--	
2017-10-25 9:47	bt	1.33	0.33	6446.7	5.4	166	264	y	--	3(2/3) bails; diagnostic check battery 3.414V
2018-05-22 10:13	bt,ds	0.89	-0.11	6447.1	5.0	72	120	y	--	Stratified at depth: T 2.9°C, C 183, SC, 315; 4-5 bails water slightly grey; see above notes about surrounding conditions
2018-07-03 13:50	bc	1.73	0.73	6446.3	7.9	205	305	y	--	
2018-08-16 15:30	bc	3.67	2.67	6444.3	8.7	168	245	y	--	
2018-10-19 10:05	bt	2.30	1.30	6445.7	6.6	221	339	y	--	No stratification; 2 bails slightly dirty
2018-11-16 13:56	bt	2.48	1.48	6445.5	--	--	--	--	--	Installed new logger with 1 hour timestep
2018-06-21 10:49	bt,ds	0.86	-0.14	6447.1	13.1	41	53	y	--	Stratified at depth: T 7.0°C, C 87.4, SC 132.3; soil saturated; ponding in channels and holes; 5 bails clear water
2019-07-27 14:40	bc	1.50	0.50	6446.5	8.9	167	243	n	--	
2019-08-24 14:05	bc	3.08	2.08	6444.9	8.8	168	243	y	--	
2019-10-18 9:04	bt	0.75	-0.25	6447.3	3.8	180	302	y	--	Stratified at depth T 5.6°C, C 210, SC 334; 4.5 bails slightly dirty; see notes on LP_P1

Table 11. Groundwater monitoring observations, Water Years 2010 to 2019
Perazzo Meadows Restoration, Sierra County, California

Site Conditions					Water Quality Observations					Remarks
Date/Time	Observer	Top-of-casing to water (ft)	Depth to water (ft, bgs)	Water Surface Elevation (ft, NGVD/NAVD)	Temperature (°C)	Specific Conductance (at field temp.) (µS/cm)	Specific Conductance (at 25 °C) (µS/cm)	Bailed?	Soil crack size/moisture	
Piezometer LP-W1 - Lower Meadow, on upland meadow south of Little Truckee River near Henness Pass Road										Galvanized well pipe and cap; bring Monkey wrench in Winter.
Total Depth		<i>ft bgs</i>								
Depth to bottom =		<i>ft btoc</i>								
Total Stickup =		<i>1.50 ft above gs</i>								
Elevation =		<i>6445.0 ft</i>								
2015-04-03 11:31	kb	2.41	0.91	6444.1	-3.8	87	182	n	--	
2015-05-05 10:50	kb	2.90	1.40	6443.6	4.9	113	186	n	--	
2015-10-21 14:04	bt	4.84	3.34	6441.7	8.5	130	191	y	--	1 full bailer and (2) 1/4 full clear; cap on tight needed pipe wrench
2016-06-01 14:29	bt	2.16	0.66	6444.3	11.6	106	149	y	--	Stratified SC@ depth 106.2@7.6°C, 158.7 @25°C; logger was in slate mode and stopped on 4/2/16; restarted at 14:45 in continuous mode; bailed water clear
2016-07-29 18:05	bc	5.08	3.58	6441.4	9.1	118	171	y	--	
2016-10-12 11:05	ds,bc	4.71	3.21	6441.8	7.7	122	183	y	--	
2017-07-13 13:17	bt	2.36	0.86	6444.1	13.8	128	163	y	--	4.5 bails clear; see notes for LP_P1 as this well is in a cluster of wells
2017-09-22 12:45	bc	2.47	0.97	6444.0	8.3	154	226	y	--	
2017-10-25 9:57	bt	2.64	1.14	6443.9	6.1	135	210	y	--	10 bails clear water; diagnostic check battery 3.485V
2018-05-22 10:19	bt,ds	2.13	0.63	6444.4	6.0	162	255	y	--	Stratified at depth: T 3.0°C only see above notes about surrounding conditions
2018-07-03 13:45	bc	2.95	1.45	6443.6	8.3	161	237	y	--	
2018-08-16 15:35	bc	4.92	3.42	6441.6	8.8	128	186	y	--	
2018-10-19 10:13	bt	3.55	2.05	6443.0	5.5	68	107	y	--	Stratified at depth: T 5.9°C; C 138, SC 216.6; 12 bails clear water
2018-11-16 13:58	bt	3.73	2.23	6442.8	--	--	--	--	--	Installed new logger with 1 hour timestep
2019-06-21 11:10	bt,ds	2.12	0.62	6444.4	8.9	44	64	y	--	Stratified at depth: T 5.2°C, C 119.4, SC 191.5; see LP-P2 comments
2019-07-27 14:30	bc	2.72	1.22	6443.8	11.1	144	195	n	--	
2019-08-24 14:00	bc	4.24	2.74	6442.3	10.9	132	180	y	--	
2019-10-18 9:13	bt	2.06	0.56	6444.4	3.0	150	265	y	--	Stratified at depth T 4.9°C, C 173, SC 282; 10 bails clear; see notes LP_P1

Table 11. Groundwater monitoring observations, Water Years 2010 to 2019
Perazzo Meadows Restoration, Sierra County, California

Site Conditions					Water Quality Observations					Remarks
Date/Time	Observer	Top-of-casing to water (ft)	Depth to water (ft, bgs)	Water Surface Elevation t, NGVD/NAVD	Temperature (°C)	Specific Conductance (at field temp.) (µS/cm)	Specific Conductance (at 25 °C) (at 25 °C)	Bailed?	Soil crack size/moisture	
Piezometer LP-W3 - Lower Meadow, on upland meadow south of Little Truckee River near Henness Pass Road.										Galvanized well pipe and cap; bring Monkey wrench in Winter.
Total Depth		<i>ft bgs</i>								
Depth to bottom =		<i>ft btoc</i>								
Total Stickup =		<i>1.50 ft above gs</i>								
Elevation =		<i>6445.0 ft</i>								
2015-04-03 11:51	kb	4.18	2.68	6442.3	-1.2	82	159	n	--	
2015-05-05 11:33	kb	4.57	3.07	6441.9	5.8	100	160	n	--	
2015-10-21 13:35	bt	6.09	4.59	6440.4	9.1	126	181	y	--	
2016-06-01 14:52	bt	3.26	1.76	6443.2	9.2	90	129	y	--	
2016-07-29 16:00	bc	6.19	4.69	6440.3	8.4	90	139	y	--	
2016-10-12 10:45	ds,bc	5.71	4.21	6440.8	7.8	135	208	y	--	
2017-07-13 13:30	bt	3.96	2.46	6442.5	12.3	50	65	y	--	
2017-08-11 15:15	bc	4.77	3.27	6441.7	9.4	99	141	y	--	
2017-09-22 12:41	bc	4.41	2.91	6442.1	8.9	117	170	y	--	
2017-10-25 10:10	bt	4.41	2.91	6442.1	7.5	95	143	y	--	
2018-05-22 10:36	bt,ds	3.36	1.86	6443.1	6.9	17	25	y	--	Grass dry; soil dry; 5(2/3) bails slightly brown; diagnostic check battery 3.50V Stratified at depth: T 3.8°C, C 150, SC 250; ground moist; water level in nearby channel ≈1.5 feet below ground surface; 12 bails clear; wire was pulled up in top and frayed and adjusted logger estimated in Jan 2018; replaced wire with new string length of 9.3 feet from top to bottom of sensor
2018-07-03 13:35	bc	4.91	3.41	6441.6	9.7	116	164	y	--	Water slightly muddy
2018-08-16 15:20	bc	5.83	4.33	6440.7	11.5	131	176	y	--	Water is muddy
2018-10-19 10:28	bt	5.04	3.54	6441.5	8.0	128	190	y	--	No stratification; grass dry; soil dry
2018-11-16 14:02	bt	5.06	3.56	6441.4	--	--	--	--	--	Installed new logger with 1 hour timestep
2019-06-21 11:20	bt,ds	3.15	1.65	6443.4	11.6	128	172	y	--	Cap off and hanging slightly to side--look for shift in data; stratified at depth: T 5.8°C, C 103, SC 162
2019-07-27 14:30	bc	4.54	3.04	6442.0	11.7	121	161	n	--	
2019-08-24 13:55	bc	5.63	4.13	6440.9	8.9	116	168	y	--	Water muddy
2019-10-18 9:27	bt	2.51	1.01	6444.0	6.1	102	161	y	--	Meadow and willows ponded; nearby relic channels are full

Table 11. Groundwater monitoring observations, Water Years 2010 to 2019
Perazzo Meadows Restoration, Sierra County, California

Site Conditions			Water Quality Observations						Remarks	
Date/Time	Observer	Top-of-casing to water (ft)	Depth to water (ft, bgs)	Water Surface Elevation ft, NGVD/NAVD)	Temperature (°C)	Specific Conductance (at field temp.) (µS/cm)	Specific Conductance (at 25 °C) (at 25 °C)	Bailed?	Soil crack size/moisture	
Piezometer LP-W6 - Lower Meadow, on upland meadow north of Little Truckee River near Jackson Meadows Road										Galvanized well pipe with PVC cap; bring Monkey wrench in Winter.
Total Depth		<i>ft bgs</i>								
Depth to bottom =		<i>ft btoc</i>								
Total Stickup =		<i>1.50 ft above gs</i>								
Elevation =		<i>6445.0 ft</i>								
2015-04-03 13:27	kb	4.36	2.86	6442.1	-1.7	88	172	n	--	
2015-05-05 12:03	kb	4.78	3.28	6441.7	5.2	97	159	n	--	
2015-10-21 13:17	bt	6.41	4.91	6440.1	8.4	71	104	y	--	1/2 bailer with turbid water
2016-06-01 16:14	bt	3.55	2.05	6443.0	8.9	129	185	y	--	Stratified SC@depth 124.6@6.9°C, 190.1@ 25°C; logger in slate mode and stopped 4/2/16; restarted logger in continuous mode at 16:30; bailed clear water
2016-07-29 17:50	bc	6.43	4.93	6440.1	8.8	113	166	y	--	
2016-10-12 10:30	ds,bc	6.40	4.90	6440.1	8.4	70	102	y	--	Replace wire with string
2017-07-13 10:53	bt	4.51	3.01	6442.0	14.1	133	168	y	--	No stratification; ground damp and grasses lush; 4 full bails 2 (1/2) bails clear
2017-09-22 12:25	bc	5.64	4.14	6440.9	8.7	114	166	y	--	
2017-10-25 10:29	bt	4.71	3.21	6441.8	8.3	127	185	y	--	Grass dry; soil damp; 8 bails clear; diagnostic check battery 3.44V
2018-05-22 11:34	bt,ds	2.74	1.24	6443.8	7.3	201	302	y	--	One bail before SCT measurement; stratified at depth: T 4.1°C, C 125, SC 208; two seeps adjacent hill; soil moist
2018-07-03 13:25	bc	5.19	3.69	6441.3	10.0	110	170	y	--	No stratification
2018-08-16 15:10	bc	6.18	4.68	6440.3	10.3	131	182	y	--	
2018-10-19 10:44	bt	5.91	4.41	6440.6	9.0	134	193	y	--	No stratification; grass is dry; 5.5 bails slightly dirty water
2018-11-16 14:09	bt	5.68	4.18	6440.8	--	--	--	--	--	Installed new logger with 1 hour timestep
2019-06-21 8:58	bt,ds	3.00	1.50	6443.5	12.8	144	186	Y	--	Stratified at depth: T 6.4°C, C 118, Sc 185.6; soil soft and saturated; 10 bails clear water
2019-07-27 14:20	bc	5.31	3.81	6441.2	11.2	134	182	n	--	
2019-08-24 13:45	bc	6.30	4.80	6440.2	10.3	118	165	y	--	Water clear
2019-10-18 10:47	bt	3.00	1.50	6443.5	7.4	136	204	y	--	Soil wet; grasses dry; 10 bails clear

Table 11. Groundwater monitoring observations, Water Years 2010 to 2019
Perazzo Meadows Restoration, Sierra County, California

Site Conditions					Water Quality Observations					Remarks
Date/Time	Observer	Top-of-casing to water (ft)	Depth to water (ft, bgs)	Water Surface Elevation (ft, NGVD/NAVD)	Temperature (°C)	Specific Conductance (at field temp.) (µS/cm)	Specific Conductance (at 25 °C) (at 25 °C)	Bailed?	Soil crack size/moisture	
Piezometer LP-W5 - middle Lower Meadow, on upland meadow north of Little Truckee River										Galvanized well pipe and cap; bring Monkey wrench in Winter.
Total Depth		ft bgs	New Well	8-17-17						
Depth to bottom =		ft btoc								
Total Stickup =		1.50 ft above gs	1.80	ft above gs						
Elevation =		6445.0 ft								
2015-04-03 13:58	kb	5.70	4.20	6440.8	-1.1	104	202	n	--	VERY rusty water and wire cord; Levellogger covered in rusty silt. SCT meter needs recalibration--reading only negative temp values.
2015-05-05 12:19	kb	5.97	4.47	6440.5	1.6	21	37	n	--	DRY WELL! Moist, rusty mud at the bottom.
2015-10-21 12:57	bt	7.51	6.01	6439.0	8.8	136	198	y	--	1/2 bailer very turbid; very dry around well
2016-06-01 16:30	bt	3.97	2.47	6442.5	10.0	165	231	y	--	Stratified SC@ depth 137.3 @8.8°C, 198.4 @25°C; logger in slate mode and stopped 4/2/16; restarted at 16:45; ground moist with some mud spots in meadow; river too deep and swift to cross; bailed clear water
2016-07-29 17:40	bc	dry	--	--	--	--		n	--	
2016-10-12 10:15	ds,bc	7.01	5.51	6439.5	9.7	84	125	y	--	Muddy water; dtw is without logger in well
2017-07-13 12:17	bt	5.27	3.77	6441.2	--	--		n	--	Well bent at est. 45 degree angle; unable to straighten; could not get logger out or sc meter in
2017-08-10 10:10	bt, gs	--	--	--	--	--		n	--	Attempted well repair; logger still stuck in well; unable to dislodge; will replace well with new logger 8/17/17
2017-08-17 16:57	bt, gs	6.10	4.30	6440.7	13.7	148	191	n	--	New well installed at 11:30; old well dug up and logger recovered with no lose of data; initial DTW measurement was 6.52--returned at end of day
2017-09-22 12:15	bc	6.07	4.27	6440.7	10.3	106	148	y	--	Water clear for few bails then muddy
2017-10-25 10:47	bt	5.70	3.90	6441.1	11.0	87	120	y	--	Grass dry; soil damp; 2 full bails 7(2/3) bails dirty no odor; diagnostic check battery 3.51V
2018-05-22 11:53	bt,ds	2.52	0.72	6444.3	11.4	75	102	y	--	Stratified at depth: T 8.4°C, C 137, SC 201; soil moist; some ponding in meadow; several seeping channels; 15 bails-last two dirty
2018-07-03 13:15	bc	5.75	3.95	6441.1	12.4	156	205	y	--	
2018-08-16 15:00	bc	6.57	4.77	6440.2	11.9	126	167	y	--	
2018-10-19 11:01	bt	6.45	4.65	6440.4	10.9	108	146	y	--	No stratification; grass dry; soil dry; 5.0 bails slightly dirty water
2018-11-16 14:17	bt	6.18	4.38	6440.6	--	--		--	--	Installed new logger with 1 hour timestep
2019-06-21 9:18	bt,ds	3.01	1.21	6443.8	14.8	178	222	y	--	Stratified at depth: T 8.8°C, C 188, SC 265; soil damp and wet; grasses green; evidence of ponding nearby but dried out; 10 bails clear water
2019-07-27 14:05	bc	5.63	3.83	6441.2	11.9	136	181	n	--	
2019-08-24 13:30	bc	6.47	4.67	6440.3	12.1	121	160	y	--	Water clear
2019-10-18 10:31	bt	3.02	1.22	6443.8	8.4	94	137	y	--	Stratified at depth; T 8.9°C, C 125, SC 179.7; 9.75 bails clear; soil mostly dry; grasses turning brown

APPROXIMATE TOTAL STICKUP
APPROXIMATE ELEVATION;
VERY rusty water and wire cord; Levellogger covered in rusty silt. SCT meter needs recalibration--reading only negative temp values.
DRY WELL! Moist, rusty mud at the bottom.
1/2 bailer very turbid; very dry around well
Stratified SC@ depth 137.3 @8.8°C, 198.4 @25°C; logger in slate mode and stopped 4/2/16; restarted at 16:45; ground moist with some mud spots in meadow; river too deep and swift to cross; bailed clear water
Muddy water; dtw is without logger in well
Well bent at est. 45 degree angle; unable to straighten; could not get logger out or sc meter in
Attempted well repair; logger still stuck in well; unable to dislodge; will replace well with new logger 8/17/17
New well installed at 11:30; old well dug up and logger recovered with no lose of data; initial DTW measurement was 6.52--returned at end of day
Water clear for few bails then muddy
Grass dry; soil damp; 2 full bails 7(2/3) bails dirty no odor; diagnostic check battery 3.51V
Stratified at depth: T 8.4°C, C 137, SC 201; soil moist; some ponding in meadow; several seeping channels; 15 bails-last two dirty
No stratification; grass dry; soil dry; 5.0 bails slightly dirty water
Installed new logger with 1 hour timestep
Stratified at depth: T 8.8°C, C 188, SC 265; soil damp and wet; grasses green; evidence of ponding nearby but dried out; 10 bails clear water
Water clear
Stratified at depth: T 8.9°C, C 125, SC 179.7; 9.75 bails clear; soil mostly dry; grasses turning brown

Table 11. Groundwater monitoring observations, Water Years 2010 to 2019
Perazzo Meadows Restoration, Sierra County, California

Site Conditions			Water Quality Observations							Remarks
Date/Time	Observer	Top-of-casing to water (ft)	Depth to water (ft, bgs)	Water Surface Elevation (ft, NGVD/NAVD)	Temperature (°C)	Specific Conductance (at field temp.) (µS/cm)	Specific Conductance (at 25 °C) (at 25 °C)	Bailed?	Soil crack size/moisture	
Piezometer LP-W2 - uppermost Lower Meadow, on a point bar/slip-off slope south side of Little Truckee River										Galvanized well pipe and cap; bring Monkey wrench in Winter.
Total Depth		<i>ft bgs</i>								
Depth to bottom =		<i>ft btoc</i>								
Total Stickup =		<i>2.40 ft above gs</i>								
Elevation =		<i>6445.0 ft</i>								
2015-04-03 14:30	kb	5.14	2.74	6442.3	-0.4	51	98	n	--	APPROXIMATE TOTAL STICKUP
2015-05-05 13:34	kb	5.05	2.65	6442.4	7.6	29	44	n	--	APPROXIMATE ELEVATION;
2015-10-21 12:35	bt	5.98	3.58	6441.4	12.5	38	50	y	--	SCT meter needs recalibration--reading only negative temp values.
2016-06-01 15:28	bt	3.82	1.42	6443.6	10.8	58	80	y	--	Very rusty wire
2016-07-29 17:25	bc	5.82	3.42	6441.6	12.3	56	75	y	--	Very turbid; got clearer with bailing; dry area willows had no leaves
2016-10-12 9:40	ds,bc	5.96	3.56	6441.4	11.7	40	53	y	--	Logger in slate mode and stopped 4/2/16; restarted logger in continuous mode at 15:45; no stratification; bailed mostly clean water; ground at well dry
2017-07-13 11:57	bt	4.60	2.20	6442.8	14.0	50	63	y	--	Muddy water in bailer; need to replace broken wire
2017-09-22 11:45	bc	5.54	3.14	6441.9	11.8	53	70	y	--	7 bails slightly dirty; ground dry and grass green with lots of wildflowers
2017-10-25 11:24	bt	5.70	3.30	6441.7	12.7	55	72	y	--	Water was tan
2018-05-22 12:47	bt,ds	4.02	1.62	6443.4	6.1	70	110	y	--	Stratified at depth: T 10.7°C, C 80.6, SC 110.8@25°C; grass dry; soil damp; 10 bails slightly dirty; diagnostic check battery 3.477V
2018-07-03 13:00	bc	5.50	3.10	6441.9	11.5	48	65	y	--	No stratification; leaves on willows; soil moist from rain; 10 bails clear
2018-08-16 14:35	bc	5.92	3.52	6441.5	14.5	72	90	y	--	Water slightly muddy
2018-10-19 11:31	bt	5.62	3.22	6441.8	12.0	55	74	y	--	Water is muddy
2018-11-16 14:23	bt	5.61	3.21	6441.8	--	--	--	--	--	Stratified at depth: T 10.7°C, C 98.0, SC 134.5; 10 bails dirty water; grass dry; soil damp
2019-06-21 11:53	bt,ds	3.39	0.99	6444.0	13.2	45	58	y	--	Installed new logger with 1 Hour timestep
2019-07-27 13:45	bc	5.14	2.74	6442.3	15.7	41	50	n	--	Stratified temperature only 8.6°C, 10 bails clear water; soil damp; grasses green
2019-08-24 13:20	bc	5.75	3.35	6441.7	13.0	43	56	y	--	Water slightly muddy
2019-10-18 10:00	bt	2.10	-0.30	6445.3	5.3	60	97	y	--	Well inundated; flow in channel 20 feet away from well; 10 bails clear

Table 11. Groundwater monitoring observations, Water Years 2010 to 2019
Perazzo Meadows Restoration, Sierra County, California

Site Conditions					Water Quality Observations					Remarks
Date/Time	Observer	Top-of-casing to water (ft)	Depth to water (ft, bgs)	Water Surface Elevation (ft, NGVD/NAVD)	Temperature (°C)	Specific Conductance (at field temp.) (µS/cm)	Specific Conductance (at 25 °C) (µS/cm)	Bailed?	Soil crack size/moisture	
Piezometer LP-W4 - uppermost Lower Meadow, on the cut bank of a meander along the north side of the Little Truckee River,										PVC well pipe and cap
Total Depth		<i>ft bgs</i>								
Depth to bottom =		<i>ft btoc</i>								
Total Stickup =		<i>1.50 ft above gs</i>								
Elevation =		<i>6445.0 ft</i>								
4/3/2015 NR	kb	NR	NR	NR	NR	NR	NR	n	--	
2015-05-05 12:53	kb	6.25	4.75	6440.3	6.6	77	122	n	--	Rusty wire with no Levellogger. PVC cap was very stuck and filled with rusty gunk. Installed brand new Solinst LL; must use software version 4.1.0.
2015-10-21 12:17	bt	8.03	6.53	6438.5	10.2	112	155	y	--	1/4 bailer of muddy water
2016-06-01 16:51	bt	3.15	1.65	6443.4	8.1	78	115	y	--	Stratified SC@depth 69.2@ 7.1degC, 105.1 @25degC; Estimated DTW because cap was stuck and the pipe came out at the fitting at ground level; DTW from ground surface 2.10 ft.; logger in slate mode but not stopped-new logger cannot do continuous mode; restarted logger at 17:00; soil moist and soft; lots of wild flowers; bailed light brown dirty water
2016-07-29 17:35	bc	4.00	2.50	6442.5	11.5	70	93	y	--	Orange and slimy
2016-10-12 10:00	ds,bc	4.72	3.22	6441.8	10.3	63	87	y	--	Muddy
2017-07-13 11:28	bt	3.25	1.75	6443.3	11.9	79	105	y	--	Top of well broken at coupling-measured DTW from ground and added upper pipe length; 2.75 bails light brown water
2017-08-10 11:07	bt,gs	3.50	2.00	6443.0	13.9	73	92	n	--	Grasses still green in meadow and soil is damp (could be from recent thunderstorm activity)
2017-09-22 12:05	bc	--	--	--	--	--	--	n	--	Top of well off; had to pull out logger to get measurement; sc meter got stuck no measurement
2017-10-25 11:06	bt	3.59	2.09	6442.9	10.3	58	80	n	--	Grass dry; soil dry; could not get bailer in well-gets stuck
2018-05-22 12:20	bt,ds	2.40	0.90	6444.1	5.3	75	121	y	--	Only stratified temperature at depth-4.8°C; soil damp from rains; 10 bails slightly dirty; restarted logger at 13:00
2018-07-03 13:05	bc	3.46	1.96	6443.0	9.9	68	95	n	--	
2018-08-16 14:45	bc	4.02	2.52	6442.5	10.2	67	93	n	--	
2018-10-19 11:17	bt	3.96	2.46	6442.5	10.6	64	87	n	--	Could not get bailer in deep enough
2019-06-21 9:41	bt,ds	3.10	1.60	6443.4	9.1	75	108	n	--	Well has been damaged and repaired; bailer does not fit in well without getting stuck
2019-07-27 13:55	bc	2.50	1.00	6444.0	9.0	68	98	n	--	Well top broken at ground surface; unable to remove cap; measured from ground surface to water and measured length of stickup; ground damp; this well will be decommissioned and replaced during construction
Piezometer LP-W4 _19- Lower Meadow, on the cut bank of the north side of the Little Truckee River across from LP_W2,										PVC well pipe and cap
Total Depth		<i>8.78 ft bgs</i>								
Depth to bottom =		<i>10.20 ft btoc</i>								
Total Stickup =		<i>1.43 ft above gs</i>								
Elevation =		<i>6445.0 ft</i>								
2019-10-18 10:15	bt	3.15	1.73	6443.3	9.3	128	183	y	--	String tangled and logger was higher in well-need to rectify next download; 10 bails clean water; dry ground in upland area

Notes:

- 1) ds is David Shaw (Balance); bc is Beth Christman (Truckee River Watershed Council); nw is Randy Westmoreland (USFS); gs is Guy Smith (USFS); tb is Travis Bagget (Balance); bhk is Brian Hastings (Balance); kb is Kerensa Brooks (Balance); bt is Ben Trustman (Balance)
 - 2) NR is not recorded, -- is not applicable
 - 3) Water surface elevations are based on ground surface elevations indicated on high-resolution digital elevation models (DEM) provided by the USFS Tahoe National Forest Sierraville Ranger District.
 - 4) btoc=below top of casing; bgs=below ground surface
- Specific conductance: Measured in micromhos/cm in field using a YSI30 hand-held meter; then adjusted to 25degC by equation $(1.8813774452 - [0.050433063928 * \text{field temp}] + [0.00058561144042 * \text{field temp}^2]) * \text{Field specific conductance}$

FIGURES

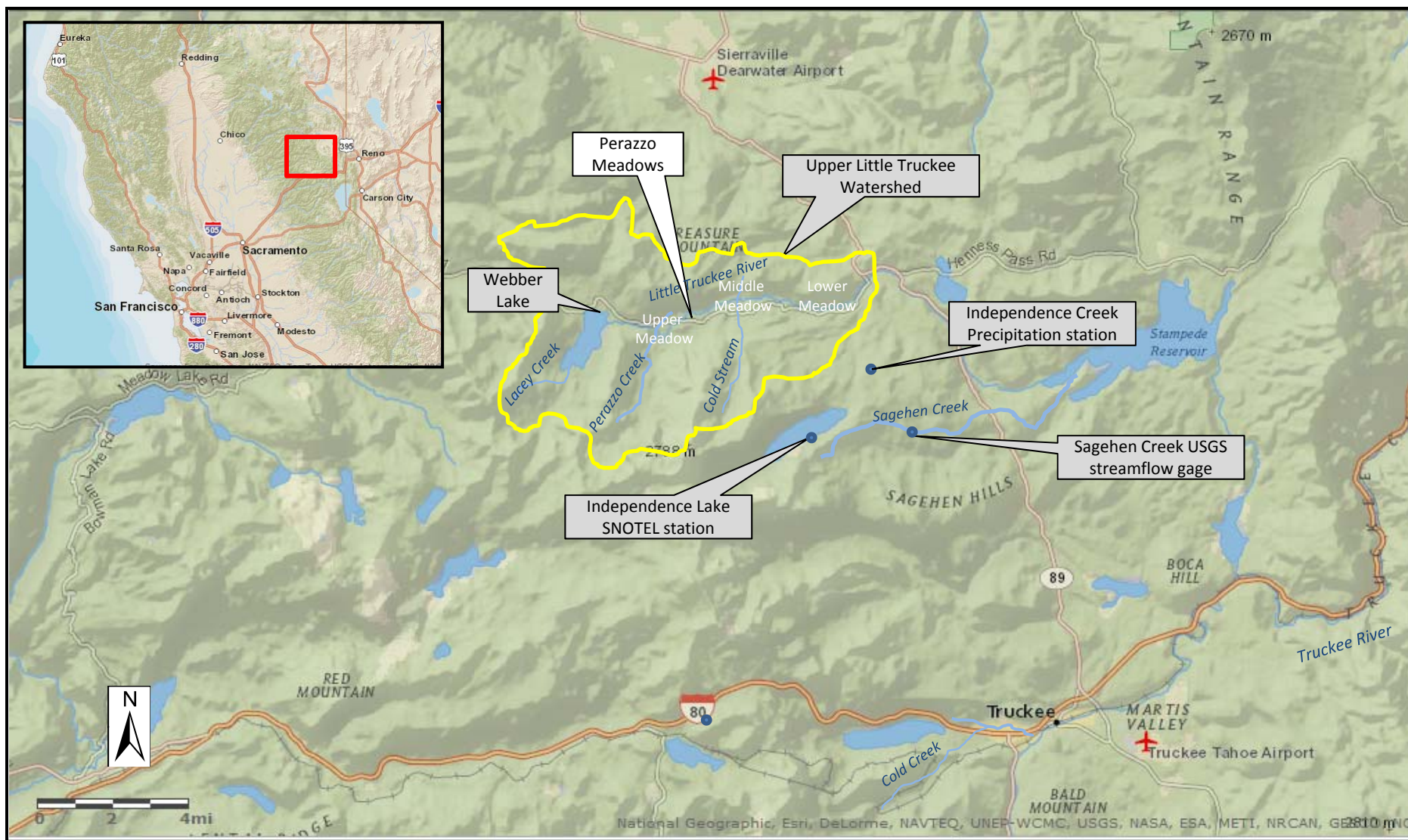
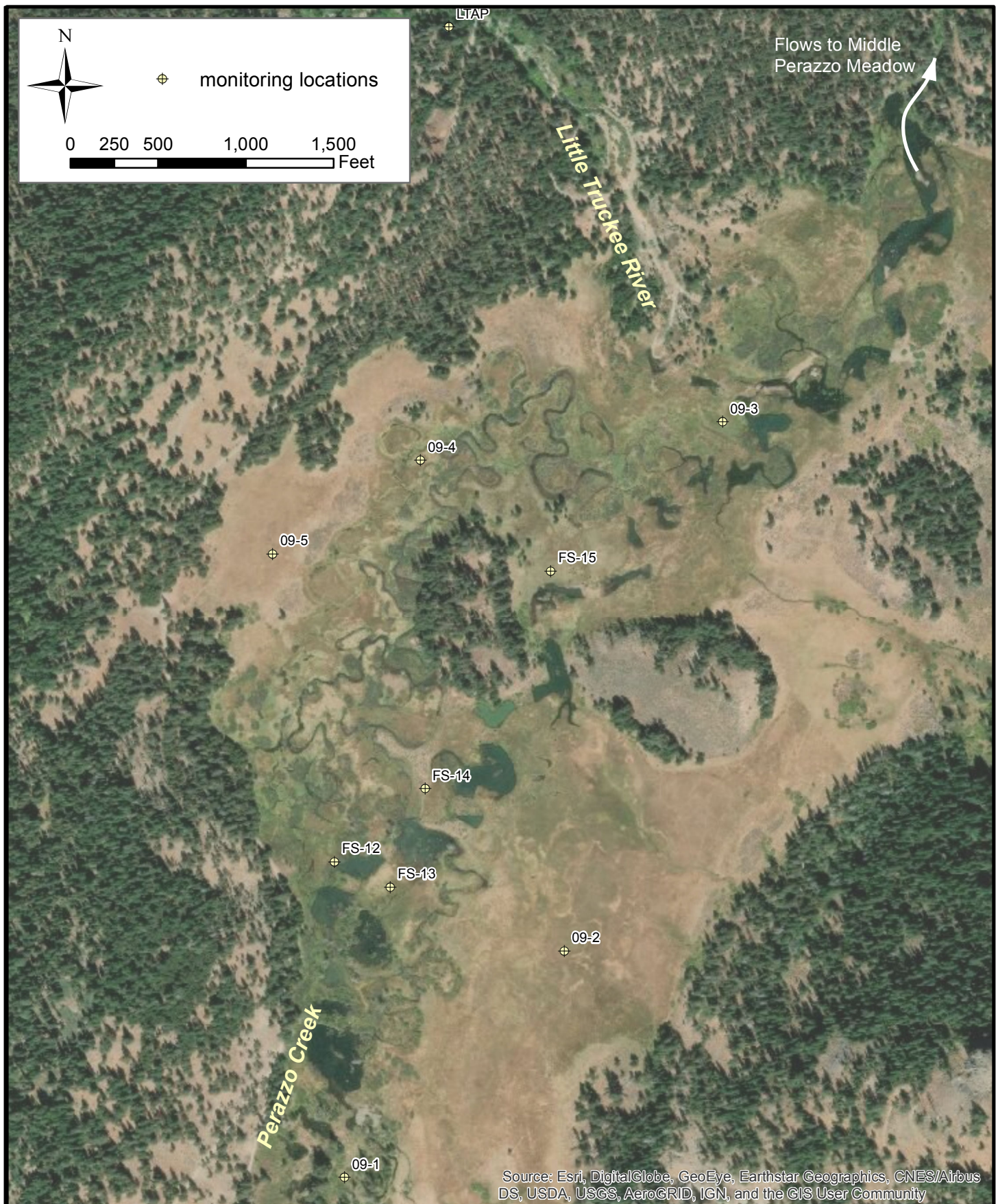


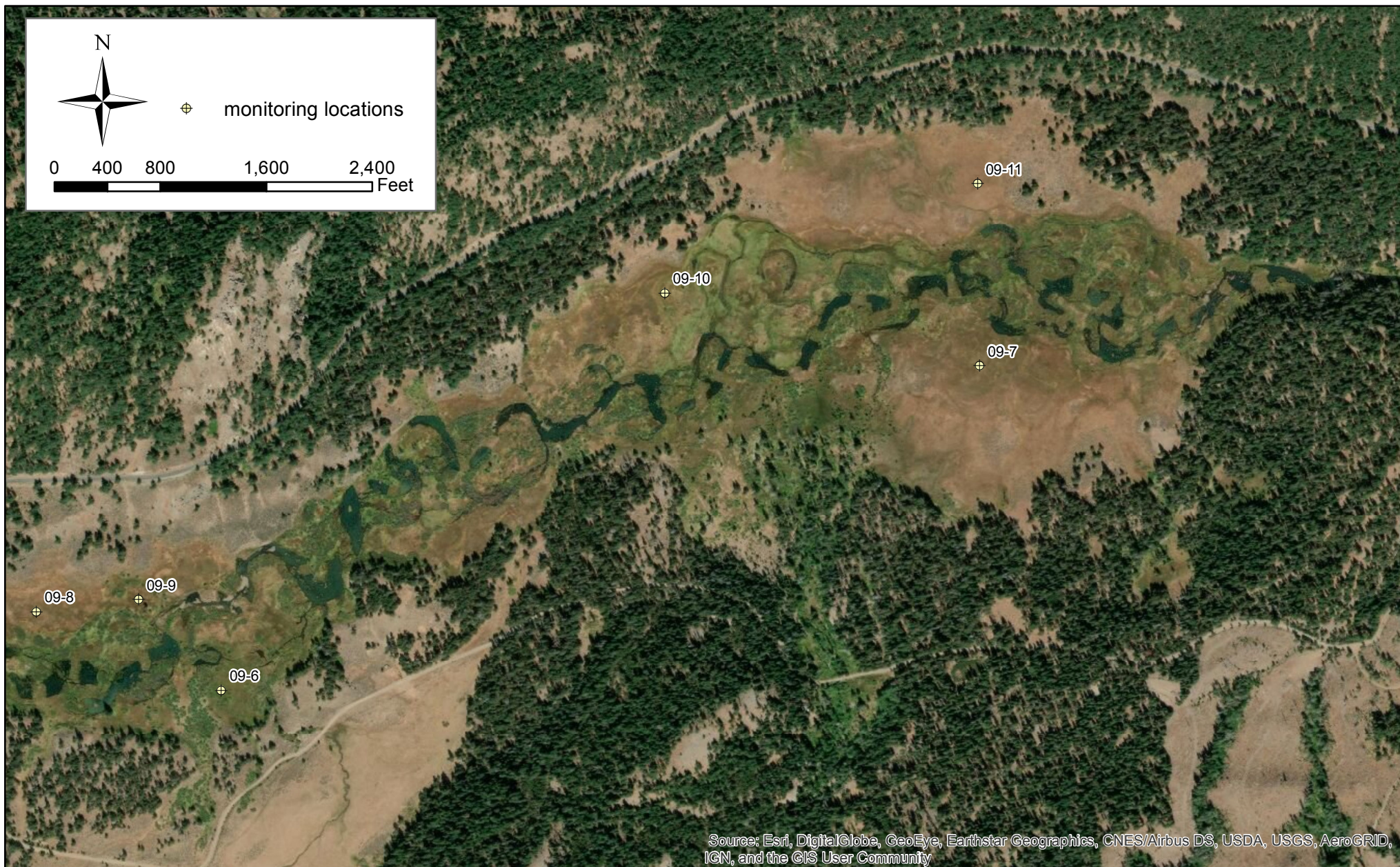
Figure 1. Perazzo Meadows, Sierra County, California

Perazzo Meadows is part of the Upper Little Truckee watershed, in the headwaters of the Truckee River. Other locations discussed in this report are also identified on this map.



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**Figure 2. Location of groundwater monitoring stations
Upper Perazzo Meadow, Sierra County, California**



**Figure 3. Location of groundwater monitoring stations,
Middle Perazzo Meadow, Sierra County, California**

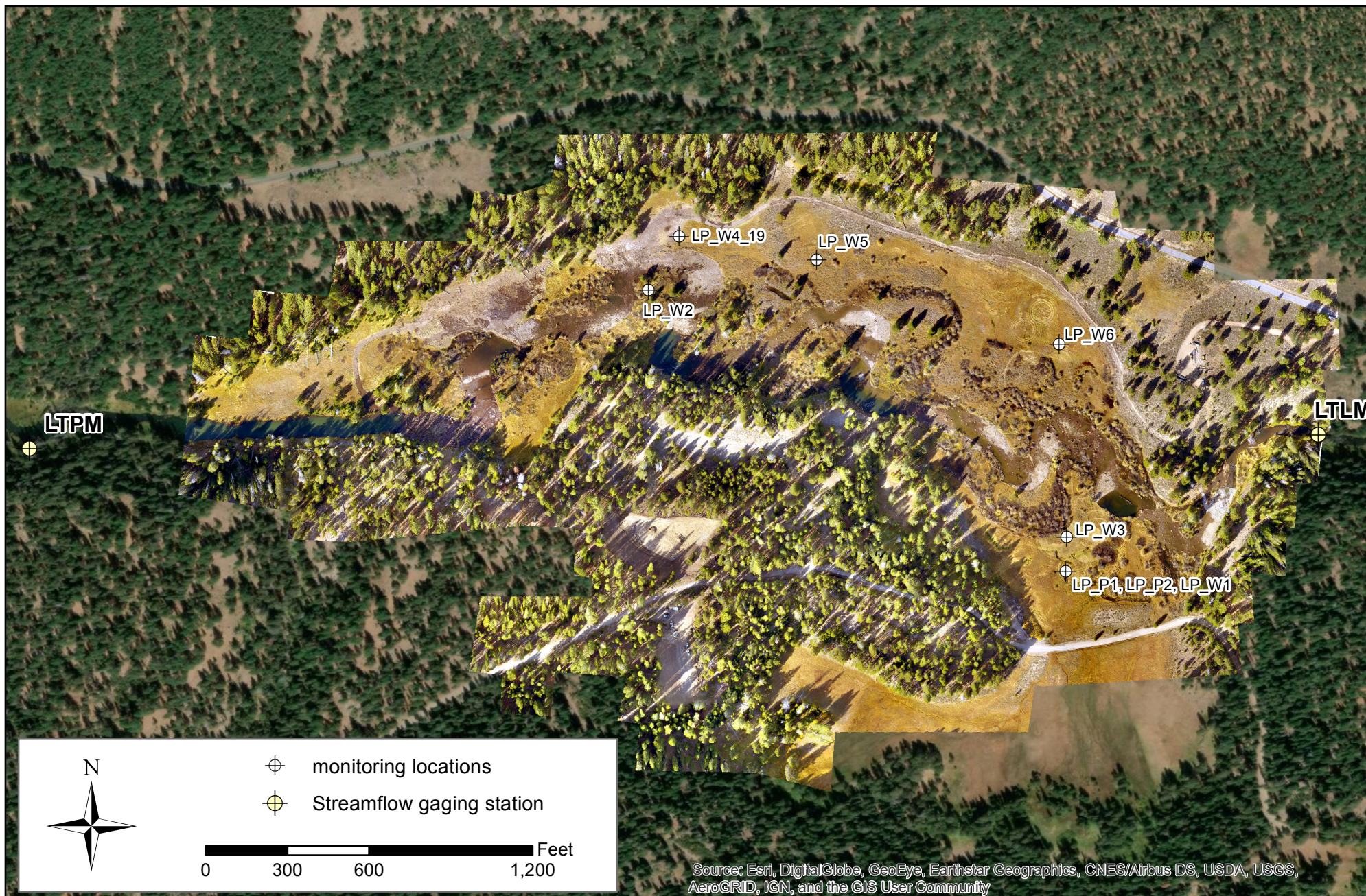


Figure 4. Location of groundwater and surface water monitoring stations, Lower Perazzo Meadow, Sierra County, California
 Monitoring stations established and monitored by UC Merced in WY2012 and WY2013. Balance Hydrologics has continued monitoring since WY2014. A new well was installed to replace LP_W4 in Summer of 2019.

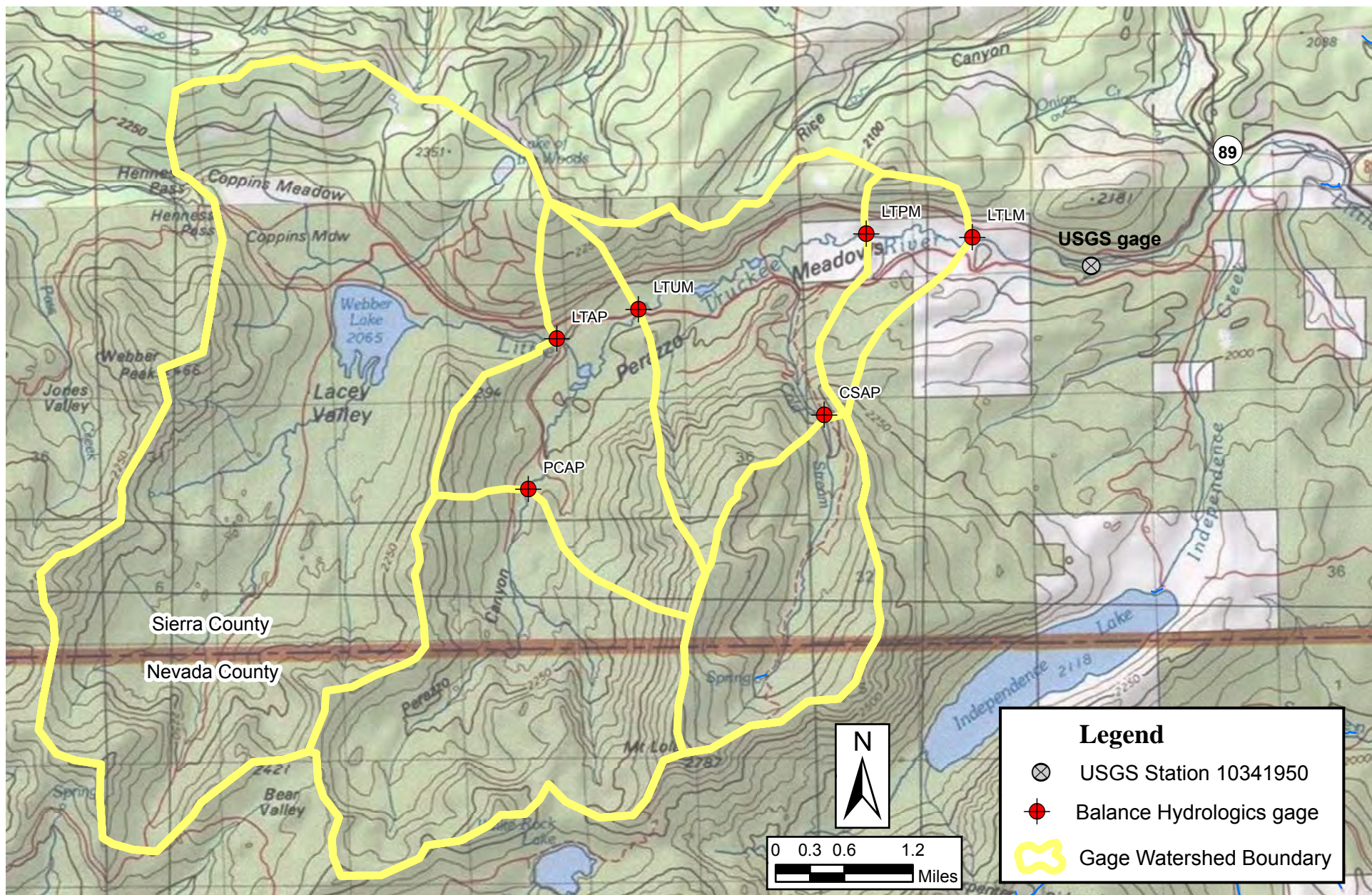


Figure 5. Stream gaging locations and contributing watersheds, Perazzo Meadows, Sierra and Nevada Counties, California

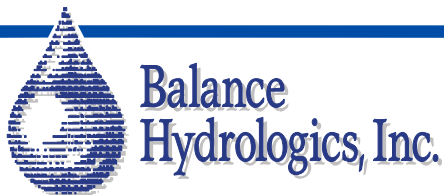
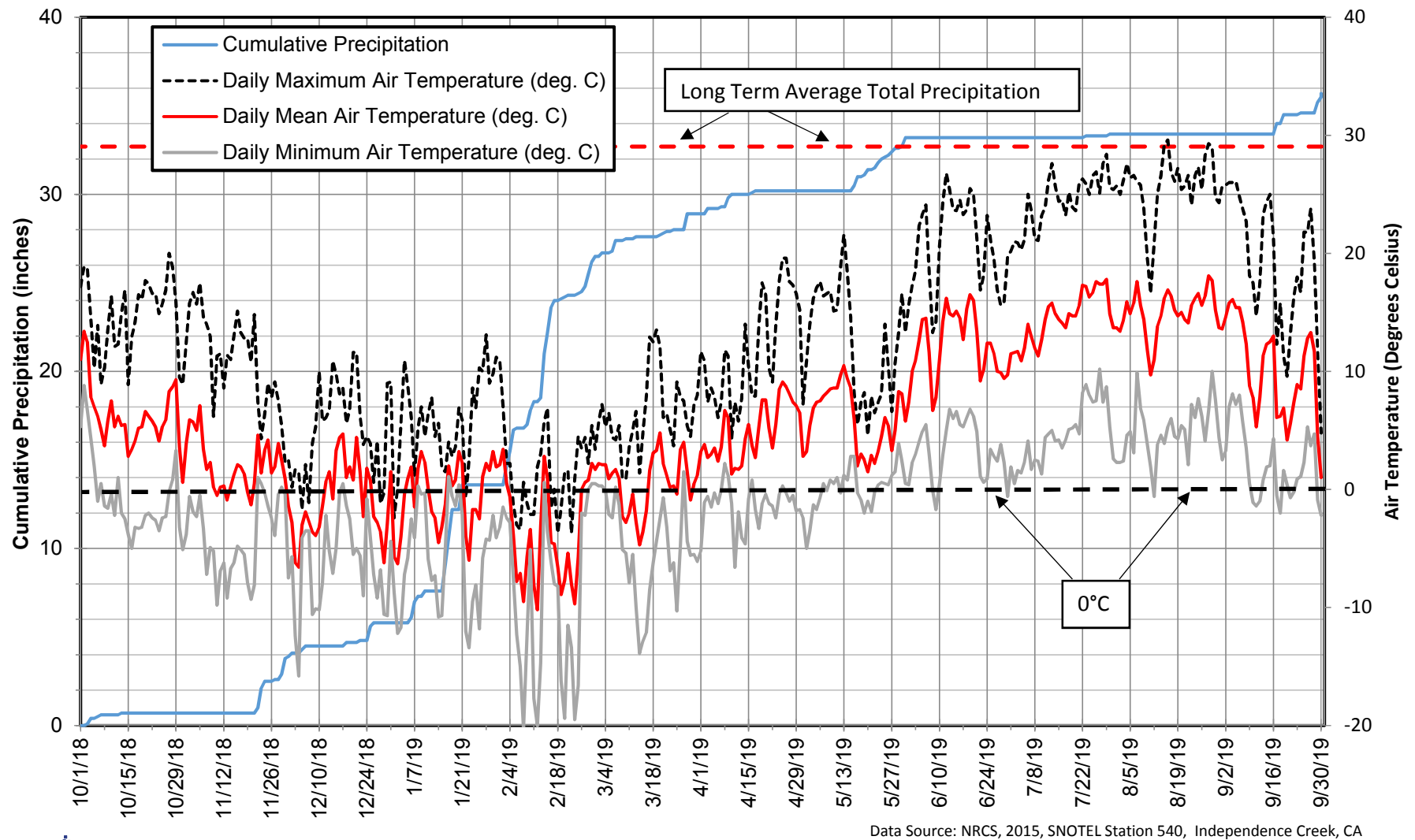
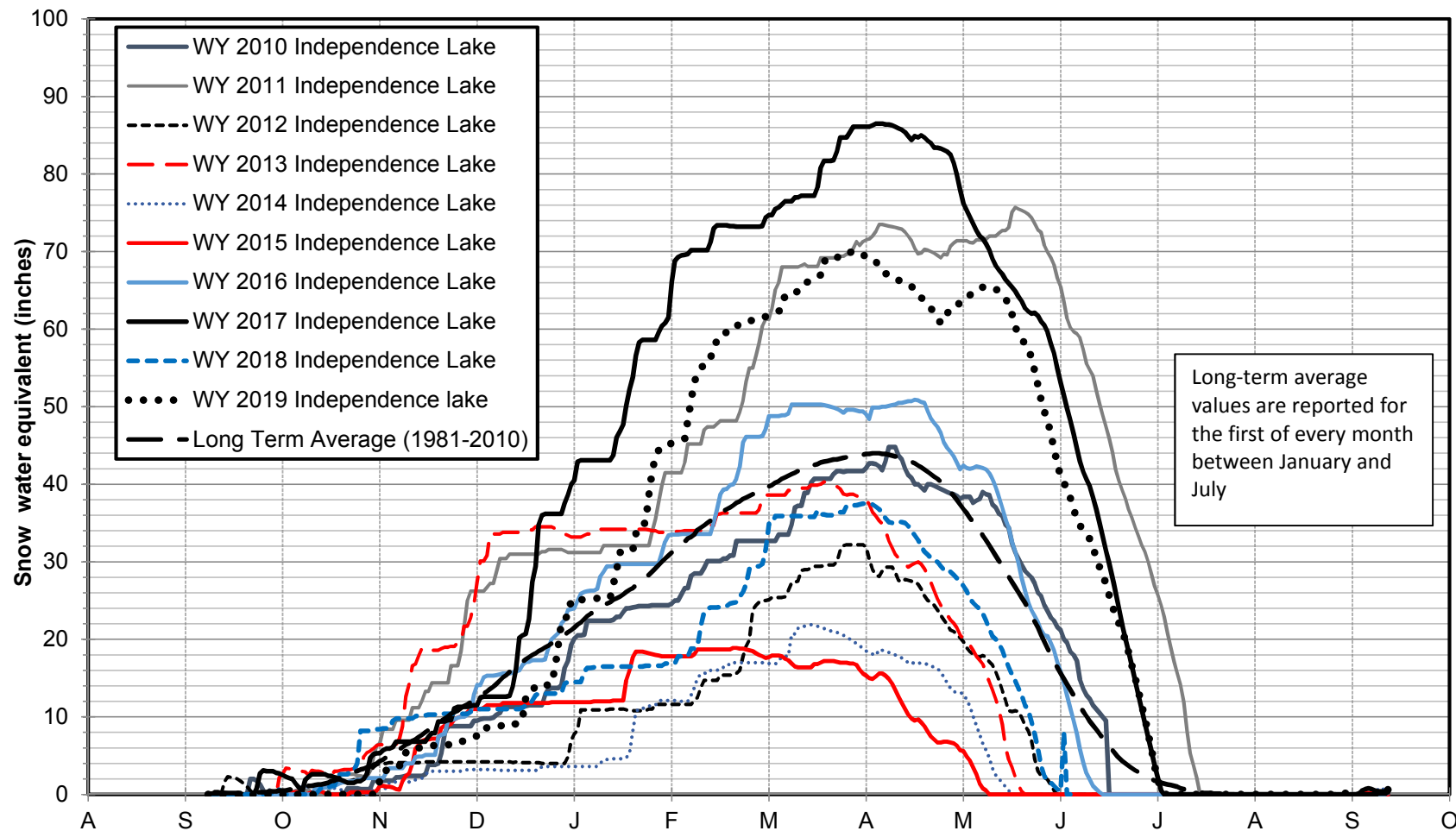


Figure 6. Cumulative precipitation and daily minimum, maximum and mean temperatures, Independence Creek, Sierra County, California, WY2019.
 SNOTEL Station 540: Independence Creek, located approximately 3.5 miles southeast of Perazzo Meadows at elevation 6,455 feet.



Data Source: NRCS, 2015, SNOTEL Station 541 & 540, Independence Lake and Independence Creek, CA

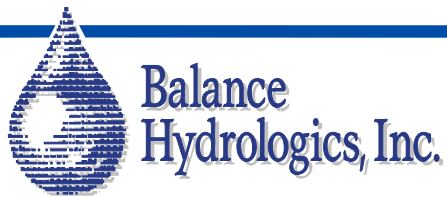


Figure 7. Snow water equivalent (SWE), Independence Lake SNOTEL Station, Nevada County, California, water years 2010 through 2019 as compared to long-term average. The Independence Lake SNOTEL station 541 is located approximately 3.5 miles southwest of Perazzo Meadows at 8,352 feet elevation. The WY2017 maximum SWE of 86.5 inches was the highest SWE depth ever recorded at this station. In contrast WY2019 maximum SWE was 70 inches on April 19, 2019, 26 inches above the long term average on the same day.

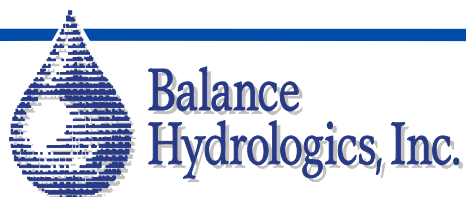
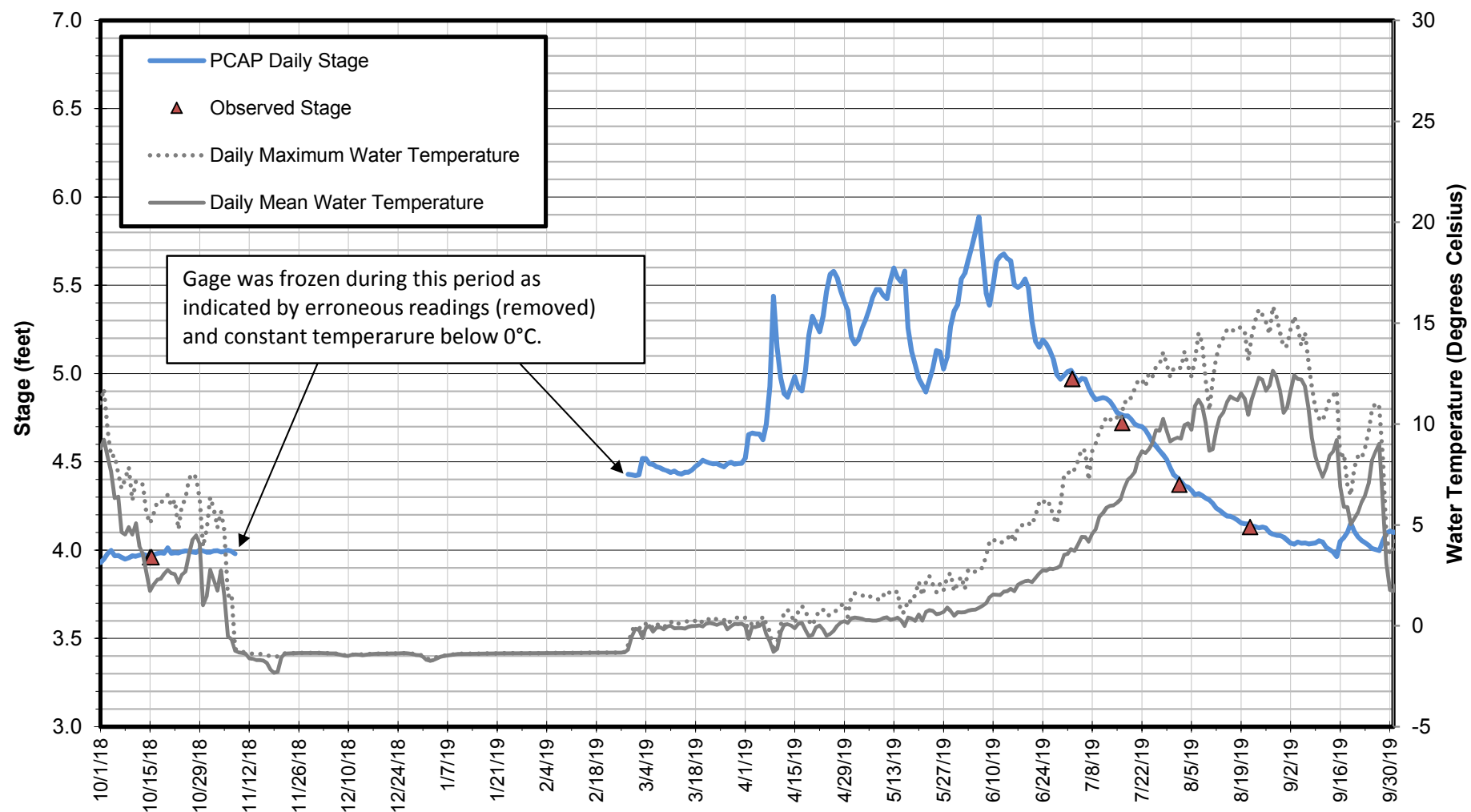


Figure 8. Daily stage and water temperature, Perazzo Creek above Perazzo Meadows (PCAP), Sierra County, California, WY2019.

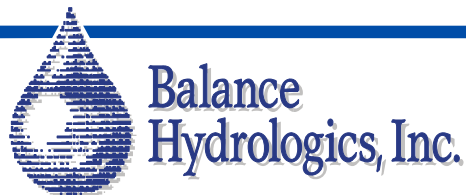
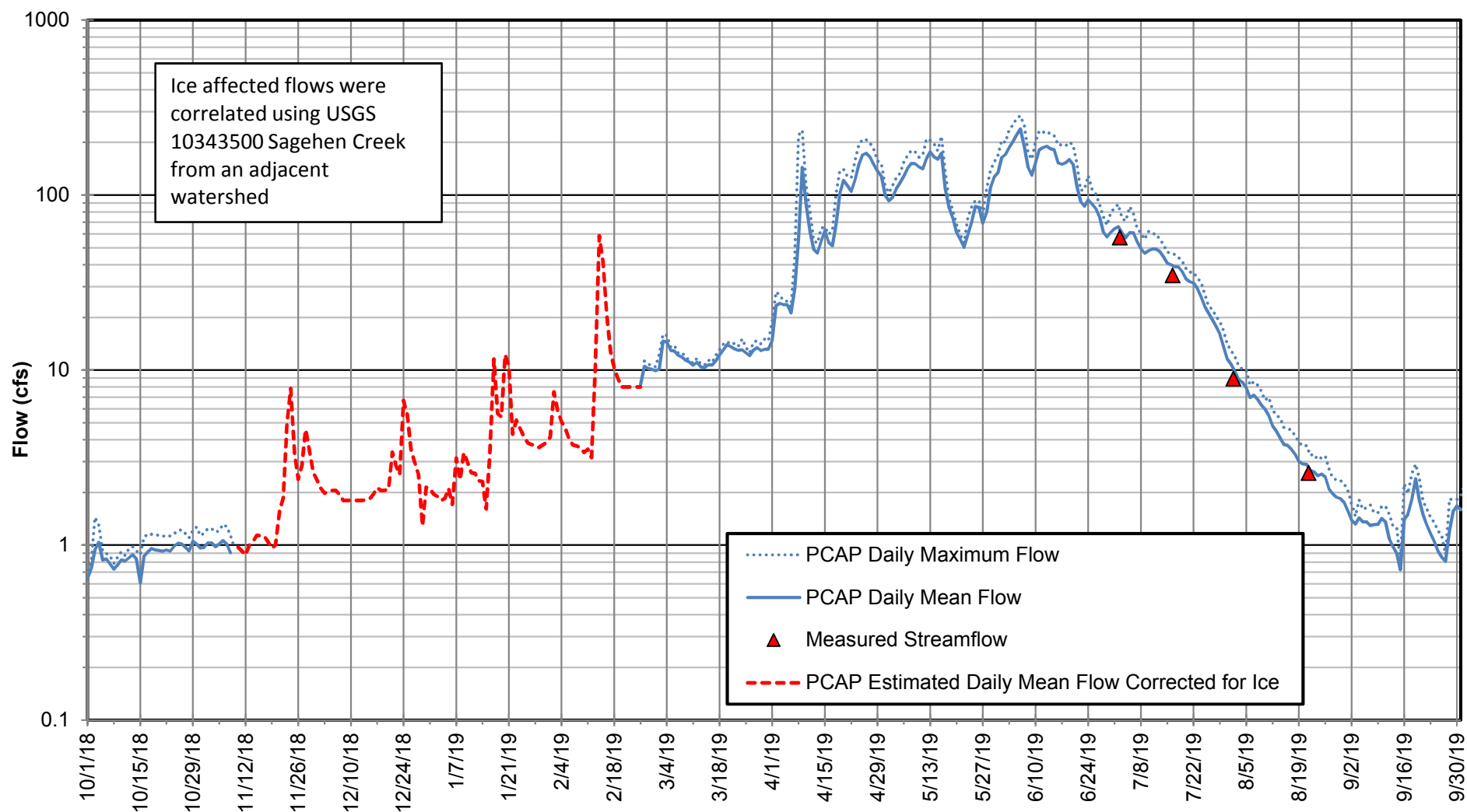


Figure 9. Daily flow hydrograph, Perazzo Creek above Perazzo Meadows (PCAP), Sierra County, California, WY2019. The peak flow of the water year was approximately 284 cfs occurring on June 6, 2019 during snowmelt. Interpolation was used for ice corrected flows at times where there was no precipitation input.

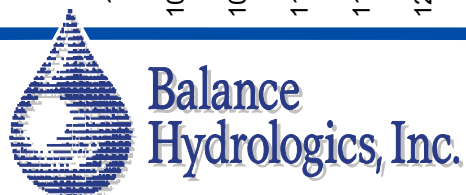
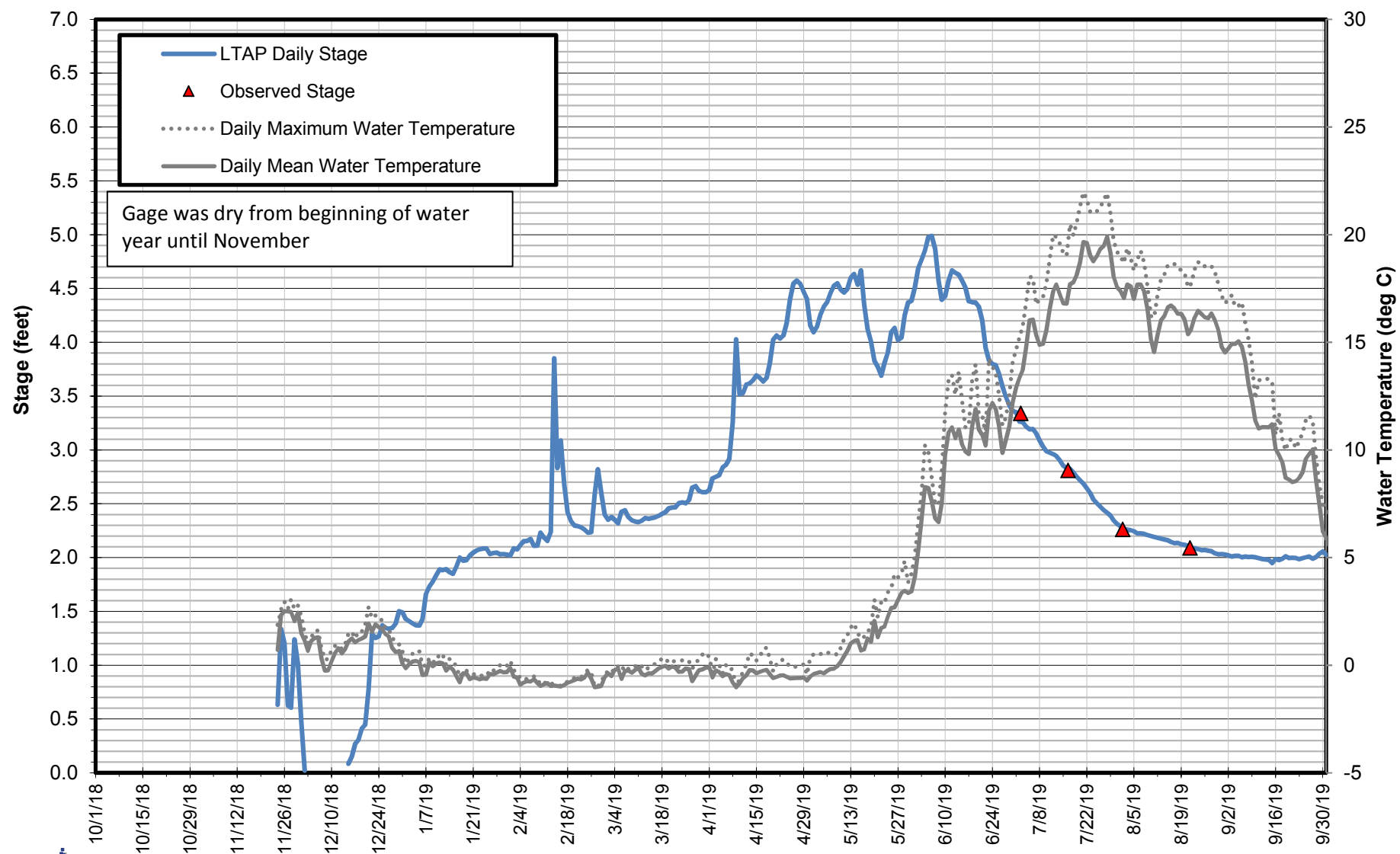


Figure 10. Daily stage and water temperature: Little Truckee above Perazzo Meadows (LTAP), Sierra County, California, WY2019.

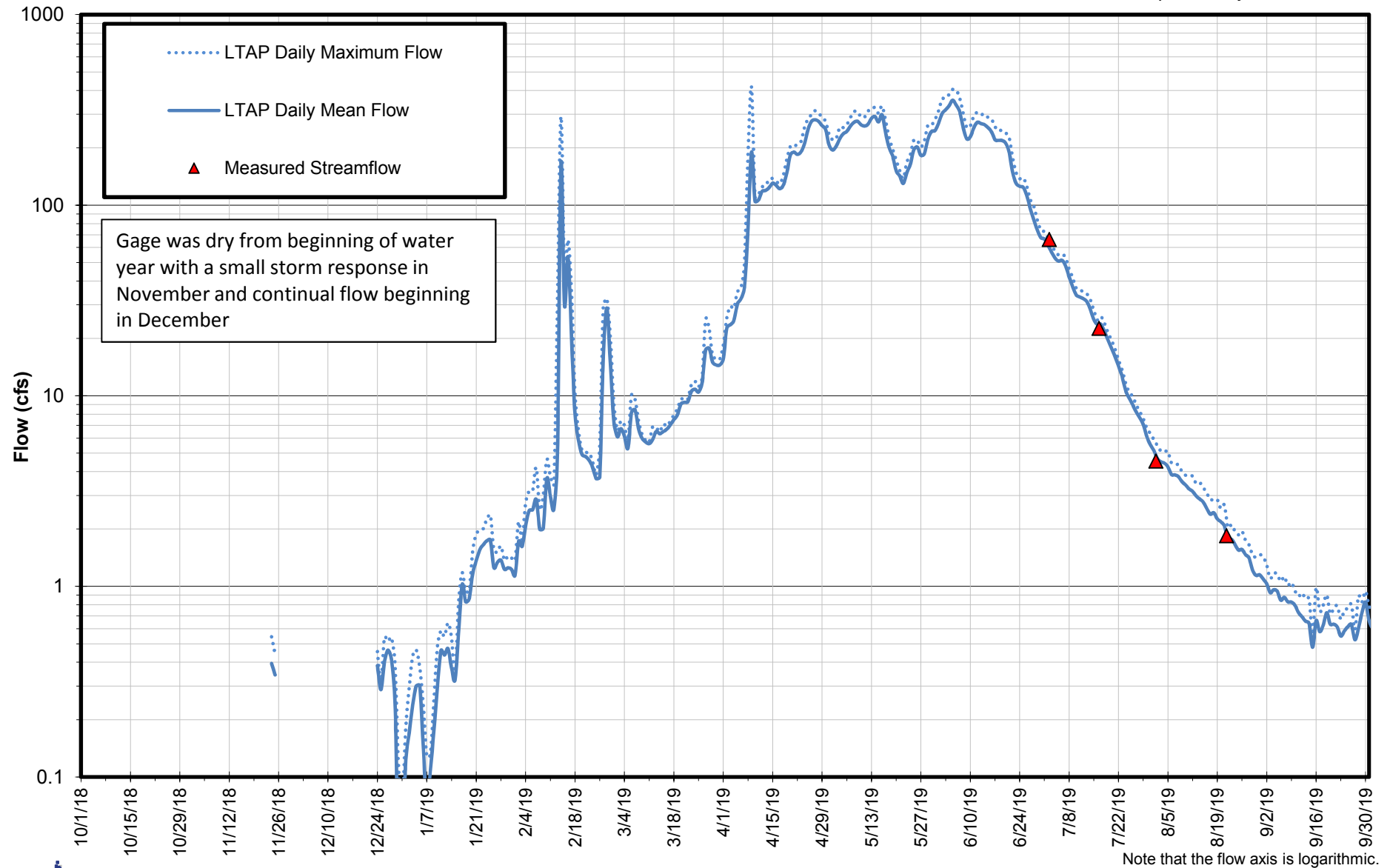
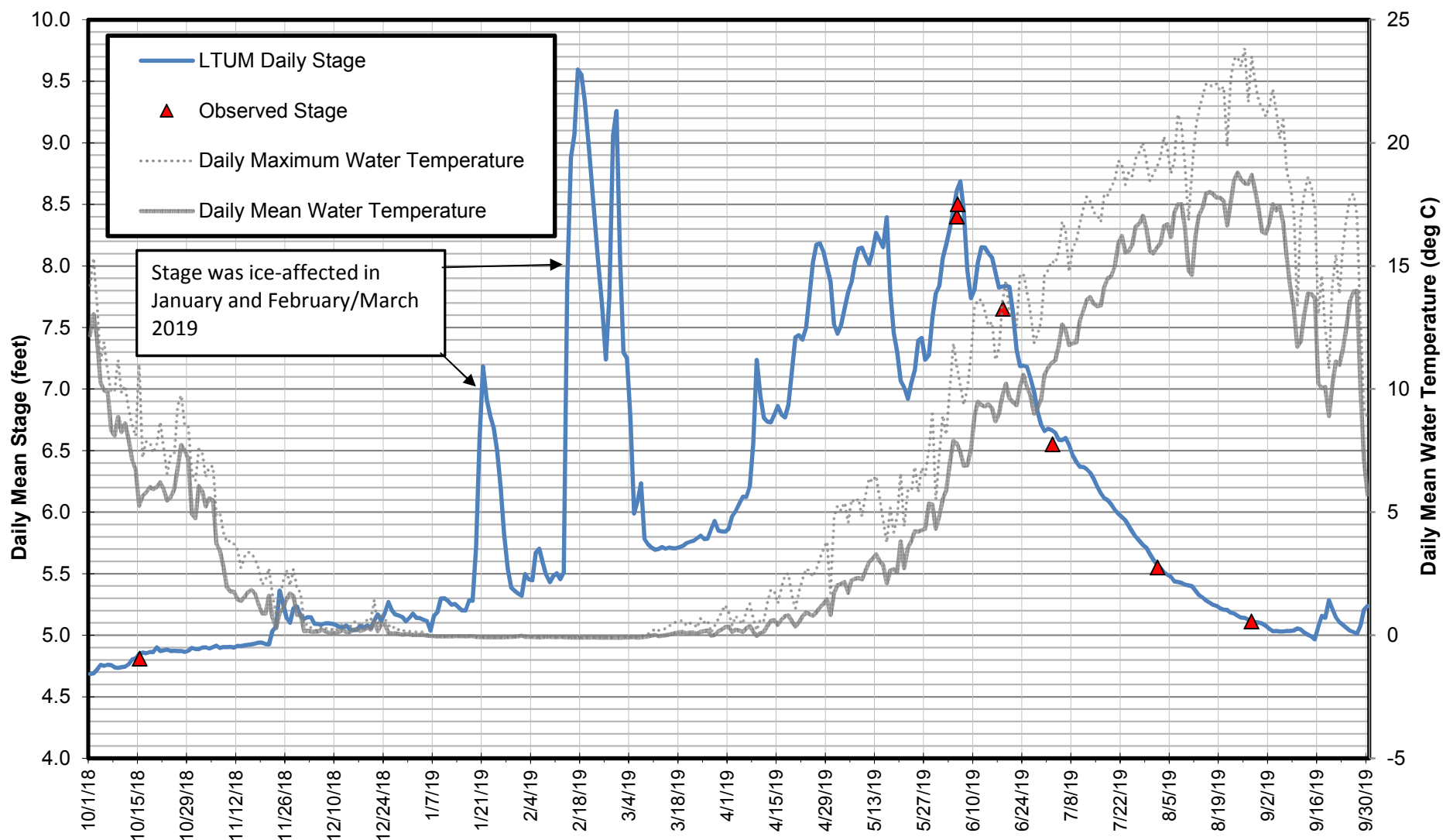


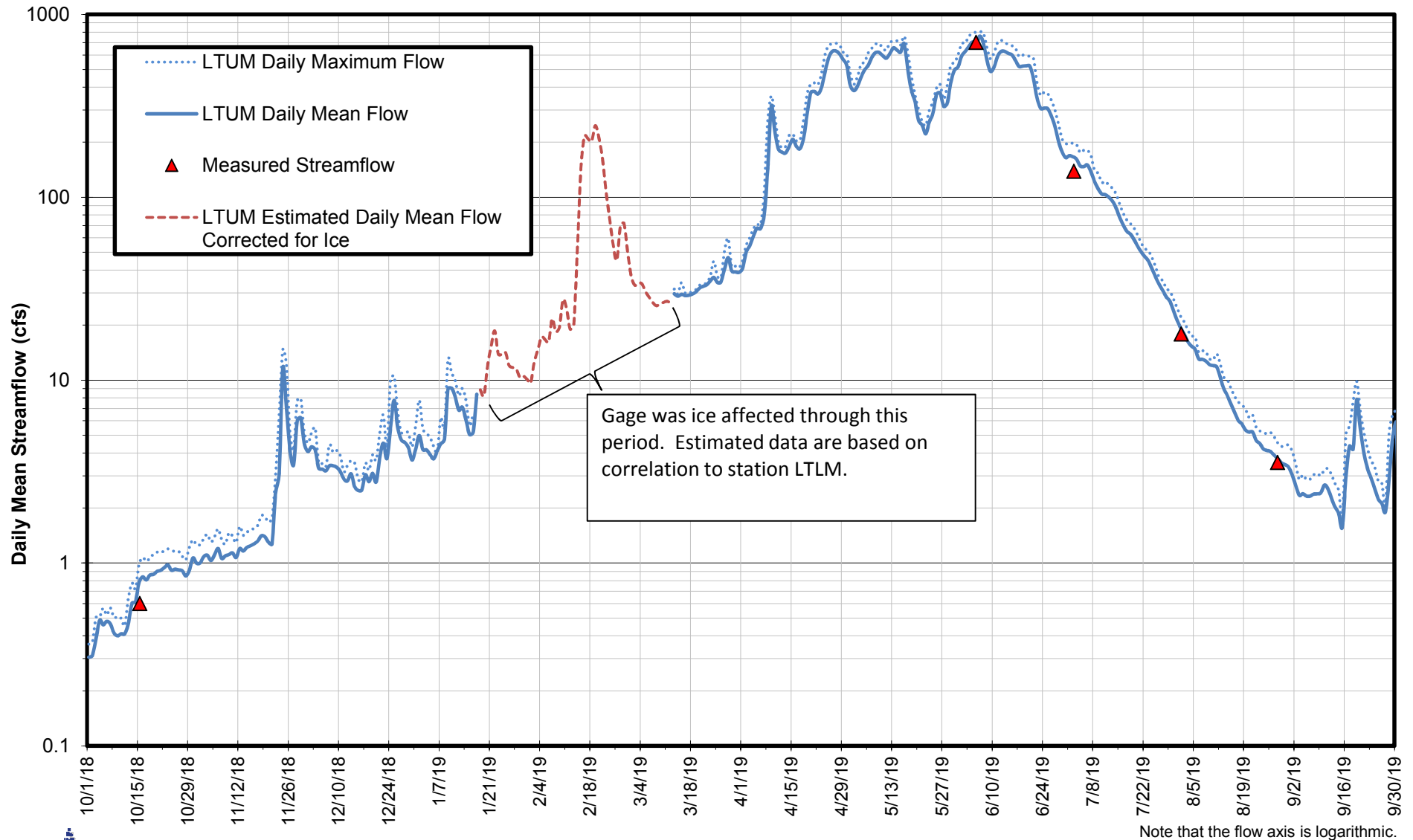
Figure 11. Daily flow hydrograph, Little Truckee River above Perazzo Meadows (LTAP), Sierra County, California, WY2019. The peak flow of the water year was approximately 458 cfs occurring on April 9, 2019. Peak flow during snowmelt was 445 cfs on June 5, 2019.



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Figure 12. Daily stage and water temperature, Little Truckee River below Upper Perazzo Meadow (LTUM), Sierra County, California, WY2019.

Preliminary and subject to revision



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Figure 13. Daily flow hydrograph, Little Truckee River below Upper Perazzo Meadow (LTUM), Sierra County, California, WY2019. The estimated peak flow of the water year was approximately 800 cfs occurring on June 6, 2019 during snow melt.

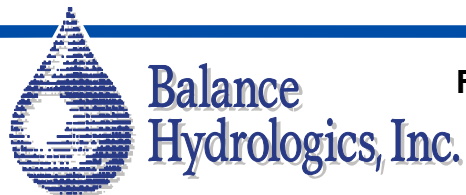
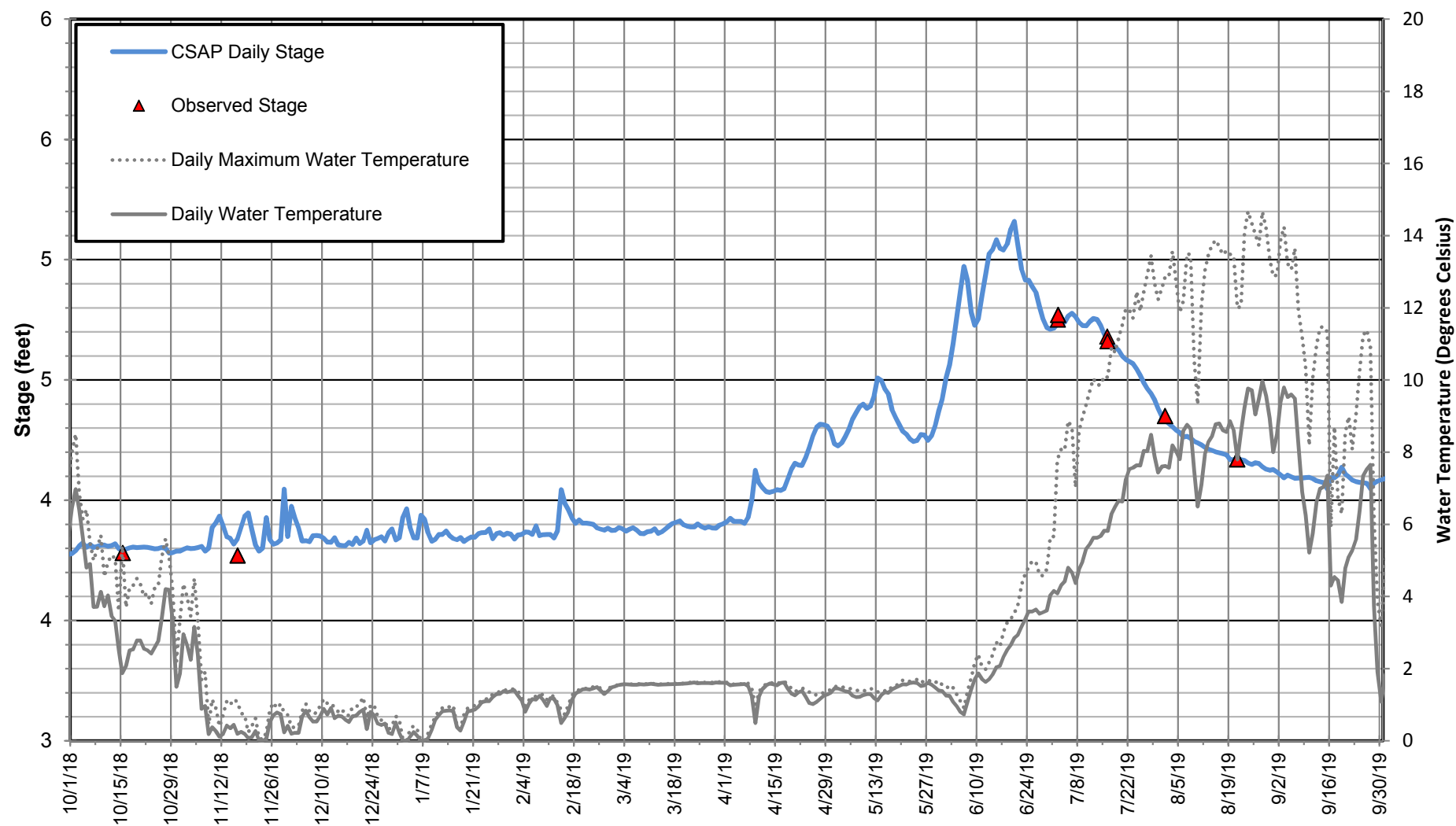


Figure 14. Daily stage and water temperature, Cold Stream above Perazzo Meadows (CSAP), Sierra County, California, WY2019.

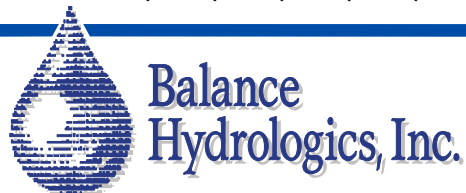
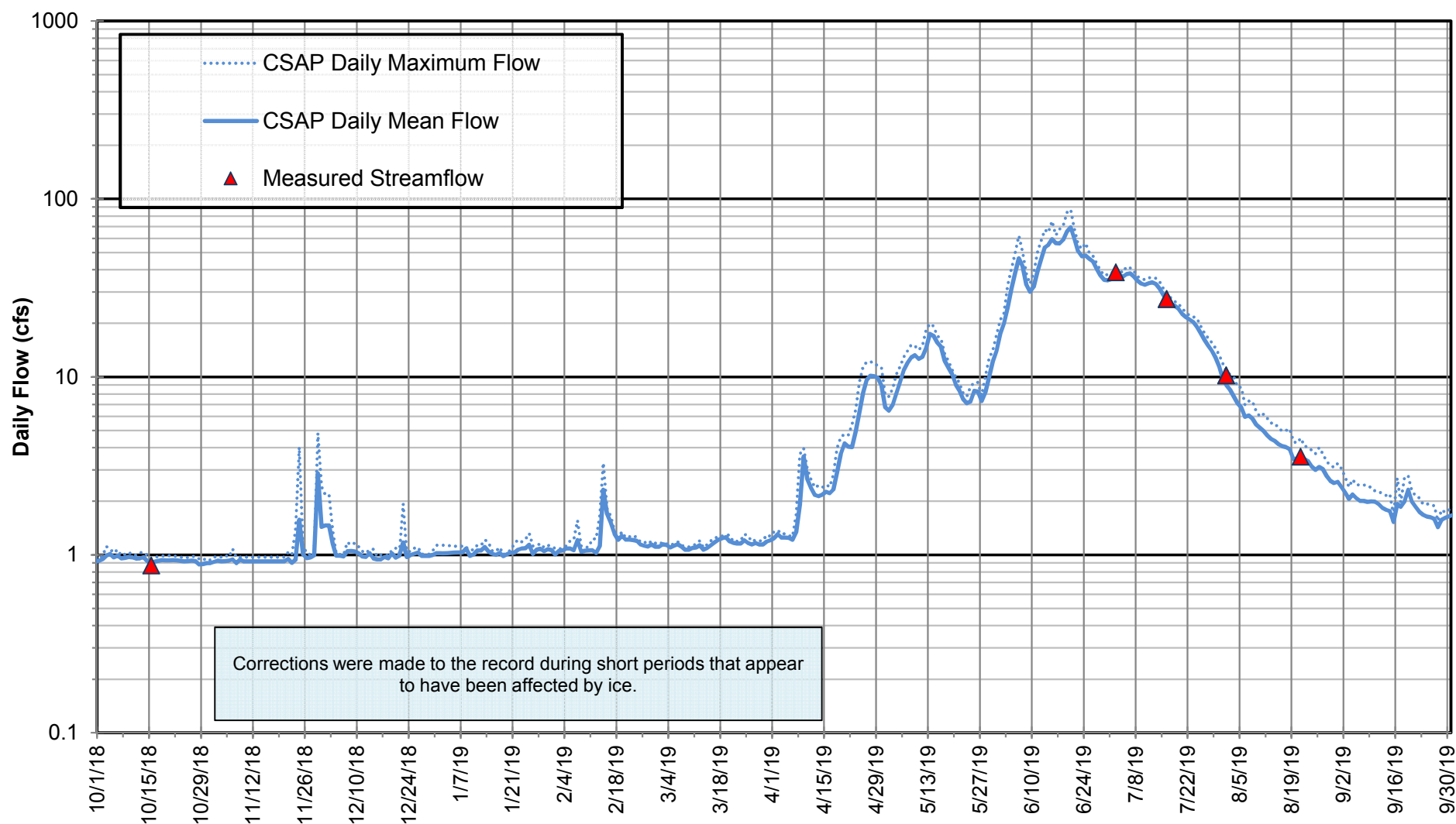


Figure 15. Daily flow hydrograph, Cold Stream above Perazzo Meadows (CSAP), Sierra County, California, WY2019. The estimated annual peak flow of 87 cfs occurred on June 20, 2019 during snowmelt.

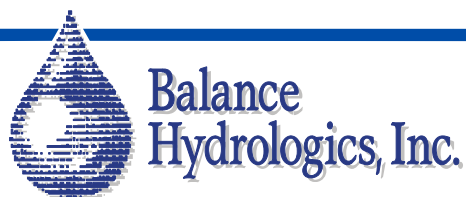
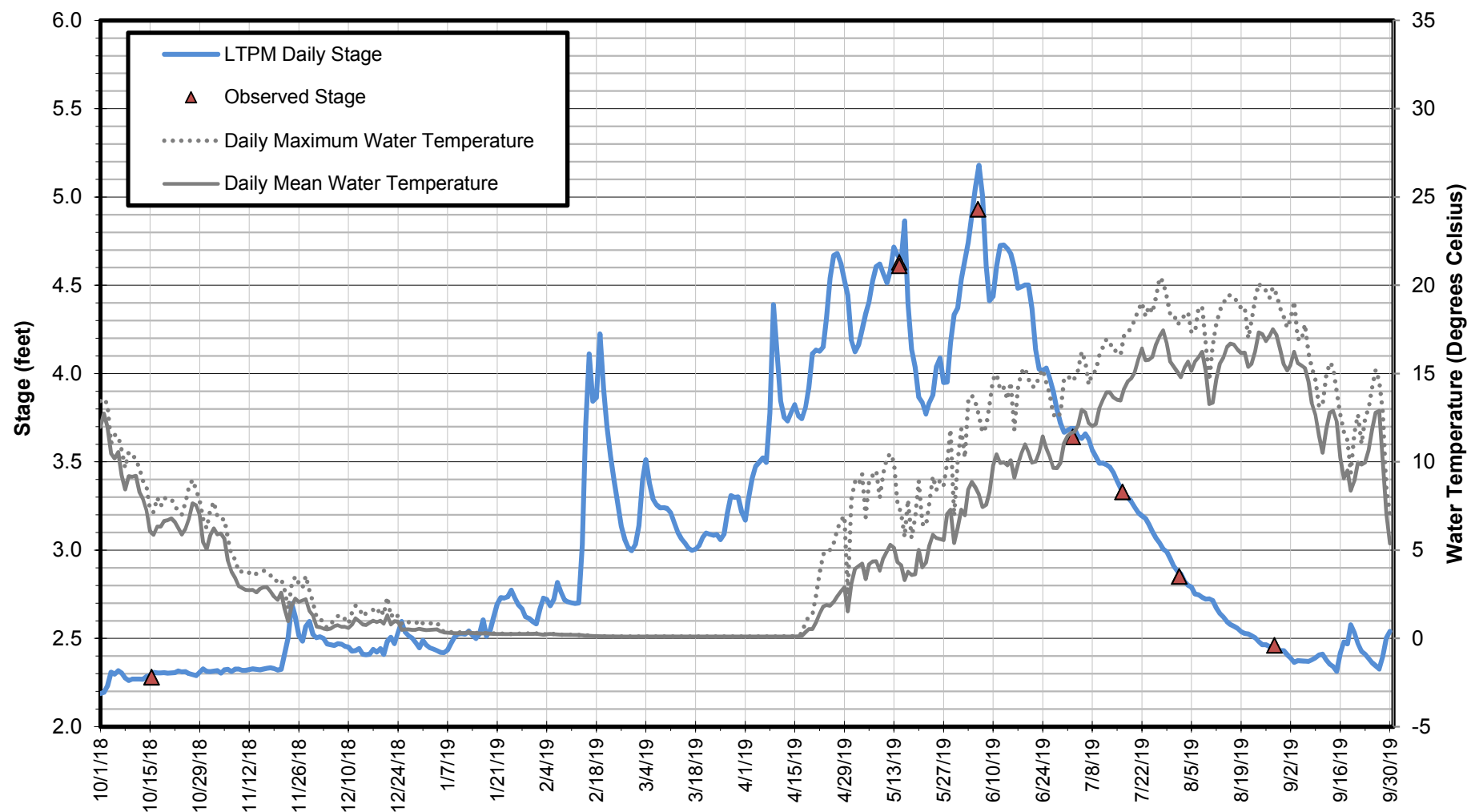
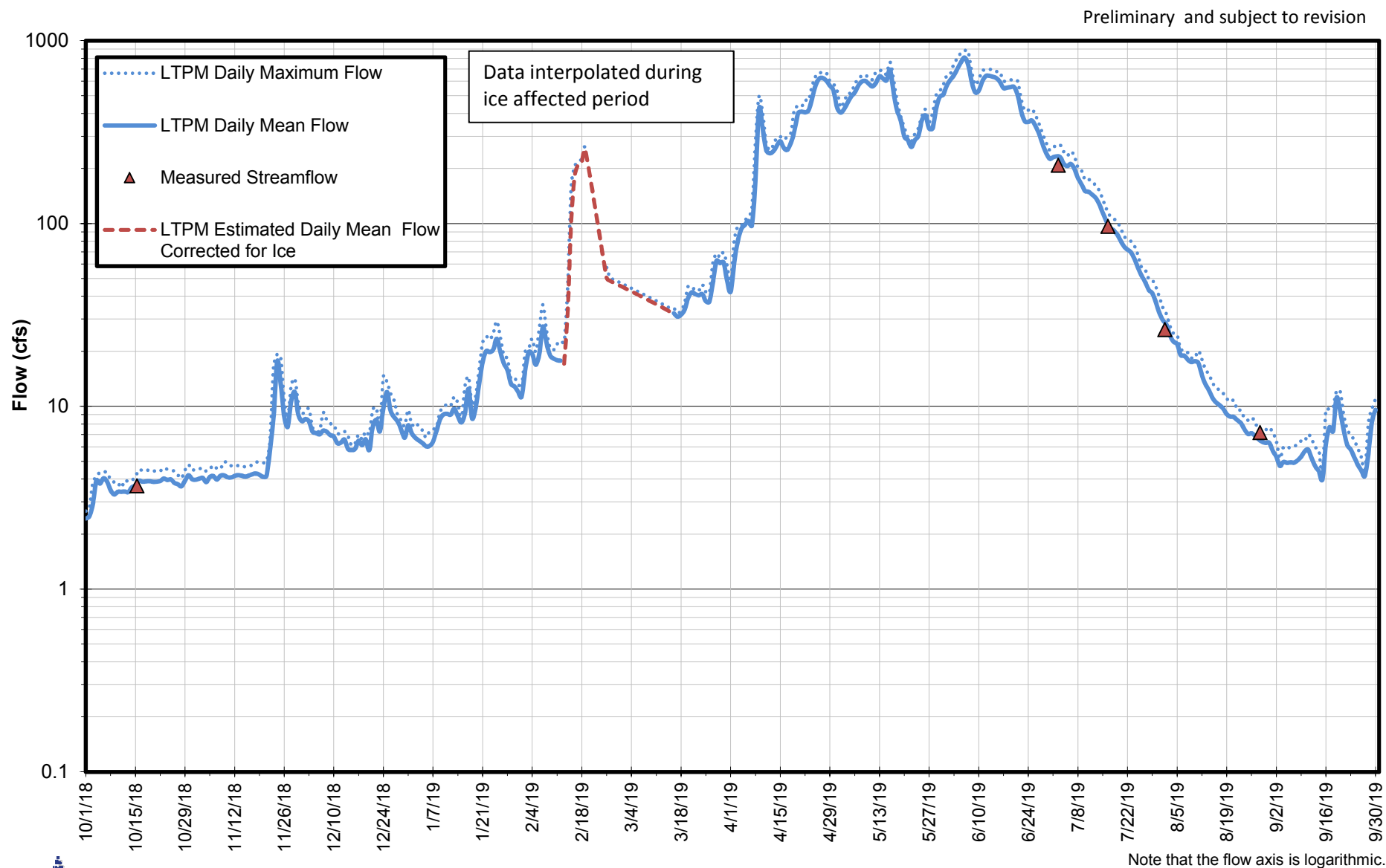
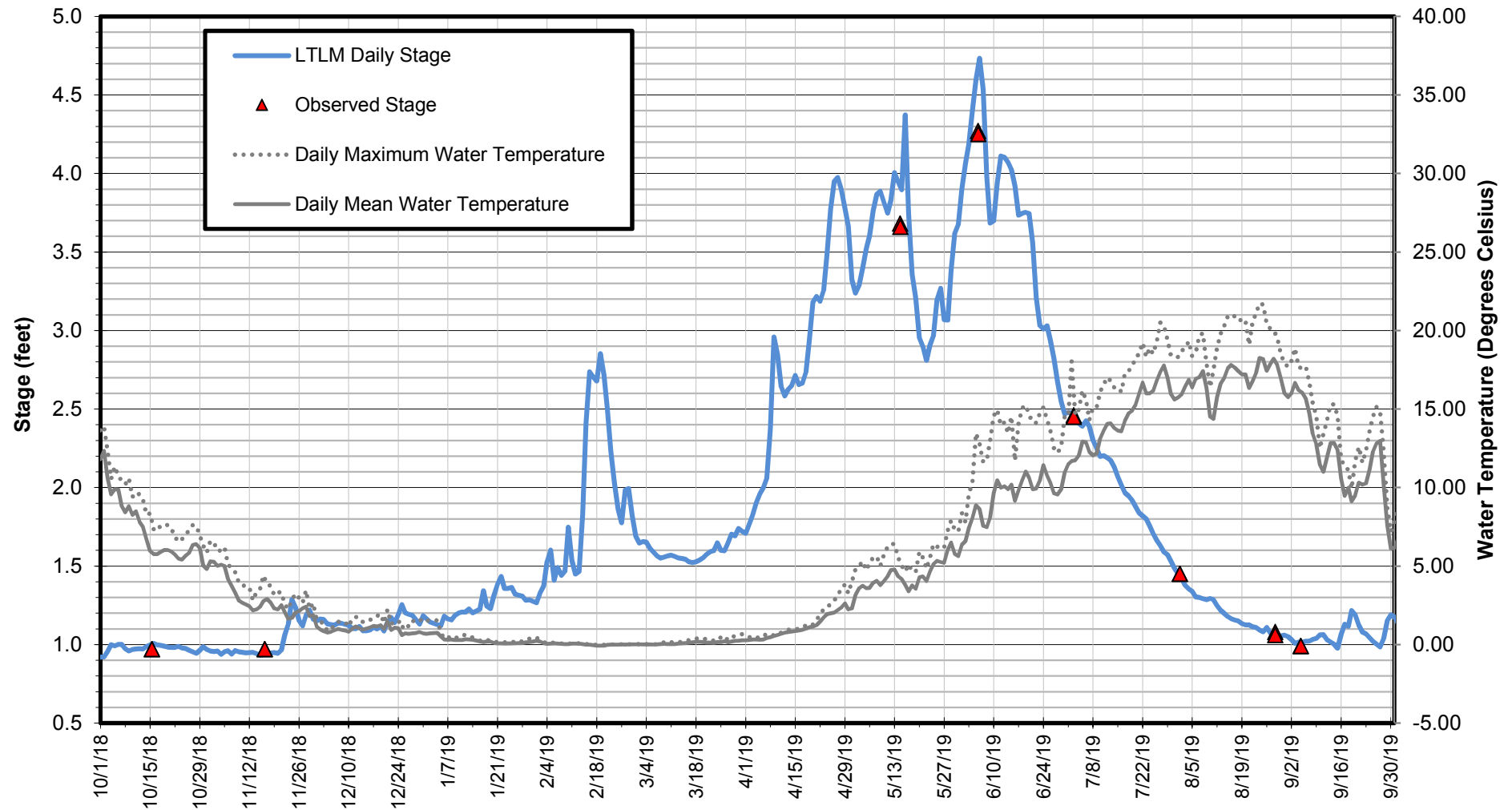


Figure 16. Daily stage and water temperature, Little Truckee River below Middle Perazzo Meadow (LTPM), Sierra County, California, WY2019.



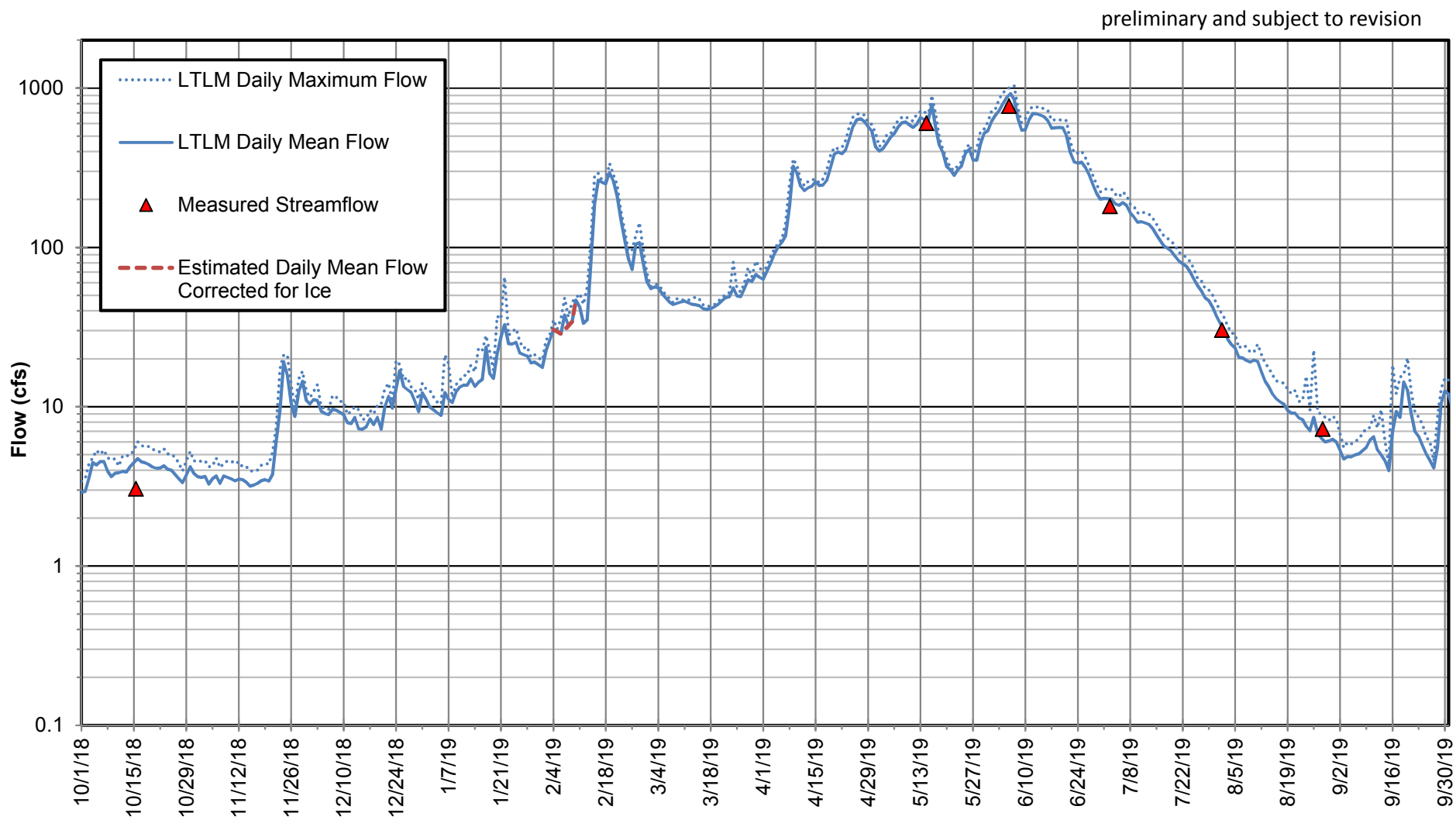
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Figure 17. Daily flow hydrograph, Little Truckee River below Middle Perazzo Meadow (LTPM), Sierra County, California, WY2019. A peak flow of 881 cfs occurred on June 6, 2019 during snowmelt runoff.



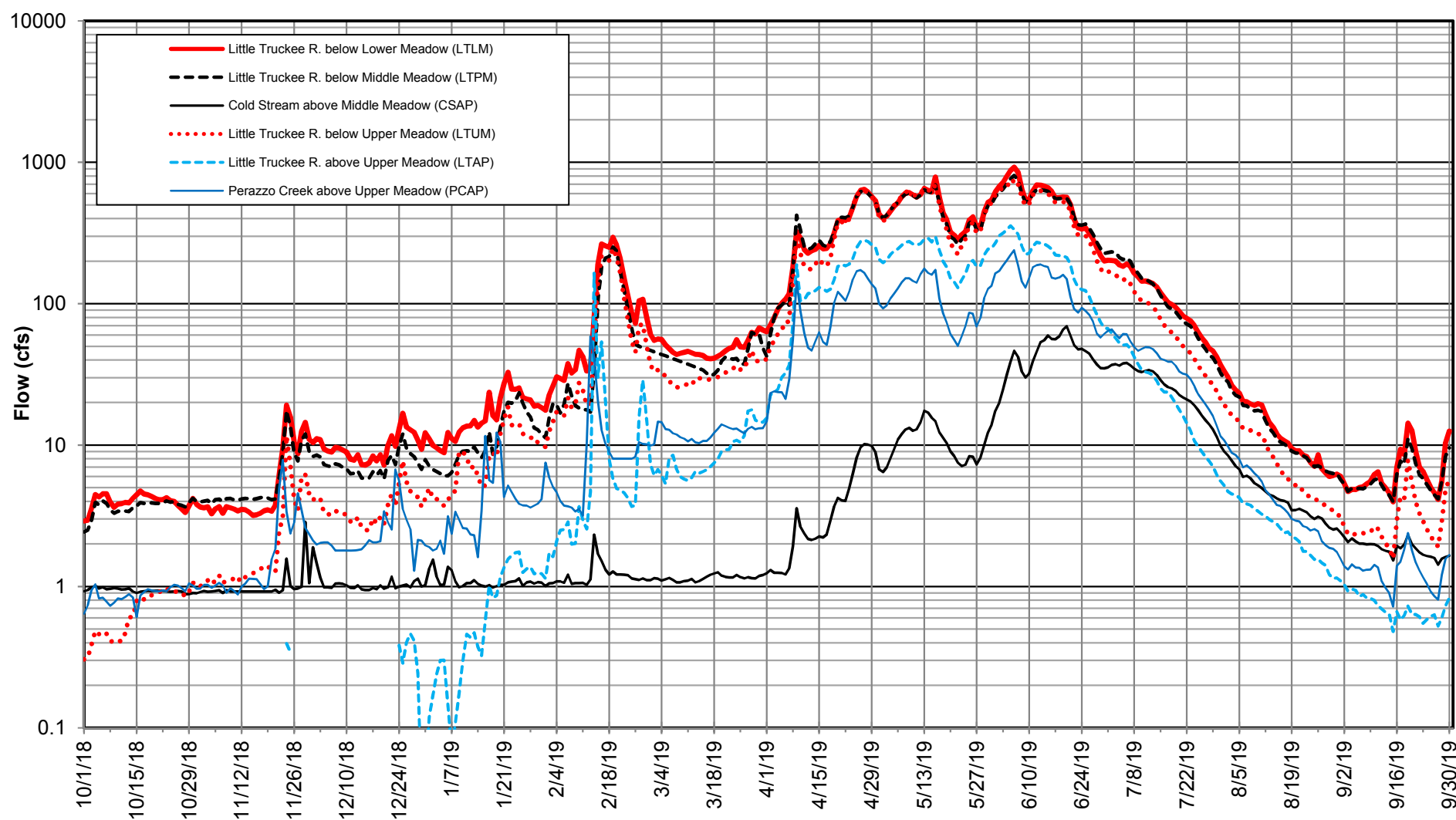
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Figure 18. Daily stage and water temperature: Little Truckee River below Lower Perazzo Meadow (LTLM), Sierra County, California, WY2019.



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Figure 19. Daily flow hydrograph, Little Truckee River below Lower Perazzo Meadow, (LTLM), Sierra County, California, WY2019. The estimated peak flow of 1035 cfs occurred on June 7, 2019 during snowmelt runoff.



Please note that the flow axis is logarithmic

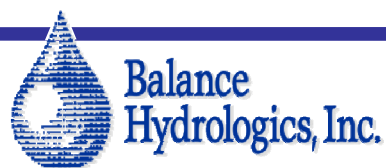


Figure 20.

Daily flow hydrographs for all stations, Perazzo Meadows, Sierra County, California, WY2019. Peak flows in WY2019 were recorded between June 5 and 7, 2019 at all stations during snowmelt except CSAP which peaked on June 20, 2019 due to higher elevation and snowpack.

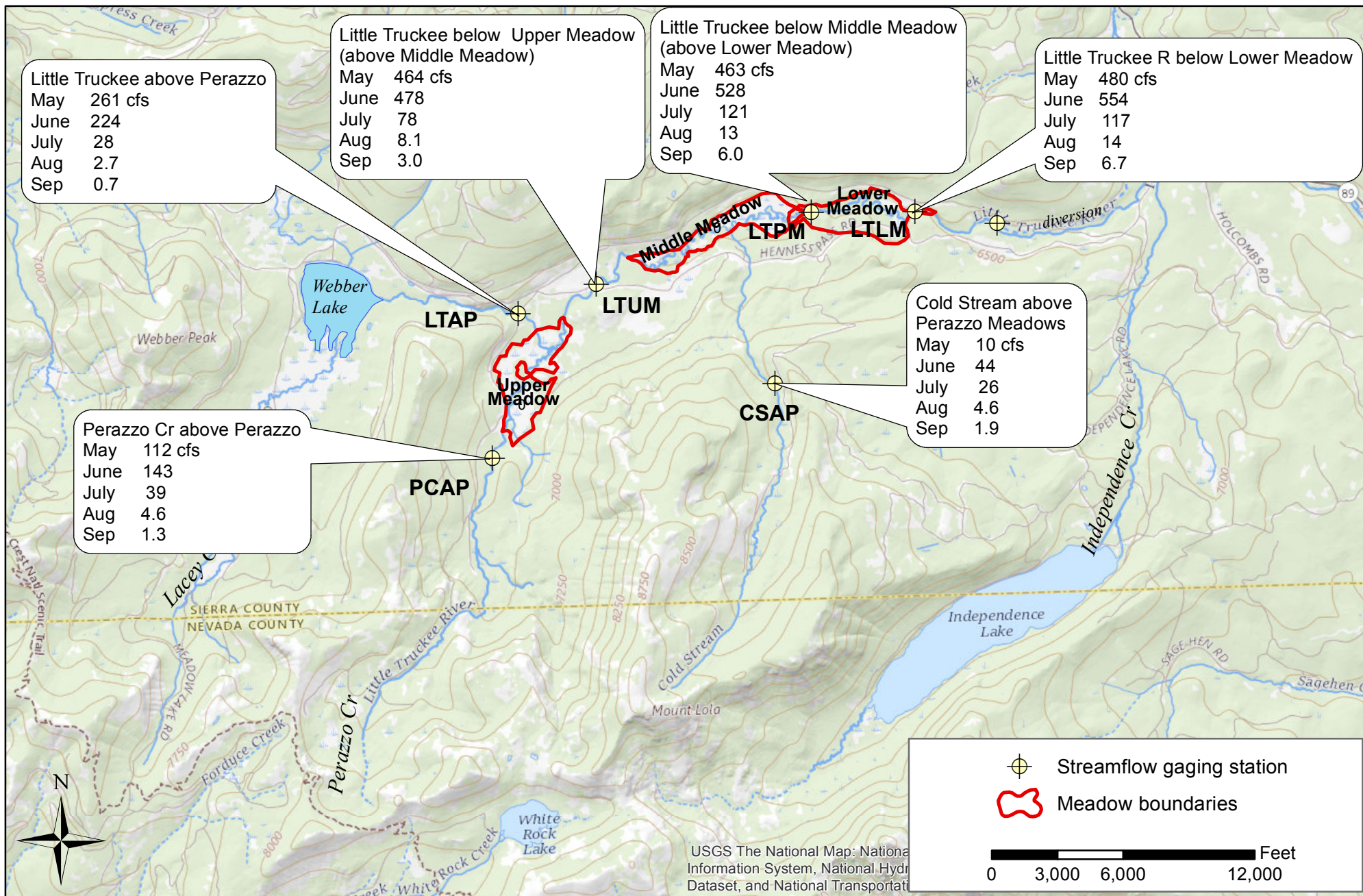


Figure 21. Monthly streamflow during the snowmelt recession period, WY2019, Perazzo Meadows, Sierra County, California

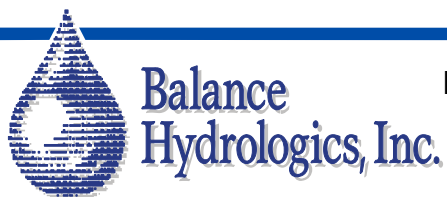
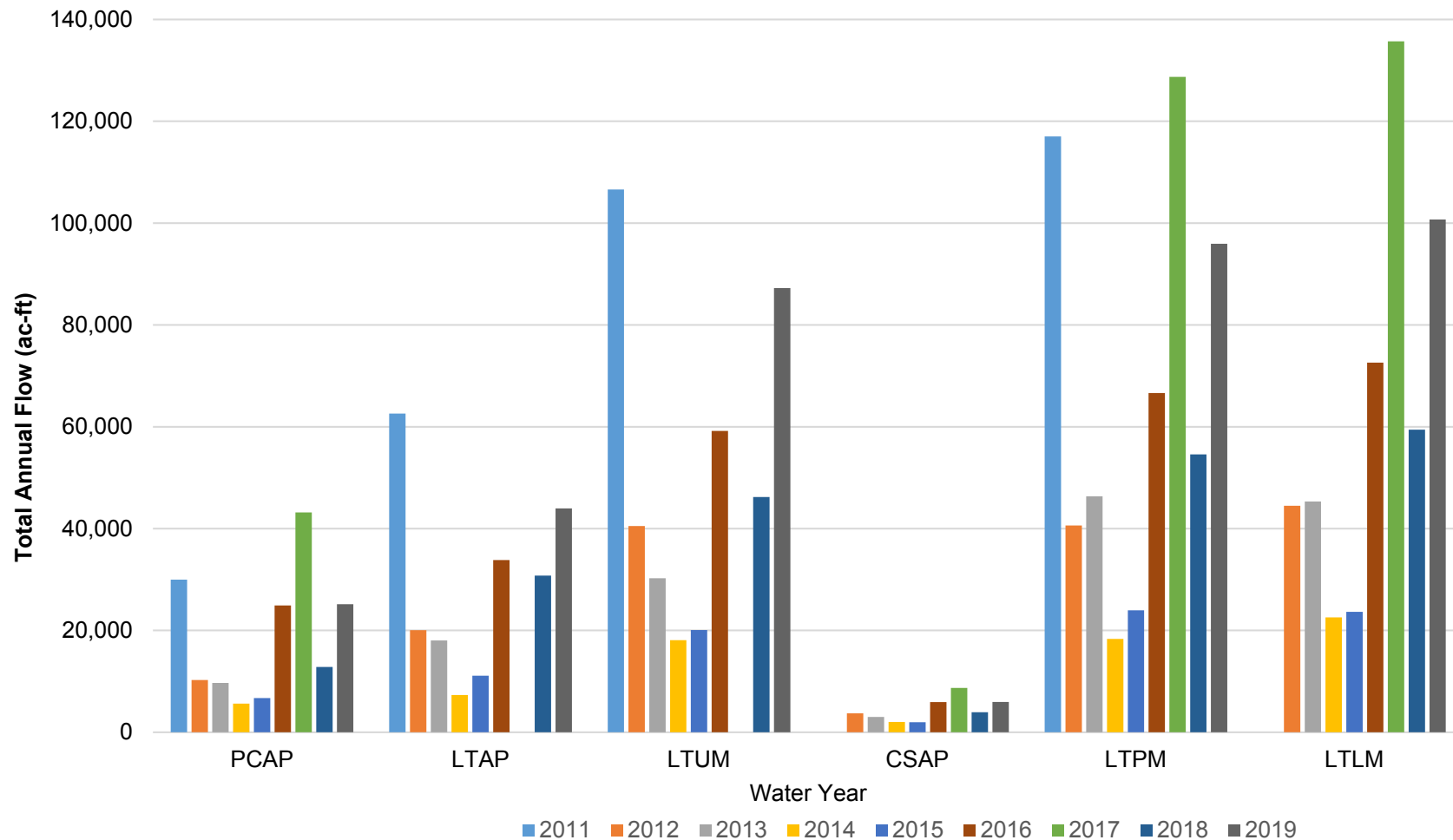
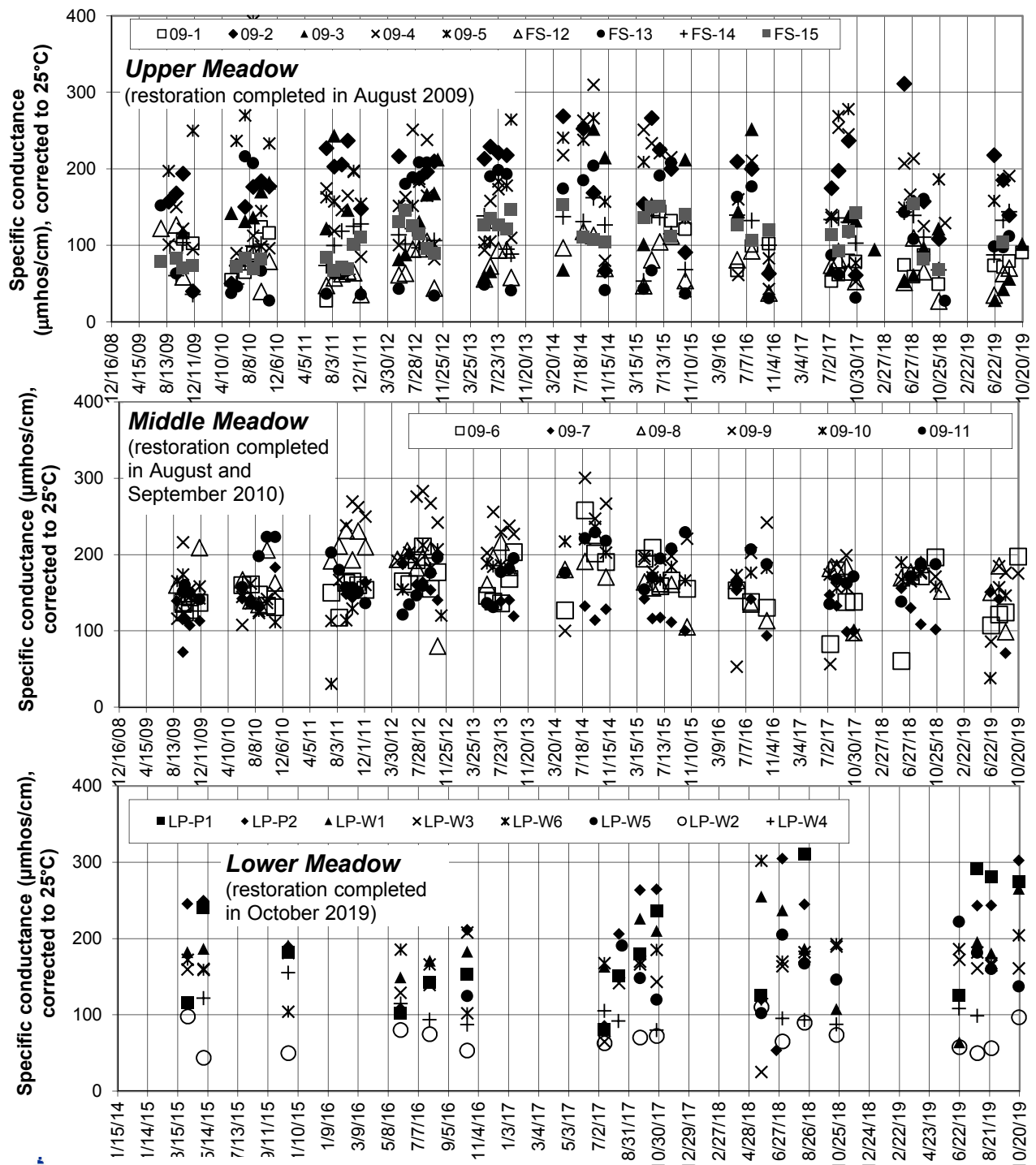


Figure 22. Total annual flow for all stream gages, Perazzo Meadows, Sierra County, California, WY2011 through WY2019. LTAP and LTUM did not have complete data records for WY2017 due to damage during high flows that year.



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**Figure 23. Specific conductance of groundwater,
Upper, Middle and Lower Perazzo Meadows,
Sierra County, California**
See Figures 2, 3 and 4 for piezometer locations.

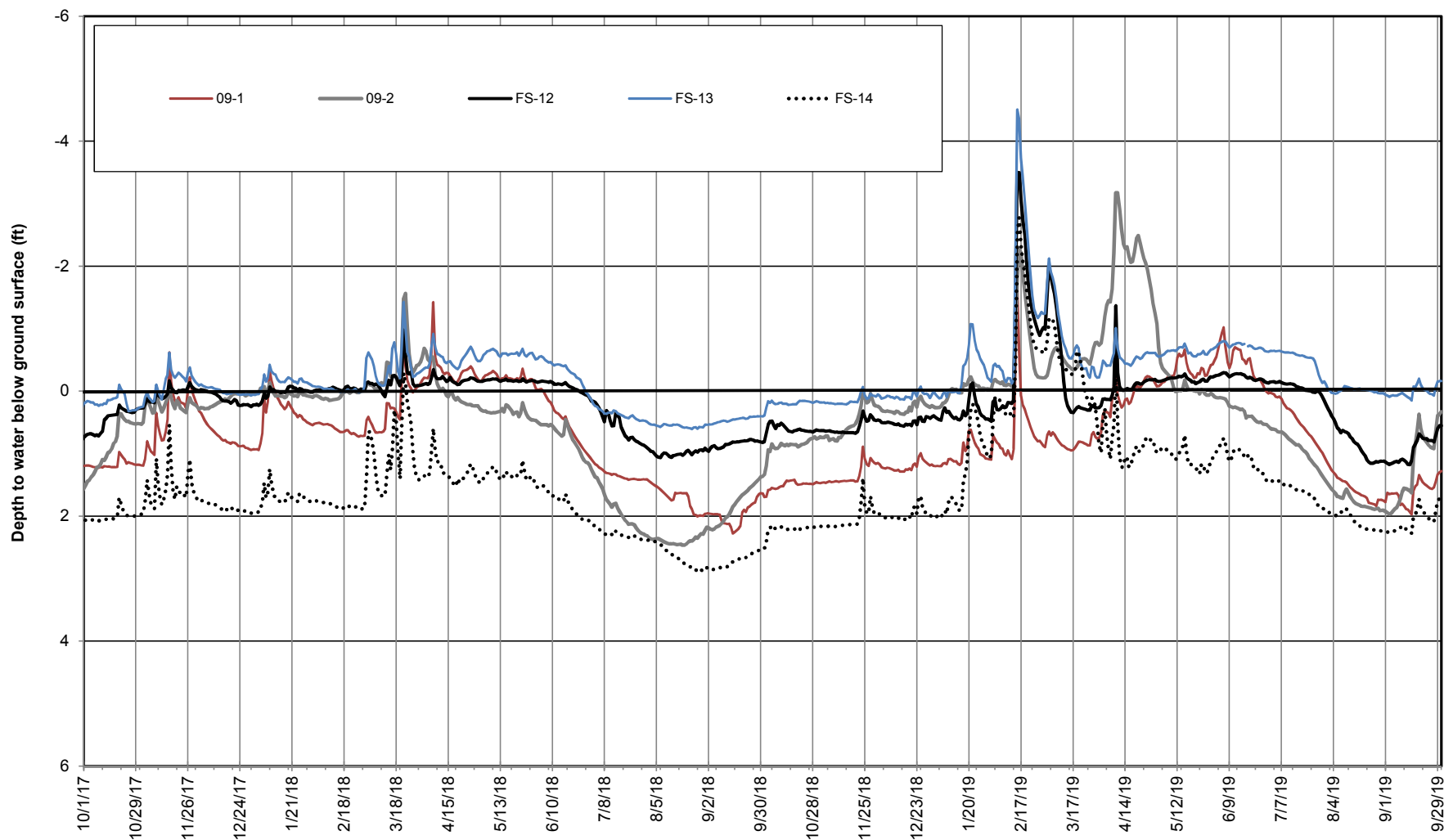
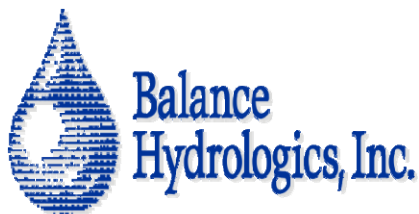


Figure 24. Depth to groundwater, WY2018 and WY2019, Upper Perazzo Meadow, Sierra County, California.

This figure shows the peizometers from the Southern portion of Upper Perazzo Meadow. Peizometer 09-2 is furthest from the channel in an open meadow area. The record indicates the meadow where 09-2 is located was inundated during April as snow and/or ice likely diverted flow from the adjacent peizometer locations (FS-12, FS13 and FS-14) or there was a pulse of snowmelt flow/ groundwater recharge to this area from the other branch of the valley. FS-12 and FS-13 show a noticeable drop in groundwater levels on July 25, 2019, possibly due to a debris dam or beaver dam break that drained the surrounding meadow.



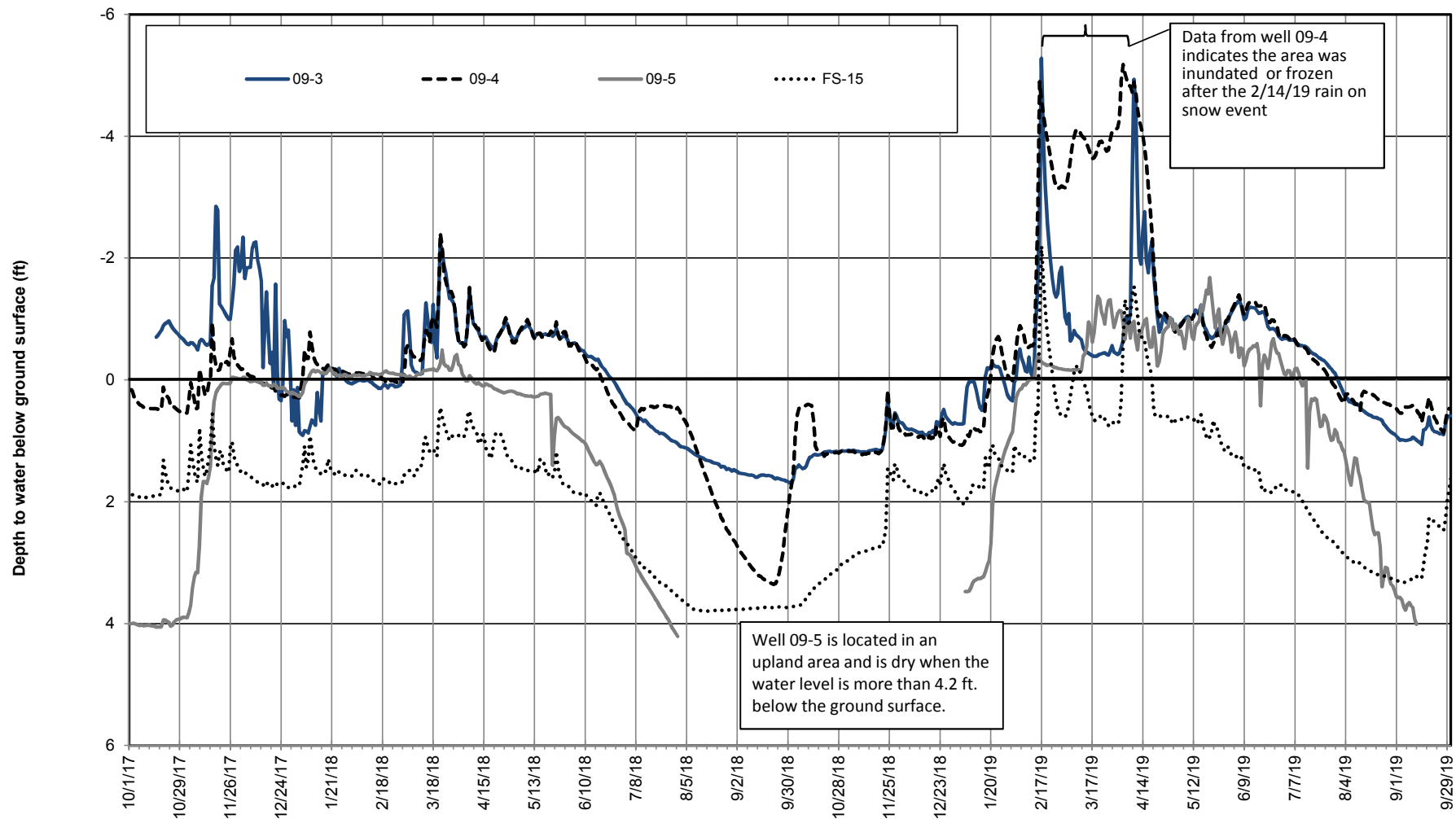
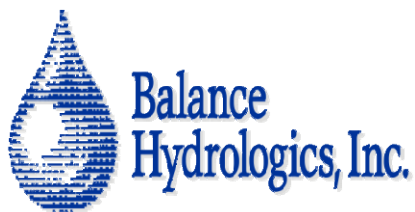


Figure 25. Depth to groundwater, WY2018 and WY2019, Upper Perazzo Meadow, Sierra County, California.

This figure shows the peizometers from the Northern portion of Upper Perazzo Meadow. Well 09-4 is located in an area of relict channels which were re-watered through restoration efforts. Well 09-4 was inundated after the 2/14/19 rain on snow event until 4/3/19. Well FS-15 is located in an upland area downstream of ponds and showed water levels above ground only after rain on snow events. Well 09-5 is located in an upland area and still sees up to 4 feet of water level variability. Well 09-3 is located in a wetland area and is typically inundated throughout most of the year. Water levels at 09-3 fell to 1.75 ft below the ground surface in 2018, much more than previous years, but returned in 2019.



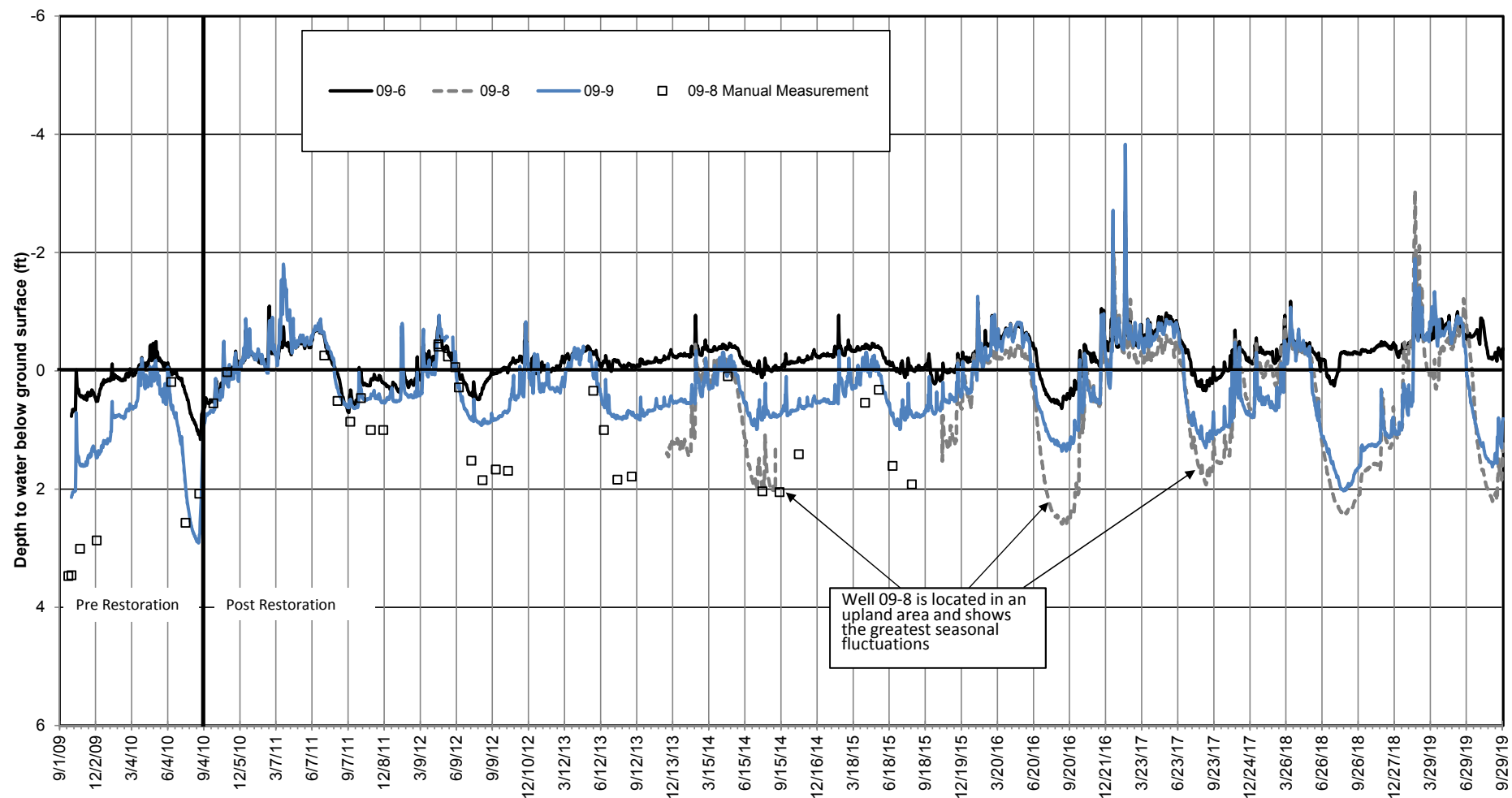


Figure 26. Depth to groundwater WY2010 to WY2019, Middle Perazzo Meadows, Sierra County, California.

This figure shows groundwater levels in the western portion of Middle Perazzo Meadow. Post-restoration, the late summer hydraulic floor is higher than pre-restoration. Channel evolution since 2016 appears to have resulted in changes in groundwater retention perhaps with some changes in groundwater conditions associated with restoration and post-restoration channel adjustment in this part of the Middle Meadow. Piezometer 09-6 continues to maintain inundation or near surface saturation during most of the year. Piezometer 09-9 is located closer to the channel and shows significant change in the hydraulic floor beginning in WY2016, possibly due to breaches in plugs near this area. Well 09-8 is located in an upland area and has been relatively un-affected from restoration efforts and changes.



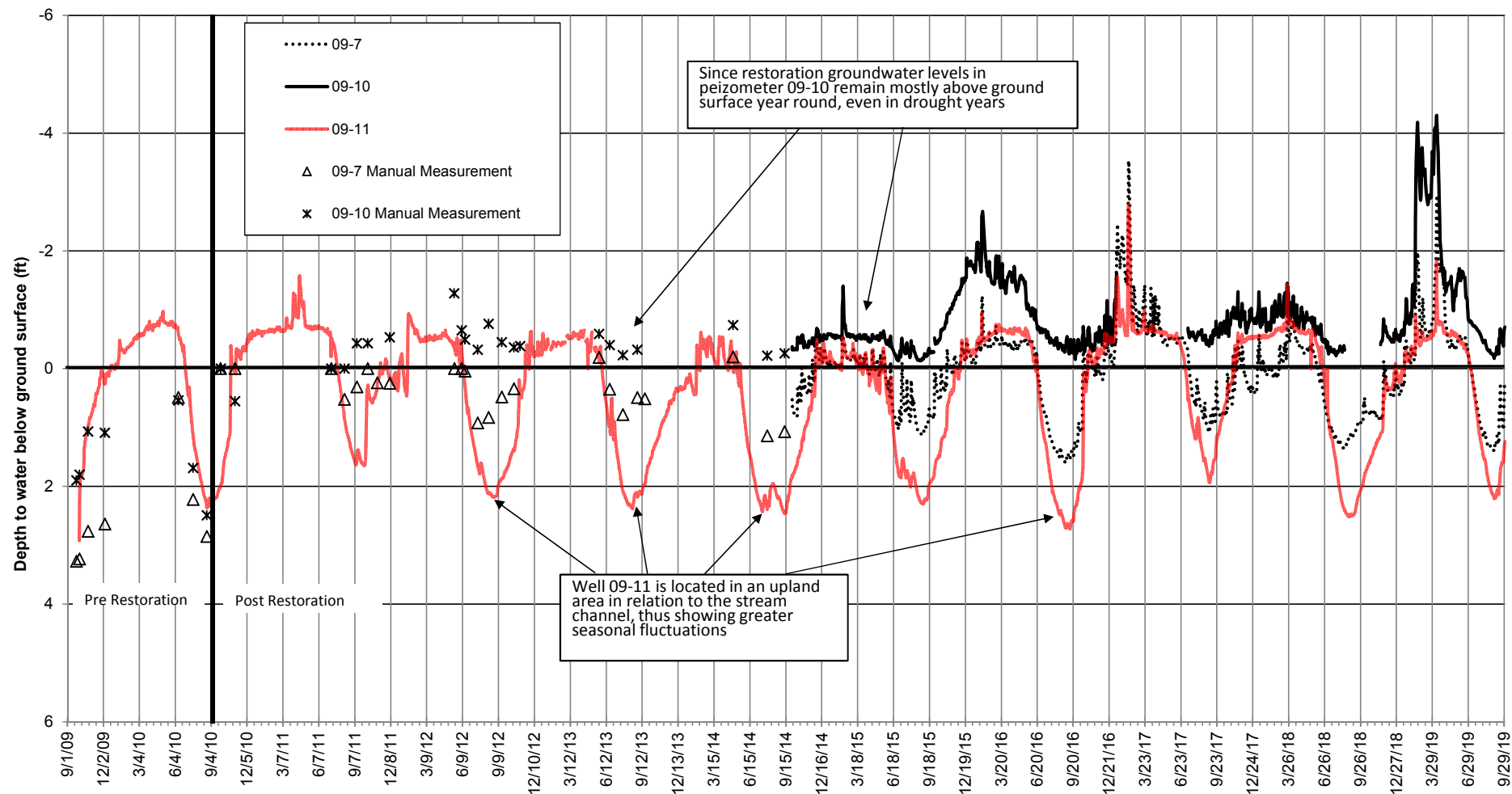


Figure 27. Depth to groundwater WY2010 to WY2019, Middle Perazzo Meadow, Sierra County, California.

This figure shows the groundwater levels in the eastern portion of Middle Perazzo Meadow. Groundwater levels in wells 09-7 and 09-10 have remained above pre-restoration levels even in drought years though a degree of meadow and channel evolution appears to have led to slightly lower groundwater levels than immediately after restoration. Well 09-11 is located in an upland area and does not show a clear response to changes from restoration activities.



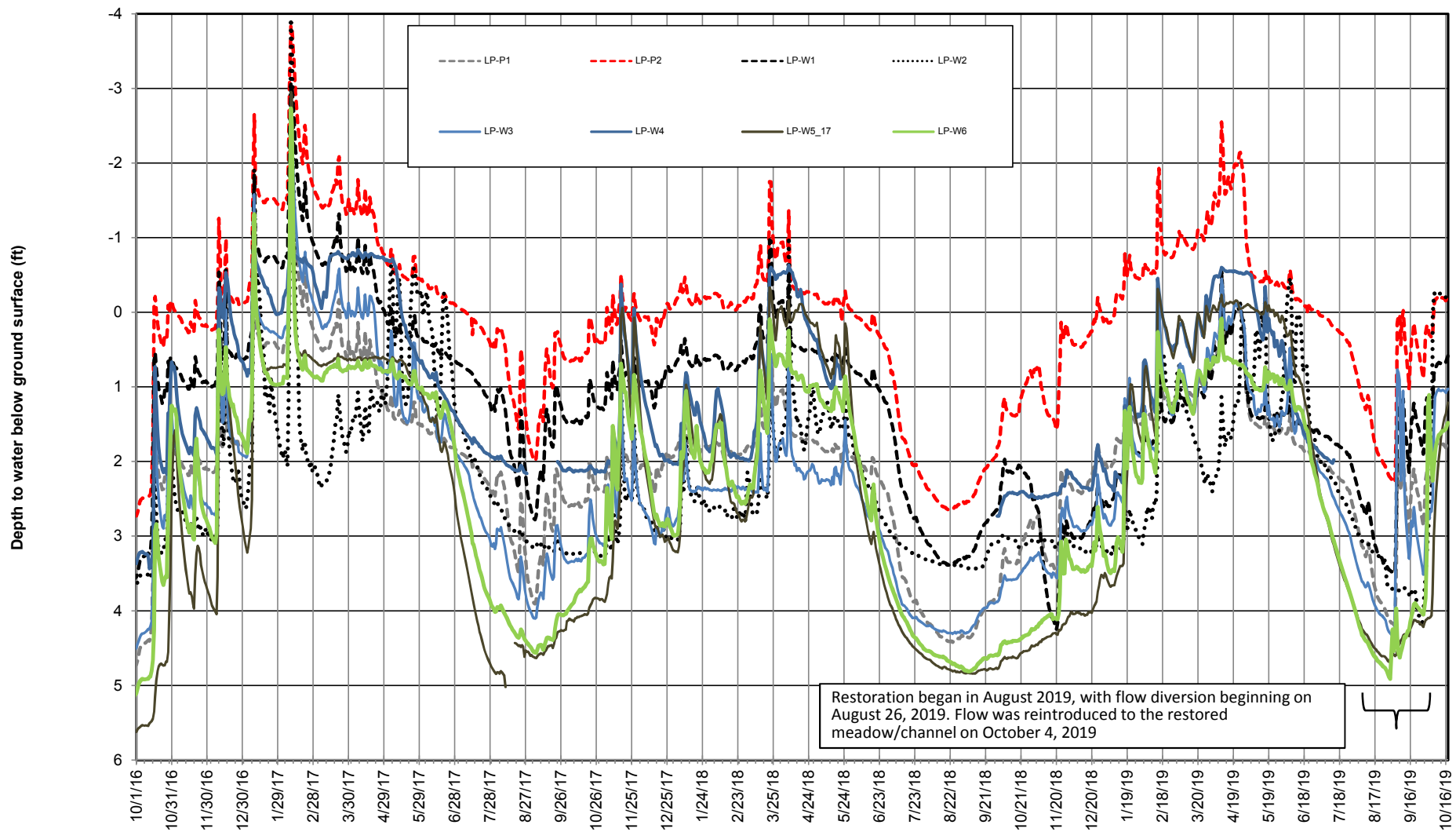


Figure 28. Depth to groundwater WY2017 through WY2019, Lower Perazzo Meadows, Sierra County, California.

Restoration of the lower meadow began in August 2019 and concluded in October 2019. WY2019 was above average precipitation with a significant snowpack due to a cold February with several storms. Groundwater recession timing was more like WY2017, which was a very wet year, compared to WY2018, which was a below average precipitation year.

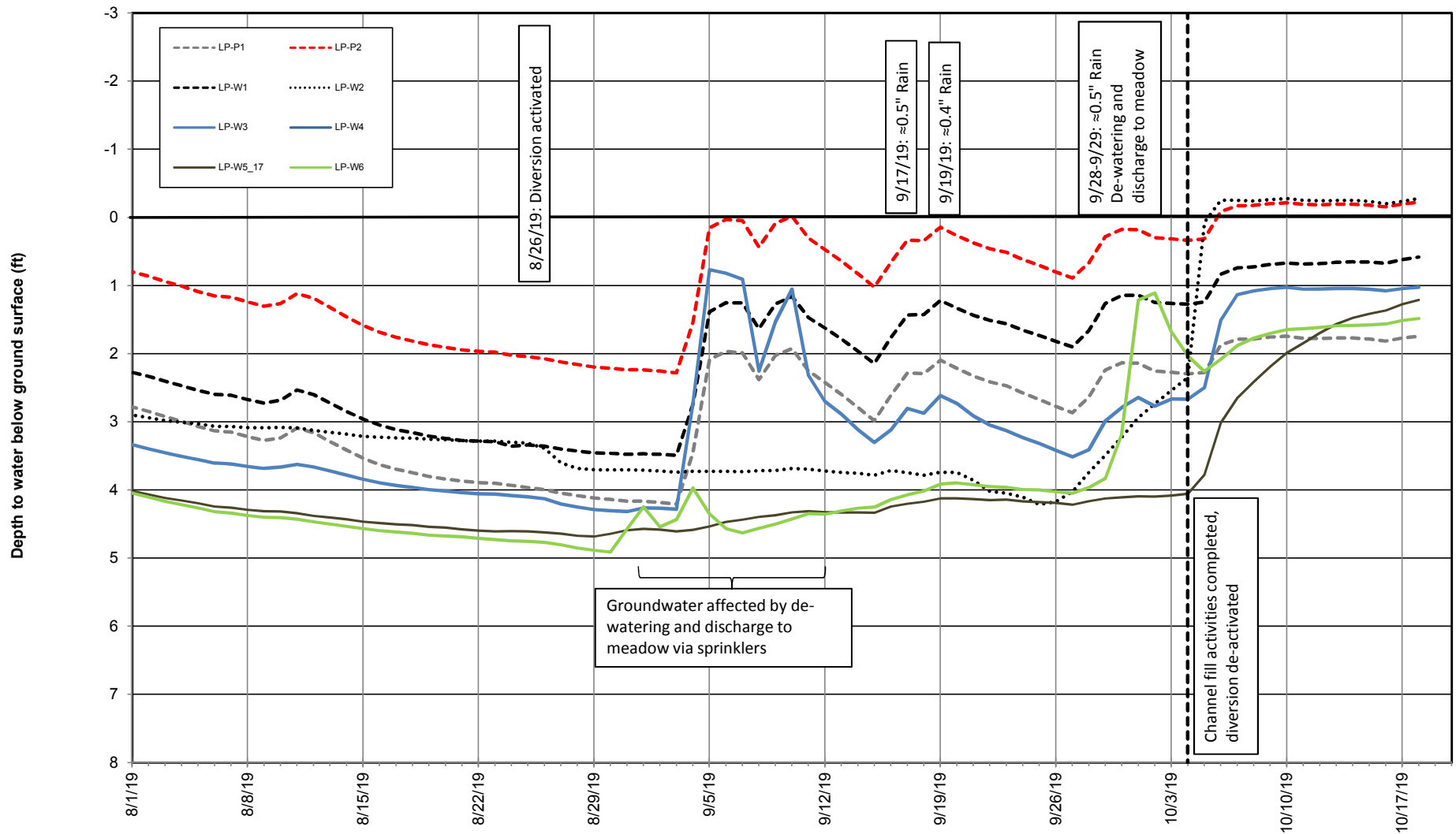


Figure 29. Lower Perazzo Meadow groundwater wells post restoration WY2019, Lower Perazzo Meadows, Sierra County, California. Restoration of the lower meadow began in August 2019 and concluded in October 2019. Diversion of flow from the Little Truckee River around the meadow began on August 26, 2019 and concluded on October 4, 2019. This figure shows groundwater levels rising at all piezometers due to a) de-watering and discharge to the meadow during the construction activities, b) early fall precipitation events and, c) the re-introduction of flow through the restored meadow.