PERAZZO MEADOWS RESTORATION HYDROLOGIC MONITORING DATA REPORT: UPPER AND MIDDLE PERAZZO MEADOWS, SIERRA COUNTY, CALIFORNIA

WATER YEAR 2014

Report prepared for:
Truckee River Watershed Council

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Perazzo Meadows Restoration Hydrologic Monitoring Data Report
Upper and Middle Perazzo Meadows, Sierra County, California, Water Year 2014

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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 multiple locations in at Perazzo Meadows, 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 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, (e.g. are initial post-project conditions representative of extreme drought or above-average precipitation); and
- A continuous record of streamflow and groundwater levels allows for an evaluation of the restoration program in terms of geomorphic and vegetation changes that accompany trends in streamflow and groundwater levels for which the project was designed.

This report summarizes groundwater conditions in Upper and Middle Perazzo Meadows and streamflow at six different locations upstream and downstream of Upper, Middle, and Lower Perazzo Meadows for water year 2014 (WY2014)[1], the fifth 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;

[1] Most 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 2014 (WY2014) began on October 1, 2013 and concluded on September 30, 2014.

- Daily, monthly, and annual streamflow values for the six gaging stations during WY2014;
- Groundwater levels at 15 wells for select areas of the meadows;
- A comparison of annual peaks, daily mean, and base streamflow at measured inflows to and outflows from Perazzo Meadows; and
- A comparison of groundwater level fluctuations in a restored meadow to groundwater levels prior to restoration.

In late WY2014, funding was provided to continue the monitoring program through WY2016, including the completion of data analysis for WY2014 and development of this monitoring report. As such, we note that observations were limited in WY2014 and unexplained anomalies during periods of non-observation may exist.

1.1 Acknowledgments

Funding for the data collection and synthesis presented in this report is from the National Fish and Wildlife Foundation and the U.S. Forest Service-Tahoe National Forest, awarded to the TRWC. Work was carried out in coordination with the TRWC, the U.S. Forest Service (USFS), and the University of California at Merced (UC Merced) and individuals from those organizations were instrumental in helping to develop the monitoring program. Beth Christman of the TRWC, Randy Westmoreland and Michael Pickard (formerly of the US Forest Service, currently with UC Merced), and other US Forest Service Staff 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**). Its watershed comprises 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 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 throughout the margins of the valley. A number of 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 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 (msl, NGVD29) at the Lower Meadow to 9,148 feet msl at Mount Lola. Most of the annual precipitation falls as snow, with occasional summer thunderstorms, early fall rainstorms, and atmospheric rivers, which can drive rain on snow events in the mid-winter. Annual peak flows tend to occur during spring snowmelt, but the periodic rain-on-snow events account for the highest flows. Perennial streams and associated wet meadows are

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

2.2 Restoration Activities

Prior to restoration, portions of the meadows had been converted from riparian low and middle gradient meadows to dry meadows (Swanson, 2008). The channel followed a meandering course through the meadow, and flow was largely contained in one single-thread channel in most locations with limited floodplain connectivity. During the summers of 2009 and 2010, the USFS employed a 'plug and pond' restoration approach with the aim of blocking the channel and spreading water across the valley floor to reoccupy multiple relic channels that had been abandoned.

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 Watershed. A network of eleven shallow monitoring wells ('piezometers') was installed in the Upper and Middle Meadows, supplementing four monitoring wells that had been previously installed by the USFS. Wells 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. In order to relate changes in groundwater level to water surface elevations in the channel, several staff plates were installed in the main stream channel to monitor stream stage. Groundwater and stream stage monitoring station locations are shown in **Figures 2 and 3**.

Piezometers were designed with the aim of measuring 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 (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

[2] 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.

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 a number of wells in Lower Perazzo Meadow, where restoration had not yet taken place, 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. Data from the UC Merced study are not included in our analysis at this time.

Piezometers were monitored by TRWC and Balance staff beginning in September 2009. 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 increased. 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 months of snowpack 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 Watershed. 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, Balance received authorization to establish five additional streamflow gaging stations to help evaluate inflows to the meadow, flows through the meadows and downstream of the meadows. Four gages were installed and instrumented in November 2010, while two additional gages were installed and instrumented in August 2011. All six gages were 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 values. Locations of all six streamflow gaging stations are illustrated in **Figure 4** and summarized in **Table 1**. WY2012 was the first year in which we reported a full annual record for all six stream gages, which continues through the current water year (WY2015).

Balance stream-gaging practices follow procedures used by the USGS, as outlined by Carter and Davidian (1968). Balance hydrologists and U.S. Forest Service 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 at 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).

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) according to Balance Hydrologics' gaging station naming conventions. The watershed area above PCAP is approximately 6.1 square miles and receives an average of 63.5 inches of precipitation (USGS, 2011). 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 above Perazzo). 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 58.6 inches of precipitation (USGS, 2011), and can be affected by ice during winter and spring months.

2.4.1.3 Little Truckee River below Upper Perazzo Meadows (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, which originate from the Little Truckee River and Perazzo Creek, as well as a portion of inflow to the Middle Meadow. The gaging station was installed on November 19, 2010 and designated as 'LTUM' (Little Truckee below Upper Perazzo Meadow). The watershed area above LTUM is approximately 25.5 square miles and includes the subwatersheds gaged by LTAP and PCAP and additional intervening areas of 3.6 square miles. Mean annual precipitation in the contributing watershed area is approximately 58.5 inches (USGS, 2011). This gage can be affected by ice during winter and spring months.

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 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 average of 54.2 inches of precipitation (USGS, 2011). Due to access restrictions and very dynamic channel conditions, this gage is operated as a baseflow gage with limited accuracy during the winter; measurements take place during the summer and fall months only.

2.4.1.5 Little Truckee River below Middle Perazzo Meadows (LTPM)

The stream gage is located on the north 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 subwatersheds gaged by the four upstream gages (LTAP, PCAP, CSAP, and LTUM) and additional intervening areas totaling 4.2 square miles. The contributing watershed receives an average of 56.3 inches of precipitation (USGS, 2011). This gage can be affected by ice during winter and spring months.

2.4.1.6 Little Truckee River at Lower Perazzo Meadows (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, an unrestored 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 Meadow), according to Balance gaging station naming conventions. The watershed area above LTLM is approximately 34.2 square miles and includes the subwatersheds gaged by the five upstream gages (LTAP, PCAP, CSAP, LTUM and LTPM) and additional intervening areas totaling 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.

2.5 Historical Streamflow Gaging

The United States Geological Survey (USGS) operated a stream gage from June 26, 1993 to September 30, 1998 (partial WY1993 – WY1998) on the Little Truckee River downstream from Perazzo Meadows (USGS 10341950). Historical streamflow at this station was affected by the Sierra Valley diversion ditch immediately upstream. Mean annual flows for the period of record at the USGS gage ranged between 23.5 cfs to 183 cfs. Peak annual flows ranged between 300 cfs to 3,980 cfs. Peak flows are generally

less affected by diversions and can be used for context when interpreting peak flows reported for Perazzo Meadows. **Table 2** summarizes the USGS gage station information and data for the period of record. This station was reoccupied and operated by the USGS from November 11, 2012 to October 20, 2013.

We understand that streamflow data has been collected on the Sierra Valley Diversion Ditch, but have not evaluated that data set as part of this monitoring program.

2.6 Comparisons to Other Watersheds

The streamflow records for Perazzo Meadows are compared to at least one of two other nearby gaging records to provide a basic check on flow magnitudes and timing of streamflow variations. These gages include: 1) Sagehen Creek, near Truckee, California (USGS 10343500), about 7 miles to the southeast, and; 2) Cold Creek, near Truckee, California (Balance gaging station CCTB), approximately 13.5 miles to the southeast.

The Sagehen Creek station (USGS 10343500) measures streamflow from a 10.5 square-mile watershed with a mean annual precipitation of 38 inches. 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.

Cold Creek is a tributary to Donner Creek, a tributary to the Truckee River, and has a watershed size of 12.6 square miles along the eastern crest of the Sierra Nevada. This location provides a comparable watershed relative to mean annual precipitation (approximately 49 inches) (USGS, 2011) but a slightly lower elevation (5,920 feet) and more distant from Perazzo Meadows. Balance installed this gaging station on October 5, 2010 and operated this gage year-round for the Truckee River Watershed Council (TRWC). This station is rarely affected by ice and its hydrology is more influenced by higher elevations along the Sierra Crest than the Sagehen Creek gage, and therefore provides a reasonable record for correlation and estimation of daily flows during ice-affected periods at Perazzo Meadows.

3. WY2014 HYDROLOGIC SUMMARY AND DISCUSSION

This section summarizes the WY2014 annual precipitation, streamflow conditions at each gaging station, and groundwater trends, concluding with a comparison of streamflow stations and discussion of groundwater conditions following restoration of Perazzo Meadows and three consecutive years of below-average precipitation and snowpack.

3.1 Annual Precipitation

Daily and annual precipitation for Perazzo Meadows is available from data collected at Independence Creek (California Data Exchange Center Station INN) located at similar elevation (6,500 feet) and approximately 3.5 miles southeast of Perazzo Meadows. Annual and long-term average snow-water equivalent is reported from Central Sierra Snow Lab, located near Donner Pass at 6,950 feet elevation and about 11 miles south-southwest. The Snow Lab has over 100 years of record and serves as a good reference for comparison to WY2014 conditions at Perazzo Meadows.

Cumulative precipitation during WY2014 is illustrated in **Figure 5** with the daily mean and minimum air temperatures. WY2014 was the third consecutive year with below-average precipitation (20.1 inches compared to the long-term average of 32.7 inches as measured at Independence Creek), and exhibited a lower than normal snowpack through the duration of the winter. Snow-water equivalent during WY2014 is illustrated relative to the previous 4 years and long-term averages in **Figure 6**, which shows that on May 1, 2014, snowpack at Independence Lake was only 40 percent (18 inches) of the long-term average seasonal maximum.

WY2014 was unusually dry through the fall and early winter with only 2.2 inches of precipitation recorded through late January. A rain-on-snow event on January 29-30, 2014 dropped 1.5 inches of rain at relatively high elevations. Subsequently, another rain and rain-on-snow event dropped an additional 4.6 inches between February 8 and 10, 2014, resulting elevated flows on both days. Additional rain and snow were recorded in late February and early March. Abundant snowfall was recorded in late March and early April.

Limited additional precipitation was recorded through the spring months. The summer was relatively warm, punctuated with a few significant isolated thunderstorms in July and August. Continued warm temperatures and absence of measurable rainfall through the end of the water year caused baseflow at many stations to fall below long-term averages and to the lowest levels observed since monitoring began in WY2010.

3.2 Streamflow

In the following subsections, we describe streamflow during WY2014 at each gaging station from upstream to downstream. We first summarize inflows to Upper Perazzo Meadow from Perazzo Creek and the Little Truckee River (stations PCAP and LTAP). We then describe flows on the Little Truckee River below the Upper Meadow and above the Middle Meadow (LTUM). Together with Cold Stream (CSAP), these stations account for the bulk of inflows to the Middle Meadow. Middle Meadow outflow (LTPM) is described in relationship to the inflows. Finally, we describe conditions at the outflow from the Lower Meadow (LTLM), which has not yet been restored. Streamflow is reported as daily mean values, unless otherwise specified. We note that there are additional intermittent tributaries, springs, and other areas between which were not gaged (see **Figure 4**); estimates of contributing flow from these intervening tributary areas are based on data collected at the existing six gaging stations.

3.2.1 Perazzo Creek above Upper Perazzo Meadows (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, monthly, and annual statistics is provided in **Form 1**. Daily mean stage and flow are graphically illustrated in **Figures 7 and 8**, respectively.

After three below average years, the 2014 water year began with baseflow fluctuating between 0.6 cfs and 1.0 cfs. A small increase in flow to 6.2 cfs occurred on December 5, 2013 in response to rain. Air temperatures in mid-December, as recorded at Independence Creek, dropped below -20 degrees Celsius and likely initiated ice-affected flows in Perazzo Creek where the gage is located in a north-facing shadow. Rain-on-snow events on January 29-30 and again on February 8-9, 2014 were recorded throughout the region, but the stage record at this station indicates effects from ice, so flows were estimated from a correlation with flows on Sagehen Creek, near Truckee, California. Based on this correlation, an estimated annual peak flow of 110 cfs occurred on February 9, 2014. These storms likely flushed much of the ice from the gaging pool during this peak, after which minimal or no ice effects are apparent. Winter baseflows remained elevated and an additional rain-on-snow event on March 6, 2014 resulted in a peak flow of approximately 46 cfs. Subsequent to this event, winter baseflows remained above 10 cfs.

Spring snowmelt began in early April and peaked at approximately 70 cfs on April 17, 2014. Peak snowmelt runoff was followed by relatively dry and warm conditions,

resulting in quickly receding streamflow into June. Summer thunderstorms occasionally elevated flows, but baseflow was primarily sustained by springs, groundwater discharge to the channel through the remainder of the summer and water year. In early September, baseflow was not measured below a minimum of 0.1 cfs, and may have been intermittent. September rainfall briefly caused flow to rise to nearly 0.5 cfs for a short-lived period.

In total, Perazzo Creek delivered approximately 5,625 acre-feet of surface water to the Upper Meadow during WY2014, almost half that of WY2013 (9,679 acre-feet) and less than 30 percent of that in WY2011 (23,582 acre-feet), a direct result of three consecutive years with below-average rainfall and snowpack.

3.2.2 Little Truckee River above Upper Perazzo Meadows (LTAP)

Table 4 provides information and observations from site visits and manual measurements of flow. An annual streamflow summary, including peak flows, monthly, and annual statistics is provided in **Form 2**. Daily mean stage and flow are graphically illustrated in **Figures 9 and 10**, respectively.

Similar to WY2013, the water year began with no surface flow in the Truckee River above Perazzo Meadow. It wasn't until the rain-on-snow event of January 29-30, 2014 when streamflow rose to between 0.8 and 2.6 cfs. Flow receded to near 0.6 cfs before the February 8-9, 2014 rain-on-snow event caused a second increase to approximately 25 cfs. Flows remained elevated through mid-February. The March 6, 2014 rain event triggered a peak flow of 74 cfs on the same day. Afterwards, winter baseflow remained above 15 cfs.

Spring snowmelt began in early April with several very similar peaks on April 18 (168 cfs), April 20 (163 cfs), and May 6 (182 cfs); the last of which was also the annual peak flow for WY2014. Peak snowmelt runoff was followed by continued dry and warm conditions, which, combined with a very limited snowpack and depleting watershed storage, resulted in quickly receding streamflow through the summer months. Summer thunderstorms occasionally elevated flows, but in early September streamflow at and below the gaging station ceased (less than 0.1 cfs). While flow may have continued upstream of the gaging station, it is likely these flows infiltrated into the streambed where the canyon begins to open to the alluvial fan. Late September rains briefly returned flows to nearly 0.3 cfs at end of the water year.

In total, the Little Truckee River, above Perazzo Meadows, contributed approximately 9,011 acre-feet of surface water to the Upper Meadow during WY2014, roughly 60 percent of that in the previous year (15,075 acre-feet) and less than 20 percent of runoff in WY2011 (55,667 acre-feet).

3.2.3 Little Truckee River below Upper Perazzo Meadows (LTUM)

Table 5 provides information and observations from site visits and manual measurements of flow. An annual streamflow summary, including peak flows, monthly, and annual statistics is provided in **Form 3**. Daily mean stage and flow are graphically illustrated in **Figures 11 and 12**. A comparison of Upper Perazzo Meadow streamflow inputs and outputs is provided in **Figure 13**.

Mean daily flow at the beginning of the water year was approximately 0.7 to 1.0 cfs, slightly higher than observed at the beginning of WY13, largely due to late September rains prior to the start of the water year. Similar to upstream gages, baseflow held steady until the storms of late January and early February caused flows to increase. The early February peak flow was measured to 123 cfs, and was followed by a similar peak in early March of 125 cfs. Other than these storms, winter baseflow fluctuated between approximately 15 cfs and 45 cfs, ultimately rising with warming temperatures in the spring. Snowmelt runoff peaks occurred on April 18 (275 cfs), April 20 (258 cfs), and May 6 (279 cfs). The May 6 peak was also the peak flow of WY2014 at this station.

In total, the Little Truckee River at the outlet of Upper Perazzo Meadows discharged approximately 18,137 acre-feet of water during WY2014, less than half that of WY2013 (37,314 acre-feet) and only 20 percent of the total runoff during WY2011. This is 3,501 acre-feet more than the sum of the two contributing tributaries (PCAP + LTAP = 14,636). This finding is generally consistent with findings in previous years, when we calculated a roughly 10 percent increase in flow across the Upper Meadow. This year and last year, however, we calculated a roughly 24 and 36 percent increase in flow across the Upper Meadow, perhaps associated with limited contributions from lower-elevation intervening areas associated with periods of limited precipitation and snowpack.

3.2.4 Cold Stream above Middle Perazzo Meadows (CSAP)

Table 6 provides information and observations from site visits and manual measurements of flow at Station CSAP. Daily streamflow for the partial water year is provided in **Form 4**. Daily mean stage and flow are graphically illustrated in **Figures 14 and 15**.

The water year began with baseflow at 1.0 to 1.2 cfs, slightly higher than the beginning of the previous water year and slightly higher than surface inflows to the Middle Meadow along the Truckee River. Similar to other streamflow monitoring stations in this watershed, the storms of late January and early February caused streamflow to increase, but winter baseflow did not increase a reflection of the higher mean elevation in this subwatershed. Aside from periodic response to precipitation, winter baseflow held steady at less than 2 cfs. Warmer temperatures in the spring released snowmelt water beginning in late March and early April, with spring snowmelt holding steady into May, with occasional peaks as high as 16 cfs. The annual peak flow of 16 cfs occurred during this period on May 26, 2014, significantly later than the other subwatersheds, as in previous years. Following the peak snowmelt, flows receded steadily and stabilized at a baseflow of 0.5 to 0.6 cfs, slightly lower than in previous years. As comparison, baseflow on Cold Stream was approximately 3 cfs following WY2011, a year with extremely high precipitation and snowpack depths.

In total, Cold Stream contributed approximately 2,004 acre-feet of surface water to the Middle Meadow in WY2013. This is about 67 percent of that in WY2013 (3,006 acre-feet) and of surface water to the Middle Meadow in WY2013. As consistent with previous years, Cold Stream appears to provide only a small fraction (roughly 11 percent) of the total annual runoff to the Middle Meadow, but accounts for a larger portion (25- to 45-percent) of the baseflow entering the Middle Meadow during the late summer and fall months. This effect however, is, muted during this third consecutive year, perhaps indicating that groundwater storage in Coldstream becomes depleted during droughts, or that late season snowpack is the driving factor behind the late-season flows emanating from Coldstream.

3.2.5 Little Truckee River below Middle Perazzo Meadows (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 mean stage and flow for Station LTPM are graphically illustrated in **Figures 16 and 17**. A comparison of Middle Perazzo Meadow streamflow inputs and outputs is provided in **Figure 18**.

At the beginning of the water year baseflow fluctuated between 2 and 3 cfs during the month of October, with roughly equal inputs from the Little Truckee River and Cold Stream. This station was affected by beaver dam construction at the outlet of the gaging station pool during the end of WY2013 and the beginning of WY2014, so

significant rating curve shifts were applied to the stage record during this time. With limited to no discharge measurements taken, the accuracy of the streamflow record is compromised through the fall. Similar to upstream gages, streamflow responded minimally to minimal autumn precipitation, and rose abruptly with the relatively warm winter storms of late January and early February, 2014, as well as the storm on March 6, 2014. Minimal ice effects were observed at the gaging station during WY2014 at this station, with minimal apparent effects on stage and flow, though ice has been accounted for by applying minor rating curve shifts.

The peak flow for the period of record occurred on April 18 during the spring snowmelt period, with sustained elevated flows between 100 and 200 cfs through April and into May. Streamflow receded through May, June, and July to a late summer baseflow of 0.5 to 1 cfs in mid-September, with punctuated flow increases associated with summer thunderstorms in July and August and early season precipitation in late September.

Total annual inflow to the Middle Meadow during WY2014 was measured to be 20,141 acre-feet, 18,137 acre-feet from the Little Truckee River (at station LTUM) and 2,004 acre-feet from Cold Stream (station CSAP). The total outflow volume (at station LTPM) was calculated to be 18,325 acre-feet, less than the sum of the two gaged inflows. This finding is inconsistent with previous years, and is attributed rating curve uncertainty associated with the lack of streamflow measurements during the WY2014 fall and winter. During WY 2012 and WY2013, the increase across the Middle Meadow was on the order of 10 to 15 percent. During the summer months in WY2014, when field observations improved gaging accuracy, streamflow leaving the Middle Meadow was consistently much higher than measured streamflow entering the Middle Meadow along the Truckee River and Cold Stream, on the order of 15 to 40 percent.

3.2.6 Little Truckee River below Lower Perazzo Meadows (LTLM)

Lower Perazzo Meadow, downstream from LTPM, has not yet been restored. Beginning in August 2011, Balance began coordinating with UC Merced researchers to develop a continuous record of flow at the Lower Meadow outlet (LTLM) to characterize baseline conditions in preparation for future restoration activities. This gage is the downstream-most gaging station in Perazzo Meadows, located approximately 0.85 river miles upstream of the Sierra Valley Diversion Ditch. Ongoing collection of baseline data prior to restoration of the meadow will provide a valuable data set against which to compare post-restoration conditions. Under current conditions, data at this station can be used to evaluate differences in meadow storage between a restored meadow

(Middle or Upper Meadow) and an unrestored meadow (Lower Meadow). **Table 8** provides information and observations from site visits and manual measurements of flow at Station LTLM. Daily streamflow for the partial water year is provided in **Form 6**. Daily mean stage and flow are graphically illustrated in **Figures 19 and 20**. A comparison of Lower Perazzo Meadow inflow and outflow is shown in **Figure 21**.

Streamflow at the beginning of the water year was between 3 and 5 cfs, following early season precipitation before the start of the water year. Flow responded minimally to minimal fall precipitation and rose rapidly with the onset of winter storms in late January and early February, with the estimated peak flow of 247 cfs occurring during the February 9, 2014 rain on snow event. The March 6 rain event caused flow to increase to 131 cfs. Snowmelt runoff peaked at 243 cfs on May 6, 2014 and began to recede in June, with punctuated flow increases associated with summer thunderstorms in July and August, ultimately reaching a baseflow of between 1 and 2 cfs by mid-September before the onset of fall precipitation in late September.

Overall, streamflow at the Lower Meadow outlet is similar to the Middle Meadow outlet, with very limited tributary inflows between the two stations and only a minor (4 percent) increase in contributing watershed area. In total, the Little Truckee River, at the outlet of Lower Perazzo Meadow discharged approximately 22,551 acre-feet of water in WY2014. Total runoff input volume to the Lower Meadow was estimated to be 18,325 acre-feet (Station LTPM), reflecting an increase in runoff with the increased contributing watershed area. This 23 percent increase in flow between the two stations is much larger than that observed in past years, likely a reflection of the uncertainty introduced by beaver dam effects at the Middle Meadow and the lack of streamflow measurements in WY2014 during the Fall and Winter. This beaver dam has since washed out and with nearly monthly flow measurements through the year; gaging accuracy is anticipated to improve. A portion of this additional runoff volume reasonably originates from the intervening areas between the two gages (1.4 square miles; see **Figure 4**).

3.2.7 Little Truckee River below Sierra Valley Mutual Water Company Diversion (USGS Station 10341950)

USGS Station 10341950 below the Sierra Valley Diversion Dam was discontinued on October 20, 2013, so streamflow data below the diversion are not available. Periodic manual streamflow measurements have taken place during WY2014, however, perhaps an indication that the USGS may again operate this gage in the future.

3.2.8 Comparison of Streamflow and Annual Runoff during WY2014

WY2014 streamflow hydrographs from all six stations are illustrated in **Figure 22** and 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 mean streamflow is tabulated in **Figure 23**.

Based on a comparison of streamflow at all six stations, we draw the following conclusions:

- Through comparison to streamflow on Cold Creek in Truckee, Sagehen Creek just south of the study area, and across stations within the study area, we conclude that the flow records are generally consistent with regional hydrology trends;
- Based on the frequency, methods used, and accuracy of our streamflow measurements, the flow records are reasonably accurate and consistent with USGS standards. It should be noted, however, that a significant degree of uncertainty was introduced during WY2014, especially during the fall and winter months when ice and snow can affect water levels at a station, but no field measurements or observations took place to verify conditions at the gages or calibrate the stage-discharge rating curves. These uncertainties are reduced during summer and fall baseflow periods, and are anticipated to be offset in the future with funding secured for additional field measurements during WY2015 and WY2016;
- All six stations exhibited similar timing for peak flows with the exception of Cold Stream (CSAP). The runoff peaks at this station shows a delay relative to the other stations and is attributed to the higher elevation of the Cold Stream watershed;
- With the exception of the Little Truckee River above Perazzo Meadow (LTAP), which went dry during the beginning and end of WY2014, baseflow at the beginning of WY2014 ranged between 0.5 cfs to 4 cfs, increasing from upstream to downstream. Baseflow toward the end of WY 2014 was markedly lower than at the beginning of the monitoring period, and lower than any other time since monitoring began in Fall 2009;
- The Little Truckee River was dry at the gaging station at the beginning of WY 2014 and became dry again at the end of the year in late September, and flow on the Little Truckee River between the Upper and Middle Meadow dropped below

the detection limit of 0.1 cfs (40 gallons per minute) at several times. These extreme low flows were offset by late season flows on Coldstream, which continues to provide a source of late season low flow support; and

- Annual precipitation and runoff volumes were very similar to the previous water year and reflect drought conditions, with three consecutive years of below-average precipitation and snowpack.

3.3 Groundwater

Groundwater levels were monitored in piezometers, beginning in July 2009 and continued through WY2014. The piezometers were located (shown in **Figures 2 and 3**) to characterize groundwater response to the plug and pond restoration efforts. Field observations during WY2014 are presented in **Table 11**, including depth to groundwater, specific conductance, water clarity and odor, and qualitative observations. Specific conductance in groundwater over the course of the monitoring period is illustrated in **Figure 24**. **Figure 25** shows depth to groundwater during the monitoring period.

Restoration activities were carried out during Summer 2009 in the Upper Meadow and Summer 2010 in the Middle Meadow. Limited information is available regarding pre-project groundwater levels in the Upper Meadow because most of the piezometers were installed only days before restoration activities began. In the Middle Meadow, however, a full year of groundwater monitoring was completed prior to restoration, allowing for comparison of groundwater levels before and after the restoration period. 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).

3.3.1 Groundwater Conditions in the Upper Meadow

Specific conductance values in piezometers (**Figure 24**) provide an indication of whether shallow groundwater is primarily under the influence of snowmelt and surface runoff, or if slightly deeper groundwater is moving through the meadow at a particular location. Many areas of the meadow exhibit a trend in which specific conductance tends to start 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). This rise indicates deeper groundwater support in an area as the summer progresses. In the past, piezometers FS-12 and FS-15 have shown relatively low or steady specific conductance water during much of the monitoring period. With the persistence of drought conditions, however, these areas

appear to be relying more on support from deeper groundwater, with limited influences from surface water. Piezometer 09-05 appears to be fairly disconnected from surface water, with relatively high conductivity. In the period following WY2011, however, this area appeared to receive more support from fresher surface water—a trend that continued for 2 years until WY2014, when conductance again began to rise at this location. Specific conductance in Piezometers 09-02 and 09-03 also reached extremely high levels toward the end of WY2014, also reflecting the limitations on surface water support for the Upper Meadow. Finally, Piezometer FS-12 appears to have been influenced by deeper groundwater prior to restoration activities, with a greater influence from surface water now under current restored conditions.

Groundwater elevations in the Upper Meadow responded similarly to below average precipitation in WY2014 as in previous years (**Figure 25**). Under very dry conditions, groundwater levels again fell to the lowest recorded since the restoration was implemented in many locations. WY2014, Piezometers FS-15, FS-14, fell to levels very similar to WY2012 and WY2013, establishing a hydraulic floor at approximately 2 to 3 feet below the ground surface in these areas.

Some areas, however, experienced different groundwater elevation dynamics over the course of the drought period, apparently due to micro-topographic changes and beaver activity in the vicinity of Piezometers FS-12 and FS13 (see **Figure 2**). Piezometers 09-04 and FS-12 reflect conditions in relic channels where surface flows were re-introduced by restoration activities. During Summer 2012, these areas dried out, apparently due to limitations on surface flow to this area as the result of beaver. Beaver activity was not as extreme in this area during WY2013 and WY2014, such that the relict channels were once again inundated. As a result, Piezometers 09-04 and FS-12 showed very low groundwater levels during Summer 2012, with recovery during WY2013 and WY2014. In contrast, Piezometer FS-13 showed a decrease in groundwater levels in WY2013 and WY2014, presumably a result of the beavers directing flows back toward the relict channels.

3.3.2 Groundwater Conditions in the Middle Meadow

Figure 24 shows specific conductance of groundwater in Middle Meadow piezometers prior to restoration (WY2010) and following restoration activities (WY2011 through WY2014). Piezometer 09-09 exhibited some of the highest specific conductance values both prior to restoration and during the past three years of drought, with the highest recorded specific conductance during the period of record during Summer 2014,

indicating that this area is increasingly supported by deeper groundwater discharge in all but the wettest periods. Other piezometers showed increasing reliance on groundwater discharge, including 09-06, 09-10, and 09-11. Piezometer 09-07, on the other hand, showed some of the lowest specific conductance values since restoration took place.

Figure 25 shows depth to groundwater in piezometers located at across the Middle Meadow prior to and after restoration. In areas closer to the channel, as represented by Piezometers 09-06, 09-09, and 09-10, groundwater levels remained consistently high through the summer months. Groundwater elevations reflected in Piezometer 09-06 have increased year to year, highlighting the beaver activity that has taken place in that area following restoration.

Other areas, such as those reflected by Piezometer 09-08 and 09-11 have reflected the increasingly dry conditions with minimum summer groundwater levels falling over the course of the 3-year drought. None of these areas, however, have seen groundwater conditions fall lower than pre-restoration conditions. For example, minimum post-restoration (drought-period) groundwater levels in WY2014 in Piezometers 09-07, 09-08, and 09-10 were up to 2.6 feet higher pre-restoration groundwater minimums and higher than any pre-restoration groundwater maxima.

4. CONCLUSIONS

Five years after plug and pond restoration activities in the Upper Meadow and four 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 year type (i.e., wet, average or dry year), and in other locations due to minor modifications and re-direction of surface flows by beavers. Precipitation and snowpack conditions during WY2014 were below normal for the third straight year. Ongoing stream gaging at inflows and outflows from the three (Upper, Middle, and Lower) Perazzo Meadows showed very similar runoff volumes during WY2014 relative to the previous water year (a drought year).

Stream and groundwater monitoring activities during were temporarily discontinued during WY2014 but automated water level recorders were left in place and data were downloaded. As a result, uncertainty in streamflow data has increased, most notably at Station LTPM (Little Truckee River below Perazzo Meadow). Monitoring is now funded through WY2016 with field activities underway in WY2015. Additional data collected will help develop a sense of year-to-year variability in hydrologic conditions and identify where this variability is dependent on climate, modified conditions in the meadow, or other influences. A better understanding of how individual storms and episodic events affect (and are affected by) the reconfigured meadow systems, and help infer how meadow function may differ in years with different climate and precipitation patterns.

The USGS gaging station below the Sierra Valley Diversion appears to have been discontinued. We recommend that efforts be made to re-establish a gage below this diversion, so that low-flow support to downstream areas can continue to be evaluated, especially in the reaches between the diversion and the confluence with Independence Creek.

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. 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 particular 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.

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FORMS

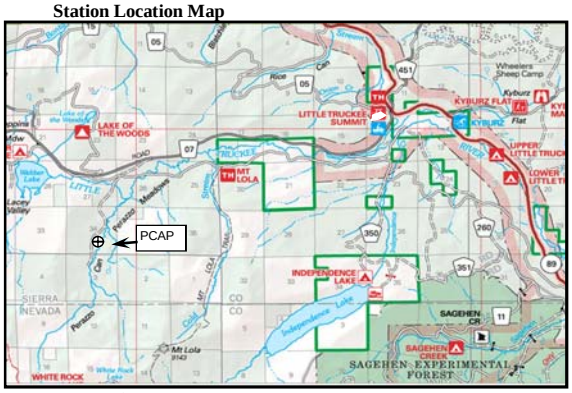
Water Year:	**2014**
Stream:	Perazzo Creek
Station:	Above Perazzo Meadows (PCAP)
County:	Sierra County, California

Form 1. Annual Hydrologic Record, WY2014

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 bridge
Land use includes timber harvesting, recreation, and open space
Flows are unregulated
Drainage area is 6.1 square miles.

Station Location Map



Annual Mean Flows

Annual mean flow for WY2014 is 7.8 cfs; WY2013 is 13.9 cfs; WY2012 is 14.0 cfs; WY2011 is 37.4 cfs.

Peak Flows (WY2014)

Date	Time (24-hr)	Gage Ht. (feet)	Discharge (cfs)	Date	Time (24-hr)	Gage Ht. (feet)	Discharge (cfs)
1/29/2014	N/A	N/A	10				
2/9/2014	N/A	N/A	112				
3/30/2014	**1:30**	**5.64**	**173**				

Extreme for period of record (WY2011-2014) is 268 cfs on December 2, 2012.

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 2014 Daily Mean Flow (cubic feet per second)

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEPT
1	0.7	1.1	0.9	1.0	*3.2*	7.1	18.0	27.3	13.9	1.2	0.6	0.1
2	0.7	1.0	0.8	1.0	*2.3*	7.3	14.3	34.4	13.9	1.1	0.4	0.1
3	0.7	1.1	1.2	1.0	*2.1*	8.4	14.0	37.6	13.6	1.0	0.3	0.1
4	0.6	1.0	1.6	0.9	*2.0*	9.0	12.4	34.9	12.8	0.9	1.0	0.1
5	0.6	0.9	3.2	0.9	*1.8*	11.2	13.3	29.0	12.7	0.8	1.6	0.1
6	0.7	1.0	2.0	0.9	*1.7*	33.1	14.5	23.8	14.6	0.7	2.6	0.1
7	0.6	0.8	1.5	0.9	*1.7*	17.2	19.0	19.1	13.0	0.7	1.6	0.1
8	0.7	0.9	1.7	0.9	*31.3*	13.7	25.9	21.7	11.6	0.7	0.8	0.1
9	0.8	1.0	1.1	0.9	*111.4*	12.8	38.2	46.8	10.4	0.6	0.6	0.1
10	0.9	1.0	1.1	0.9	*40.3*	14.5	43.7	29.7	9.1	0.6	0.5	0.1
11	0.8	0.9	1.2	1.1	*16.0*	12.8	43.4	21.4	7.9	0.6	0.5	0.1
12	0.9	0.8	1.1	1.1	*11.0*	11.7	44.3	22.9	6.6	0.6	0.5	0.1
13	0.9	1.0	0.9	1.0	*13.4*	11.2	36.6	28.0	6.0	0.5	0.4	0.1
14	1.0	1.0	1.0	0.9	14.9	10.5	34.3	34.3	5.4	0.4	0.4	0.1
15	0.8	1.0	0.9	0.9	9.8	11.1	39.7	39.7	4.6	0.3	0.4	0.1
16	0.9	1.0	0.9	0.9	8.4	12.8	38.9	37.9	3.9	0.3	0.3	0.1
17	0.9	1.0	0.9	1.0	8.1	15.1	45.6	32.4	4.1	0.3	0.3	0.1
18	0.8	0.9	0.9	1.0	6.7	14.2	45.4	31.2	3.7	0.5	0.3	0.1
19	0.7	1.2	1.0	1.0	5.7	14.3	41.5	24.2	3.0	0.4	0.3	0.1
20	0.7	2.0	1.0	*1.1*	5.8	14.5	36.8	20.6	2.7	0.3	0.2	0.1
21	0.7	1.6	1.0	*1.2*	5.5	15.7	33.5	18.8	2.5	0.6	0.2	0.2
22	0.7	1.1	1.0	*1.1*	5.3	15.9	27.8	24.5	2.4	0.5	0.2	0.2
23	0.7	0.9	1.0	*1.0*	5.3	16.1	19.2	26.3	2.1	0.4	0.2	0.1
24	0.7	1.0	1.0	*1.0*	5.4	17.7	18.6	30.9	2.0	0.5	0.2	0.1
25	0.7	1.0	1.0	*1.1*	5.5	19.7	19.7	34.0	2.0	0.4	0.2	0.3
26	0.7	1.0	1.1	*1.1*	6.4	18.8	16.4	31.2	2.4	0.4	0.2	0.3
27	0.7	0.9	1.0	*1.1*	8.5	17.9	13.3	25.9	2.2	0.6	0.2	0.5
28	1.2	0.9	1.0	*1.7*	7.3	14.4	12.3	19.3	1.8	0.5	0.1	0.4
29	1.2	0.9	0.9	*9.6*		15.0	14.4	16.2	1.6	0.6	0.1	0.2
30	1.1	0.9	0.9	*8.1*		17.2	19.2	15.8	1.4	0.5	0.1	0.2
31	1.1		0.8	*3.6*		16.4		15.2		0.8	0.1	
MEAN	0.8	1.0	1.1	1.6	12.4	14.4	27.1	27.6	6.5	0.6	0.5	0.1
MAX. DAY	1.2	2.0	3.2	9.6	111.4	33.1	45.6	46.8	14.6	1.2	2.6	0.5
MIN. DAY	0.6	0.8	0.8	0.9	1.7	7.1	12.3	15.2	1.4	0.3	0.1	0.1
cfs days	25	31	35	50	347	447	814	855	194	18	15	4
ac-ft	50	61	70	99	688	887	1615	1696	384	36	30	8

Monitor's Comments

1. 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.
2. 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), and are italicized above
3. Peak flows associated with snow-melt hydrographs commonly occur between April and June; multiple peaks are also common
4. Data are subject to revision, should additional measurement or observer account warrant adjustment of the new rating curve.

Water Year 2014 Totals:		
Mean flow	**7.8**	(cfs)
Max. daily flow	**111**	(cfs)
Min. daily flow	**0.06**	(cfs)
Annual total	**2,836**	(cfs-days)
Annual total	**5,625**	(ac-ft)

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www.balancehydro.com

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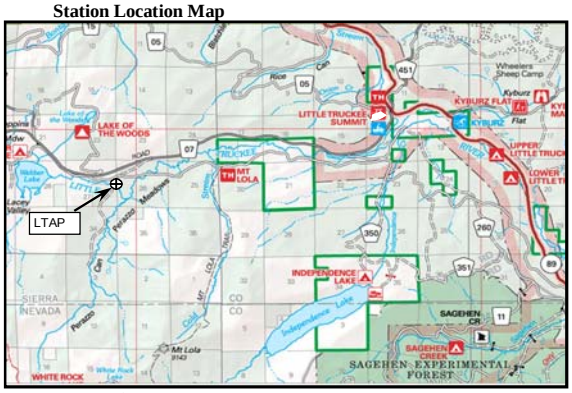
Form 2. Annual Hydrologic Record, WY2014

Water Year:	**2014**
Stream:	Little Truckee River
Station:	Above Perazzo Meadows (LTAP)
County:	Sierra County, California

Station Location Map



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 WY2014 is 12.4 cfs, WY2013 (partial) is 24.7 cfs, WY2012 is 27.0 cfs, WY2011 (partial) is 88.5 cfs.

Peak Flows (WY2014)

Date	Time (24-hr)	Gage Ht. (feet)	Discharge (cfs)	Date	Time (24-hr)	Gage Ht. (feet)	Discharge (cfs)
3/6/14	18:00	3.08	74	5/3/14	10:30	3.16	84
4/10/14	23:30	3.15	83	**5/6/14**	**10:30**	**3.82**	**182**
4/18/14	9:15	3.73	168	5/9/14	22:15	3.11	78
4/20/14	9:30	3.70	163				

Extreme for period of record (WY2011-2014) is 694 cfs on April 26, 2012.

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

WY2014 Daily Mean Flow (cubic feet per second)

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEPT
1	0.0	0.0	0.0	0.0	0.7	12.5	23.2	53.6	19.6	2.6	1.0	0.0
2	0.0	0.0	0.0	0.0	0.7	11.2	19.2	56.9	16.3	2.6	0.9	0.0
3	0.0	0.0	0.0	0.0	0.6	11.5	16.0	62.1	13.8	2.5	0.9	0.0
4	0.0	0.0	0.0	0.0	0.6	13.6	15.7	52.8	13.0	2.5	1.1	0.0
5	0.0	0.0	0.0	0.0	0.5	16.8	16.0	47.1	17	2.4	1.1	0.0
6	0.0	0.0	0.0	0.0	0.5	60.5	16.5	101.7	15	2.1	0.9	0.0
7	0.0	0.0	0.0	0.0	0.4	48.9	23.8	85.4	13.6	1.9	0.9	0.0
8	0.0	0.0	0.0	0.0	4.3	31.4	36.4	58.8	12.4	1.8	1.0	0.0
9	0.0	0.0	0.0	0.0	13.2	26.9	56.0	69.0	11.9	1.7	0.8	0.0
10	0.0	0.0	0.0	0.0	6.0	33.7	73.3	71.5	10.3	1.7	0.7	0.0
11	0.0	0.0	0.0	0.0	13.3	27.7	74.2	63.6	9.9	1.6	0.7	0.0
12	0.0	0.0	0.0	0.0	19.2	19.6	72.8	56.7	12.3	1.5	0.7	0.0
13	0.0	0.0	0.0	0.0	17.7	17.2	57.2	53.4	9.7	1.3	0.5	0.0
14	0.0	0.0	0.0	0.0	22.6	16.9	52.8	54.3	8.2	1.3	0.5	0.0
15	0.0	0.0	0.0	0.0	23.4	17.5	52.3	54.2	7.4	1.2	0.5	0.0
16	0.0	0.0	0.0	0.0	20.1	19.0	50.8	55.1	7.9	1.2	0.5	0.0
17	0.0	0.0	0.0	0.0	13.0	23.9	48.1	53.9	10.7	1.3	0.5	0.0
18	0.0	0.0	0.0	0.0	9.5	24.5	98.4	49.1	9.8	1.3	0.5	0.0
19	0.0	0.0	0.0	0.0	8.3	22.3	85.8	45.9	6.6	1.3	0.5	0.0
20	0.0	0.0	0.0	0.0	7.0	21.6	104.0	45.6	4.8	1.4	0.5	0.0
21	0.0	0.0	0.0	0.0	6.0	22.7	87.3	47.1	4.3	1.3	0.5	0.0
22	0.0	0.0	0.0	0.0	5.8	23.1	68.6	45.3	4.0	1.1	0.5	0.0
23	0.0	0.0	0.0	0.0	5.8	23.0	61.2	43.9	3.7	1.0	0.5	0.0
24	0.0	0.0	0.0	0.0	5.7	22.7	54.6	43.2	3.6	0.9	0.5	0.0
25	0.0	0.0	0.0	0.0	6.0	22.3	56.8	40.9	3.4	0.9	0.5	0.0
26	0.0	0.0	0.0	0.0	7.0	28.8	59.0	34.5	3.0	0.9	0.5	0.1
27	0.0	0.0	0.0	0.0	13.9	26.2	49.6	44.0	2.9	0.9	0.4	0.2
28	0.0	0.0	0.0	0.0	12.6	22.5	47.9	34.1	2.7	0.9	0.4	0.2
29	0.0	0.0	0.0	0.6		31.0	47.8	61.9	2.7	0.9	0.4	0.0
30	0.0	0.0	0.0	0.8		31.0	48.8	28.4	2.6	1.0	0.3	0.0
31	0.0		0.0	0.6		24.9		24.0		1.1	0.2	
MEAN	0.0	0.0	0.0	0.1	8.7	24.4	52	53	8.8	1.5	0.6	0.0
MAX. DAY	0.0	0.0	0.0	0.8	23.4	60.5	104	102	20	2.6	1.1	0.2
MIN. DAY	0.0	0.0	0.0	0.0	0.4	11.2	15.7	24.0	2.6	0.9	0.2	0.0
cfs days	0.0	0.0	0.0	2.0	244.4	755	1574	1638	263	46	19.2	0.6
ac-ft	0.0	0.0	0.0	4.1	485	1498	3123	3249	522	92	38.1	1.3

Monitor's Comments

1. 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.
2. Stage and flow are commonly affected by ice in the winter months;
4. Peak flows associated with snow-melt hydrographs commonly occur between April and June; multiple peaks are also common
5. Daily mean flows may be affected by operations at Webber Lake (Reservoir)
6. Data are subject to revision, should additional measurement or observer account warrant adjustment of the new rating curve.

Partial Water Year 2014 Totals:		
Mean flow	**12.4**	(cfs)
Max. daily flow	**104**	(cfs)
Min. daily flow	**0.00**	(cfs)
Annual total	**4,543**	(cfs-days)
Annual total	**9,011**	(ac-ft)

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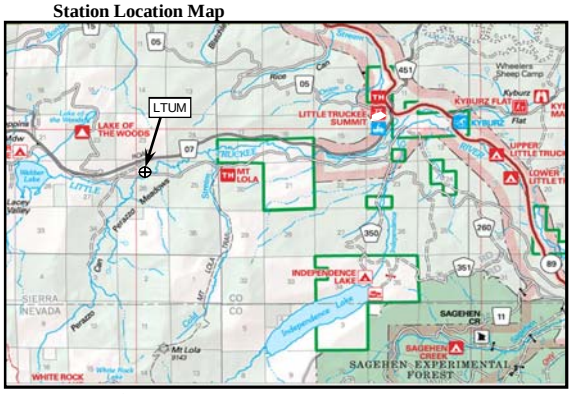
Form 3. Annual Hydrologic Record, WY2014

Water Year:	**2014**
Stream:	Little Truckee River
Station:	Upper Perazzo Meadow (LTUM)
County:	Sierra County, California

Station Location Map



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 Flow

Annual mean flow for WY2014 is 25 cfs, WY2013 is 54 cfs, WY2012 is 45 cfs, WY2011 (partial) is 141 cfs.

Peak Flows (WY2014)

Date	Time (24-hr)	Gage Ht. (feet)	Discharge (cfs)	Date	Time (24-hr)	Gage Ht. (feet)	Discharge (cfs)
2/9/14	9:30	6.06	123	4/20/14	11:45	6.58	258
3/6/14	18:00	6.02	125	**5/6/14**	**12:00**	**6.71**	**279**
4/12/14	23:45	6.18	156	5/9/14	21:45	6.24	173
4/18/14	11:15	6.65	275	5/15/14	22:00	6.18	157

Extreme for period of record (WY2011-2014) is 801 cfs on June 29, 2011.

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

WY2014 Daily Mean Flow (cubic feet per second)

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEPT
1	0.7	1.7	1.0	1.3	3.5	25.0	43.6	103	44	4.8	1.1	0.7
2	0.7	1.3	0.7	1.2	2.8	24.9	36.6	119	41	4.5	1.1	0.1
3	0.7	1.3	1.4	1.1	2.2	29.6	32.9	131	39	4.1	0.7	0.0
4	0.6	1.3	1.6	1.3	2.4	32.5	32.2	119	36	3.9	1.7	0.1
5	0.6	1.2	1.7	1.0	2.2	37.2	33.2	107	38	3.5	4.3	0.3
6	0.6	1.1	1.1	1.0	1.7	111.1	37.0	168	37	3.2	3.8	0.3
7	0.6	0.9	1.9	0.9	1.7	79.7	49.6	136	38	3.0	3.9	0.2
8	0.7	1.0	2.4	1.0	16.7	52.9	69	102	33.0	2.9	2.6	0.1
9	0.9	1.1	1.7	1.0	90.8	46.4	100	144	30.1	2.8	1.8	0.1
10	0.9	1.3	1.7	1.1	53.5	58.4	128	137	27.0	2.5	1.4	0.1
11	0.9	0.9	1.8	1.6	36.7	48.1	129	112	25.1	2.3	1.3	0.1
12	0.9	0.7	1.5	1.7	27.1	36.6	130	103	24.9	2.1	1.1	0.1
13	1.0	1.0	1.4	1.3	28.9	33.5	115	106	22.3	1.9	1.0	0.1
14	0.9	0.9	1.5	1.2	42.5	33.1	101	115	19.3	1.6	0.9	0.2
15	0.8	1.0	1.4	1.0	39.7	33.6	106	126	17.2	1.6	0.8	0.2
16	1.0	1.1	1.4	1.1	36.1	35.1	107	128	16.1	1.5	0.7	0.2
17	0.9	1.1	1.3	1.1	26.5	43.1	118	120	18.9	2.0	0.6	0.1
18	0.9	0.9	1.2	1.1	20.0	43.7	190	108	18.2	2.0	0.6	0.2
19	0.8	1.2	1.5	1.2	18.3	39.9	170	97	13.8	2.1	0.6	0.2
20	0.8	2.4	1.3	1.2	16.1	39.2	186	91	11.1	2.4	0.6	0.2
21	0.9	2.6	1.2	1.1	14.6	41.4	161	86	9.7	3.1	0.6	0.3
22	0.9	1.4	1.2	1.0	14.1	42.1	130	88	9.3	2.3	0.6	0.2
23	1.0	1.1	1.3	0.9	13.9	42.1	106	91	8.5	1.7	0.5	0.1
24	1.0	1.2	1.2	0.9	13.6	42.1	95	95	8.1	1.5	0.6	0.1
25	1.1	1.0	1.2	1.0	14.0	43.1	104	98	7.6	1.3	0.6	0.4
26	1.0	0.9	1.6	1.0	16.1	50.9	100	90	7.6	1.2	0.7	0.4
27	0.9	0.9	1.6	1.0	29.3	46.6	87	94	7.3	1.1	0.6	1.1
28	1.6	1.1	1.8	1.1	24.8	40.9	81	76	6.6	1.0	0.5	1.1
29	1.7	1.1	1.6	8.2	25.0	56.6	81	63	6.0	1.0	0.4	0.8
30	1.7	1.0	1.4	11.1		56.5	90	55	5.4	1.0	1.4	0.6
31	1.8		1.2	5.4		44.8		50		1.1	1.0	
MEAN	0.9	1.2	1.4	1.8	21.9	44.9	98.3	105.1	20.9	2.3	1.2	0.3
MAX. DAY	1.8	2.6	2.4	11.1	90.8	111.1	190.1	168.2	44.2	4.8	4.3	1.1
MIN. DAY	0.6	0.7	0.7	0.9	1.7	24.9	32.2	50.2	5.4	1.0	0.4	0.03
cfs days	29.4	35.7	44.8	55.9	634.8	1390.7	2949	3259	627	71.0	37.9	8.7
ac-ft	58.4	70.8	88.9	110.9	1259.1	2758.5	5850	6463	1244	140.8	75.2	17.2

Monitor's Comments

1. Daily mean values are based on 15-minute automatd measurements of stage; stage shifts have been applied to account for changes in sedimentation of the gage over the course of the monitoring program.
2. Daily mean stage and flow are commonly affected by ice in the winter months; these periods have been adjusted to correct daily mean flow
3. Peak flows associated with snow-melt hydrographs commonly occur between April and June; multiple peaks are also common
4. Daily mean flows may be affected by operations at Webber Lake (Reservoir)

Water Year 2014 Totals:		
Mean flow	**25**	(cfs)
Max. daily flow	**190**	(cfs)
Min. daily flow	**0.03**	(cfs)
Annual total	**9,144**	(cfs-days)
Annual total	**18,137**	(ac-ft)

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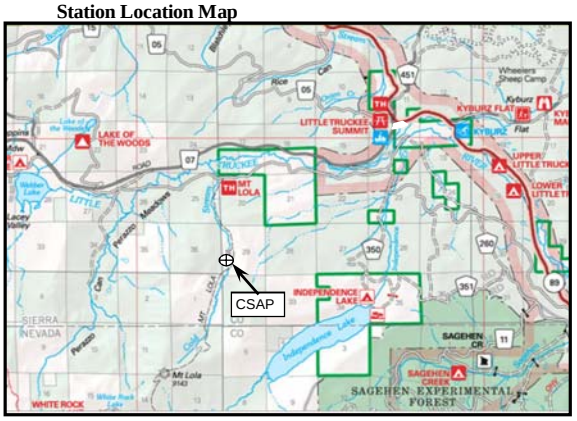
Form 4. Annual Hydrologic Record, WY2014

Water Year:	**2014**
Stream:	Cold Stream
Station:	Above Perazzo Meadows (CSAP)
County:	Nevada County, California

Station Location Map



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. 1,000 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 WY 2014 is 2.8 cfs; WY 2013 is 4.2 cfs; WY 2012 was 5.4 cfs;
WY 2011 (only a short period of data).

Peak Flows

Date	Time (24-hr)	Gage Ht. (feet)	Discharge (cfs)	Date	Time (24-hr)	Gage Ht. (feet)	Discharge (cfs)
2/9/14	19:15	3.90	11	4/17/14	20:15	3.91	12
3/30/14	0:00	3.88	11	5/3/14	17:00	3.97	15
				5/16/14	16:30	4.00	15
				5/25/14	**19:00**	**4.03**	**16**

Extreme for period of record, (Aug. 2011-Sept. 2013) is 58 cfs on May 16, 2012

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 2014 Daily Mean Flow (cubic feet per second)

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEPT
1	1.2	*2*	*1*	1.3	*2*	1.4	1.9	7.7	9.6	2.1	1.1	0.6
2	1.2	1.5	1.3	1.3	1.6	1.3	1.8	9.4	9.4	2.0	1.0	0.6
3	1.1	1.5	1.6	1.3	1.5	1.3	1.7	10.2	9.4	1.9	0.9	0.6
4	1.0	1.7	1.9	1.2	*1*	1.3	1.6	10.5	9.2	1.8	1.2	0.6
5	1.0	*2*	3.3	1.1	*1*	1.4	1.7	10.3	9.2	1.7	1.1	0.6
6	1.1	1.5	3.5	1.2	1.2	2.3	1.8	9.5	9.3	1.6	0.9	0.6
7	1.1	1.2	3.6	1.1	1.1	1.7	2.1	8.8	9.0	1.6	0.8	0.6
8	1.2	1.3	3.5	1.1	1.2	1.7	2.5	8.7	8.6	1.7	0.8	0.6
9	1.3	1.5	1.9	1.1	6.6	1.5	3.3	10.0	8.2	1.5	0.8	0.6
10	1.3	1.3	1.8	1.2	4.3	1.5	4.1	8.7	7.9	1.5	0.8	0.5
11	1.2	1.2	1.7	1.1	2.0	1.5	4.5	8.2	7.4	1.4	0.8	0.5
12	1.2	1.2	1.6	1.2	1.5	1.4	5.2	8.3	6.1	1.5	0.7	0.5
13	1.2	1.4	1.4	1.2	1.7	1.6	5.0	8.8	5.6	1.4	0.7	0.5
14	1.2	1.3	1.6	1.2	2.2	1.6	5.1	9.9	5.6	1.3	0.7	0.5
15	1.0	1.4	1.7	1.2	1.9	1.6	5.7	11.7	5.0	1.3	0.7	0.6
16	1.1	1.3	1.6	1.2	1.8	1.6	6.5	12.1	4.5	1.3	0.7	0.5
17	1.1	1.4	1.6	1.2	1.7	1.6	8.2	11.5	4.5	1.8	0.7	0.5
18	1.1	1.3	1.5	1.3	1.6	1.7	8.8	11.3	4.2	1.8	0.7	0.6
19	1.2	1.4	1.3	1.3	1.4	1.8	9.0	10.7	3.7	1.6	0.7	0.6
20	1.2	1.6	1.4	1.4	1.5	1.9	8.7	10.1	3.4	1.5	0.7	0.6
21	1.1	1.7	1.3	1.4	1.5	2.0	8.4	9.1	3.3	1.5	0.7	0.6
22	1.1	*2*	1.3	1.4	1.5	2.0	7.4	9.0	3.2	1.2	0.7	0.6
23	1.1	*2*	1.4	1.0	1.5	2.0	6.5	9.8	3.0	1.0	0.7	0.5
24	1.1	*2*	1.3	1.0	1.5	2.2	6.6	11.6	2.9	1.1	0.7	0.4
25	1.1	*2*	1.3	1.1	1.5	2.3	6.5	13.4	2.9	1.1	0.7	0.6
26	1.1	1.5	1.5	1.2	1.4	2.4	5.7	13.8	2.9	1.1	0.7	0.6
27	1.2	1.5	1.5	1.1	1.5	2.5	5.1	12.7	2.6	1.0	0.7	0.7
28	*2*	1.4	1.3	1.0	1.5	1.8	5.0	10.9	2.3	1.0	0.6	0.7
29	1.6	1.4	1.2	2.6		5.5	5.3	10.2	2.2	1.0	0.6	0.7
30	*2*	*1*	1.3	3.6		5.5	6.1	9.9	2.3	1.2	0.6	0.6
31	*2*		1.2	*2*		1.9		9.7		1.3	0.6	
MEAN	1.2	1.4	1.7	1.4	1.8	2.0	5.1	10.2	5.6	1.4	0.8	0.6
MAX. DAY	1.6	1.7	3.6	3.6	6.6	5.5	9.0	13.8	9.6	2.1	1.2	0.7
MIN. DAY	1.0	1.2	1.2	1.0	1.1	1.3	1.6	7.7	2.2	1.0	0.6	0.4
cfs days	37.4	43.1	53.9	41.9	51.1	61.4	151.9	316.4	167.4	44.6	23.8	17.5
ac-ft	74.1	85.6	106.9	83.1	101.4	121.8	301.2	627.5	332.0	88.4	47.1	34.7

Monitor's Comments

1. Mean daily values are based on 15-minute measurements of stage; several stage shifts have been applied to account for changes in sediment scour or fill at the gage over the course of the monitoring program.
2. Mean daily stage and flow are commonly affected by ice in the winter months; these periods have been adjusted to correct for ice.
3. Italicized font indicates an estimated flow (when affected by ice); and are shown without decimal digits.
4. Data are subject to revision, should additional measurements or observer accounts warrant adjustment of the rating curve.

Water Year 2014 Totals:		
Mean flow	**2.8**	(cfs)
Max. daily flow	**14**	(cfs)
Min. daily flow	**0.4**	(cfs)
Annual total	**1,010**	(cfs-days)
Annual total	**2,004**	(ac-ft)

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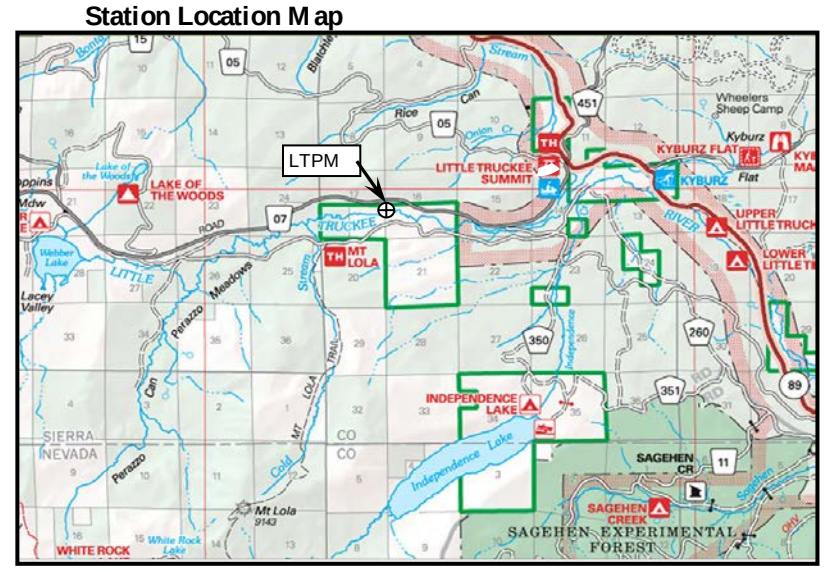
Form 5. Annual Hydrologic Record, WY2014

Water Year:	**2014**
Stream:	Little Truckee River
Station:	Middle Perazzo Meadow Outlet (LTPM)
County:	Sierra County, California

Station Location Map



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 WY2014 is 25.3 cfs; WY2013 is 66.5 cfs, WY2012 is 56.5 cfs, WY2011 is 161.6 cfs.

Peak Flows (WY2014)

Date	Time (24-hr)	Gage Ht. (feet, #3)	Discharge (cfs)	Date	Time (24-hr)	Gage Ht. (feet)	Discharge (cfs)
1/29/14	22:30	1.63	20				
2/9/14	11:00	1.95	132				
3/6/14	18:45	1.78	115				
4/18/14	**15:00**	**2.12**	**210**				

Extreme for period of record (WY2010-WY2014) is 1,166 cfs on December 2, 2012

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.
Gaging is sponsored by the Truckee River Watershed Council and USFS

WY2014 Daily Mean Flow (cubic feet per second)

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEPT
1	2.3	3.2	2.9	2.8	5.9	26.2	44.0	94.3	46.7	5.3	4.0	1.7
2	2.5	3.0	2.5	2.8	5.4	26.8	38.7	111.8	43.0	4.8	2.8	1.6
3	2.7	3.2	3.5	2.7	5.1	34.2	36.3	126.2	40.9	4.5	2.2	1.3
4	2.4	3.1	3.5	2.9	5.1	36.6	35.8	117.7	37.9	4.5	5.5	1.0
5	2.5	2.8	3.3	2.7	4.6	37.9	36.3	111.6	38.0	4.2	14.1	0.8
6	2.6	2.9	2.7	2.6	4.2	103.2	41.2	139.4	39.0	3.8	10.9	0.8
7	2.5	2.6	3.4	2.5	3.9	81.7	50.7	135.9	38.5	3.8	7.6	0.6
8	2.6	2.7	4.8	2.6	15.7	54.4	66.0	100.7	34.5	4.4	6.7	0.6
9	2.9	3.0	3.5	2.7	98.8	46.5	88.6	128.2	31.3	4.3	4.2	0.6
10	2.9	3.0	3.5	3.1	60.1	59.0	112.9	135.8	28.2	3.9	3.2	0.6
11	2.6	3.1	3.5	3.7	34.5	52.0	116.0	109.5	25.5	3.7	3.1	0.6
12	2.7	2.7	3.2	4.1	28.5	38.8	113.3	99.0	22.7	3.6	3.1	0.6
13	2.8	3.0	2.9	3.6	31.8	34.5	110.3	100.1	22.7	3.2	2.4	0.5
14	2.8	3.2	3.2	3.4	40.4	33.1	91.2	108.3	19.4	2.8	2.3	0.5
15	2.5	3.3	3.0	3.3	36.5	33.2	99.5	120.7	17.0	2.7	2.0	0.5
16	2.4	2.9	3.0	3.2	32.1	34.7	97.9	124.9	14.6	2.8	1.9	0.7
17	2.4	3.1	2.9	3.2	22.6	41.9	109.6	121.0	16.3	3.3	1.7	0.8
18	2.3	3.0	2.9	3.3	17.5	44.2	157.6	109.8	17.1	7.3	1.4	1.0
19	2.3	3.3	3.3	3.4	15.6	39.8	158.5	103.0	13.3	5.3	1.2	1.0
20	2.3	4.1	3.1	3.4	14.0	38.5	156.0	92.8	10.7	5.7	1.1	0.9
21	2.2	5.0	2.9	3.3	12.8	40.8	155.0	83.9	9.3	9.7	1.2	1.0
22	2.2	3.6	2.9	3.2	12.6	41.1	125.3	81.4	8.8	7.0	1.0	1.1
23	2.3	3.0	3.0	3.0	12.1	41.0	101.3	86.4	8.2	4.6	1.1	0.8
24	2.3	3.0	3.0	3.0	12.1	41.4	93.2	89.5	8.0	3.5	1.1	0.6
25	2.3	3.0	2.9	3.3	12.6	45.7	102.6	94.0	8.1	3.0	1.6	1.4
26	2.4	3.0	3.0	3.3	15.2	51.2	95.5	89.7	8.4	2.6	2.1	2.6
27	2.4	3.0	2.9	3.1	31.1	47.7	84.7	90.5	8.0	2.3	1.6	6.0
28	3.0	3.1	2.9	3.1	26.5	42.5	79.5	78.1	7.3	2.1	1.4	5.7
29	3.0	3.1	2.6	9.1		58.8	77.9	64.5	6.2	2.1	1.2	3.5
30	3.1	3.0	2.5	12.0		60.6	84.3	57.9	5.8	3.0	1.1	2.4
31	3.2		2.4	7.2		48.9		52.8		4.0	1.4	
MEAN	2.6	3.1	3.1	3.7	22.0	45.7	92.0	101.9	21.2	4.1	3.1	1.4
MAX. DAY	3.2	5.0	4.8	12.0	98.8	103.2	158.5	139.4	46.7	9.7	14.1	6.0
MIN. DAY	2.2	2.6	2.4	2.5	3.9	26.2	35.8	52.8	5.8	2.1	1.0	0.5
cfs days	79.3	93.9	95.5	115.6	617.3	1416.9	2759.8	3159.4	635.1	128.0	96.0	42.0
ac-ft	157.2	186.2	189.4	229.3	1224.5	2810.5	5474.0	6266.7	1259.7	253.8	190.5	83.3

Monitor's Comments

1. 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.
2. Stage and flow are commonly affected by ice in the winter months; these periods have been corrected
3. Peak flows associated with snow-melt hydrographs commonly occur between April and June; multiple peaks are also common
4. Daily mean flows may be affected by operations at Webber Lake (Reservoir)
5. Data are subject to revision, should additional measurement or observer account warrant adjustment of the new rating curve.

Water Year 2014 Totals:		
Mean flow	**25.3**	(cfs)
Max. daily flow	**159**	(cfs)
Min. daily flow	**0.5**	(cfs)
Annual total	**9,239**	(cfs-days)
Annual total	**18,325**	(ac-ft)

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Water Year:	**2014**
Stream:	Little Truckee River
Station:	Lower Perazzo Meadow outlet (LTLM)
County:	Nevada County, California

Form 6. Annual Hydrologic Record, WY 2014

Station Location / Watershed Descriptors

N 39° 29' 39", W 120° 19' 07" near Independence Lake, California. Gage is located on north bank

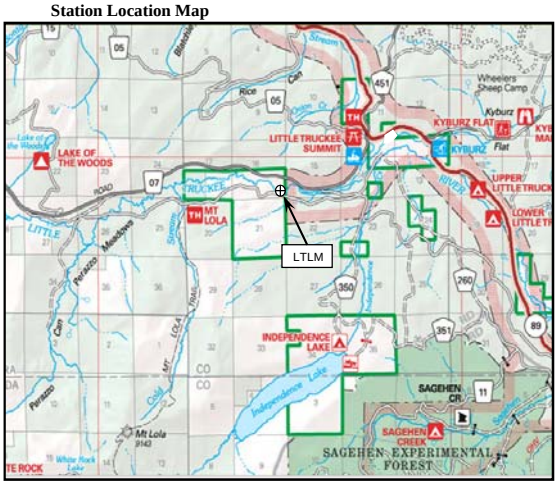
Gage is accessed from USFS Road 07 (Jackson Meadows Road).

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.

Station Location Map



Mean Flow

Mean daily flow (MDQ) for WY2014 is 31 cfs; mean flow for WY2013 was 63 cfs; mean flow for WY2012 was 50 cfs.

Peak Flows (WY 2014)

Date	Time (24-hr)	Gage Ht. (feet)	Discharge (cfs)	Date	Time (24-hr)	Gage Ht. (feet)	Discharge (cfs)
1/30/14	23:15	5.17	65				
2/9/14	**12:15**	**6.19**	**247**				
5/6/14	16:30	6.18	243				

Extreme for period of record (Aug. 2011 to Sept 2014): 1,403 cfs on 12/2/2012

Period of Record

Staff plate and water level recorder were installed August 18, 2011.

Gaging is sponsored by the Truckee River Watershed Council

WY 2014 Daily Mean Flow (cubic feet per second)

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEPT
1	3.7	6.8	5.0	4.9	13.8	35.4	56.5	109.5	59.4	6.5	5.7	2.2
2	3.8	5.9	4.2	4.9	9.6	35.2	47.5	124.0	54.2	5.8	4.9	2.1
3	3.9	5.8	7.3	5.0	8.9	44.7	43.4	134.6	51.5	5.4	4.7	2.2
4	3.4	5.4	7.6	5.2	8.7	48.0	42.9	127.6	47.3	5.3	7.7	2.3
5	3.4	4.7	7.3	4.0	7.9	48.0	42.4	123.5	47.1	4.8	15.2	2.3
6	3.6	5.3	6.6	4.0	7.3	119.8	48.9	154.5	49.1	4.2	13.2	2.2
7	3.3	4.2	8.9	4.1	6.8	102.8	61.4	150.8	48.3	4.0	9.8	2.2
8	3.7	4.5	10.5	4.8	28.5	71.0	81.7	115.8	43.1	4.4	8.4	2.2
9	4.6	5.0	8.7	4.7	158.8	57.5	103.5	139.2	38.9	4.2	5.9	2.1
10	4.7	4.7	8.4	5.6	105.0	77.2	127.4	149.9	34.8	3.7	4.9	2.1
11	4.4	4.5	8.1	7.2	55.3	66.7	131.1	124.5	31.4	3.1	4.5	2.0
12	4.5	3.8	7.1	7.8	35.6	46.3	127.6	112.9	27.1	3.0	4.2	1.9
13	5.1	4.6	6.0	6.2	42.4	41.0	125.6	112.9	28.2	2.6	3.3	1.9
14	4.9	4.6	6.0	5.4	56.3	39.0	107.3	118.9	24.4	2.4	3.5	1.9
15	4.3	4.8	5.7	4.7	52.7	39.3	114.8	129.0	21.7	2.4	3.3	1.8
16	4.1	4.2	5.7	4.4	51.6	40.5	112.6	133.8	18.6	2.5	3.2	1.7
17	4.3	4.6	5.5	4.5	39.0	47.7	122.4	130.5	20.6	3.0	3.1	1.8
18	4.2	4.7	5.6	4.9	28.6	51.0	172.5	119.6	21.9	6.1	3.0	1.7
19	4.2	5.6	7.3	4.8	25.1	46.1	175.2	115.5	18.0	4.9	2.9	1.7
20	4.2	8.0	6.5	4.6	22.9	45.3	170.4	111.2	15.0	5.3	2.9	1.6
21	4.1	10.2	5.6	4.5	21.3	47.7	171.0	104.7	13.3	8.5	2.9	1.5
22	4.0	6.8	5.5	4.1	20.3	47.9	140.5	100.6	12.3	6.9	2.8	1.4
23	4.1	5.2	5.4	3.9	19.3	48.2	118.7	104.9	11.1	4.5	2.9	1.3
24	4.0	4.9	5.2	4.1	18.7	48.4	109.7	107.2	10.7	3.9	2.8	1.3
25	4.0	4.9	5.1	4.8	19.1	52.6	121.3	111.2	10.6	3.4	3.1	2.2
26	4.1	5.2	4.9	4.8	21.9	62.8	115.6	107.5	10.7	3.5	3.1	4.8
27	4.1	5.3	4.5	4.5	43.2	59.7	104.3	108.0	9.9	3.6	2.5	9.1
28	6.4	5.6	4.3	4.9	36.3	52.3	99.0	96.7	9.3	3.6	2.3	9.3
29	6.8	5.5	4.0	21.8		76.9	96.1	82.9	7.9	3.8	2.3	6.2
30	6.8	5.1	3.9	34.2		82.7	101.0	74.8	7.3	4.9	2.2	4.4
31	6.9		3.9	16.1		64.0		67.9		5.9	2.3	
MEAN	4.4	5.3	6.1	6.8	34.5	56.3	106.4	116.3	26.8	4.4	4.6	2.7
MAX. DAY	6.9	10.2	10.5	34.2	158.8	119.8	175.2	154.5	59.4	8.5	15.2	9.3
MIN. DAY	3.3	3.8	3.9	3.9	6.8	35.2	42.4	67.9	7.3	2.4	2.2	1.3
cfs days	137.8	160.0	190.3	209.5	964.7	1745.5	3192.4	3604.5	803.8	136.2	143.2	81.4
ac-ft	273.2	317.4	377.6	415.6	1913.5	3462.2	6332.1	7149.5	1594.3	270.1	284.0	161.4

Monitor's Comments

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 and with fewer decimal digits.
4. Mean daily values are based on 15-minute measurements.

Water Year 2014 Totals:		
Mean flow	**31**	(cfs)
Max. daily flow	**175**	(cfs)
Min. daily flow	**1.3**	(cfs)
Annual total	**11,369**	(cfs-days)
Annual total	**22,551**	(ac-ft)

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TABLES

Table 1. Streamflow gaging station summary, Perazzo Meadows, Little Truckee River Wateshed, 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	248 cfs, April 26, 2012	248	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	694	Located on south bank, approximately 130 feet upstream from USFS road 7-030 bridge; subject to ice
Little Truckee at 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	801 cfs, June 29, 2011	752	Located on east bank, approx. 40 feet downstream from Henness Pass Rd bridge; subject to ice
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	58.4 cfs, May 16, 2012	58.4	Highest elevation station, subject to longer periods of ice and snow; delayed annual peak flow
Little Truckee at 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	1,052 cfs, June 6, 2010,	896	Gage relocated on September 28, 2010 and June 8, 2011. Current location is at last pond in Middle Meadow Plug and Pond project.
Little Truckee at 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	1,337 cfs, April 26, 2012	1,337	Located below Lower Meadow, north bank

Notes:

1. Webber Lake Reservoir 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

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Table 2. Historical gaging summary, Little Truckee River below Diversion Dam, near Sierraville, California
USGS station #10341950, Water Years 1993 to 1998 and 2012 to 2013

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	6/26/1993
1994	23.5	227	1.5	300	5.86	4/19/1994
1995	183.2	1,290	2.2	1,630	8.14	6/27/1995
1996	113.4	1,700	2.3	1,880	9.78	5/16/1996
1997	122.1	2,400	2.1	3,980	12.50	1/2/1997
1998	106.4	602	1.8	697	6.02	6/16/1998
2013	110.0	781	2.04	1,140	4.98	12/2/2012

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 Water Company; most flows are affected by diversion.
3. WY1993 partial: June 17 -September 30, 1993
4. This station was re-established by the USGS in the Fall of 2012; data are available through October 20, 2014.

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Table 3. Field Observer Log
Perazzo Creek above Perazzo Meadow (PCAP), WY2014

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	Additional sampling?	Estimated stage at staff plate	Inferred dates?	
(mm/dd/yr)		*(feet)*	*(R/F/S/B)*	*(cfs)*	*(AA/PY)*	*(e/g/f/p)*	*(deg C)*	*(µmhos/cm)*	*(at 25 deg C)*	*(Qbed, etc.)*	*(feet)*	*(mm/dd/yr)*	
9/16/2013 13:55	bkh	3.92	b	0.26	py	g/f	14	89	111	--	4.18 5.60	recent T's 4/29/2013	Record may reflect many thunderstorms this summer. Water clear w/ many fish. Gage in good condition. Aspen already dropped leaves. Alders still have green leaves.
7/14/2014 10:45	bkh/de/ sf	3.96	b	0.33	py	g/f	14	58	73	--	4.54	Spring/Early Summer	Qmeas captured ~95% of total flow. 30+ days since last rain. Difficult to measure velocity in several sections
8/7/2014 12:00	bkh	4.10	f/u	1.26	mmb	g	10	60	83	--	4.30	prev. night	Water clear, recall seeing "red" cell thunderstorm over watershed last night at ~5pm. Ponding on roads, humid.
8/29/2014 13:00	rw	3.88	u	0.20	py	f		--	--	--	--	--	Velocity not measurable on channel margins though movement was observed.
9/25/2014 9:30	pk	4.02	b	0.13	py	g		--	--	--	--	--	30+ days since last rain. Minor leaf jam at riffle causing stage shift. Cleared leafs at 9:58. Staff read 3.965 after clearing, possibly still falling

Observer Key: (bkh) is Brian Hastings, (de) is Dylan Esmonde, (sf) is Sharon Falvey, (pk) is Peter Kulchawik, (rw) is Randy Westmoreland
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 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 * field temp] + [0.00058561144042 * field temp^2]) * Field specific conductance
Additional Sampling: Qbed = Bedload, Qss = Suspended sediment, Nutr = nutrients; other symbols as appropriate

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Preliminary and subject to revision

Table 4. Field Observer Log
Little Truckee River above Perazzo Meadows (LTAP), WY2014

Site Conditions				*Streamflow*			*Water Quality Observations*			*High-Water Marks*		*Remarks*
Date/Time (observer time) (mm/dd/yr)	Observer	Stage (feet)	Hydrograph (R/F/S/B)	Measured Discharge (cfs)	Instrument Used (AA/PY/MM)	Estimated Accuracy (e/g/f/p)	Water Temperature (deg C)	Field Specific Conductance (µmhos/cm)	Adjusted Specific Conductance (at 25 deg C)	Estimated stage at staff plate (feet)	Inferred dates? (mm/dd/yr)	
7/14/14 12:15	bkh, USFS	1.83	B	1.13	PY	g/f	18.1	41.0	47.0	3.05	Winter baseflow	30+ days since last rain; staff plate vandalized but intact and functional; many HWMs above current water surface--related to draw down?
8/7/2014 12:45	bkh	1.74	B	0.68	MM	f	14.6	42.0	52.0	--	--	Flows elevated in other tributaries from t-storms, but LTAP appears unaffected (Webber Lake)
9/4/14 13:00	USFS	1.26	B	0.40	PY	f	--	--	--	--	--	no comments
9/25/2014 10:35	pk	1.04	B	0.11	PY	g	--	--	--	--	--	Water clear, dry period last 20+ days; leaves beginning to fall, small fish in pool

Observer Key: (bkh) is Brian Hastings; (ds) is David Shaw, (pk) is Peter Kulchawik, and (USFS)- US Forest Service, Tahoe National Forest, Truckee, CA, various staff
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 standard (AA) or pygmy (PY) bucket-wheel ("Price-type") current meter, or Marsh McBurney (MM); can be accompanied with (BB) Bridge-Board 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 * field temp] + [0.00058561144042 * field temp^2]) * Field specific conductance
Additional Sampling: Qbed = Bedload, Qss = Suspended sediment, Nutr = nutrients; other symbols as appropriate

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Table 5. Field Observer Log
Little Truckee River below Upper Perazzo Meadow (LTUM), WY2014

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)*	*(e/g/f/p)*	*(deg C)*	*(µmhos/cm)*	*(at 25 deg C)*	*(feet)*	*(mm/dd/yr)*	
9/16/13 12:00	bkh	4.46	B	0.20	PY	g/f	13.9	69	86	--	--	Abundant algae, cobbles heavily embedded, water slightly green hue; staff plate needs to be reinforced before winter
5/29/14 14:30	ds	5.58	B	--	--	--	--	--	--	--	--	Download; staff plate requires maintenance, LTUMa logger was hooked on fencepost
7/14/14 14:00	bkh, USFS	4.58	B	1.52	PY	g	20.5	60	66	5.75	annual peak?	Sunny, hot, water clear, still measureable flow as compared to this time in WY13
8/7/14 11:00	bkh	4.82	B	4.54	PY	g	12	74	98	--	--	Sunny, elevated stage from rain previous day; water slightly turbid
9/4/14 11:30	USFS	4.30	B	0.2	PY	p	--	--	--	--	--	No comments
9/25/14 12:00	pk	4.41	B	0.1	PY	p	--	--	--	--	--	Overcast, windy, rain expected; water mostly clear, past 20+ days were dry

Observer Key: (ds) is David Shaw; (bkh) is Brian Hastings; (USFS)-US Forest Service, Tahoe National Forest, Truckee, CA, various staff
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 standard (AA) or pygmy (PY) bucket-wheel ("Price-type") current meter. ("Other") includes Marsh-McBurney or Flo-Mate meters; 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 * field temp] + [0.00058561144042 * field temp^2]) * Field specific conductance
Additional Sampling: Qbed = Bedload, Qss = Suspended sediment, Nutr = nutrients; other symbols as appropriate

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Table 6. Field Observer Log:
Cold Stream above Middle Perazzo Meadows (CSAP), water year 2014

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)*	*(e/g/f/p)*	*(deg C)*	*(µmhos/cm)*	*(at 25 deg C)*	*(feet)*	*(mm/dd/yr)*	
9/16/2013 10:28	bkh	3.41	B	0.95	PY	g	…	…	…	5.4	May	water clear; free flow over downstream gravel/cobble/wood riffle; nights getting into 30's
5/29/2014 12:45	ds	3.87	R	8.67	PY	f	…	…	…	…	…	snow visible in upper watershed, diurnal snowmelt likely; possible scour at downstream end of gage pool
8/7/2014 9:50	bkh	3.54	U	0.85	MM	f	3.8	42	71	3.7	last week	rain over the last 7+ days; water clear and cold; downstream riffle looks mobile
9/25/2014 13:42	pk	3.44	B	0.58	PY	f	…	…	…	…	…	wood jam downstream of staff seems the same; good amount of rain today, first in ~30 days

Observer Key: (ds) is David Shaw, (PK) is Peter Kulchawik, (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 standard (AA) or pygmy (PY) bucket-wheel ("Price-type") current meter, (MM) 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; then adjusted to 25degC by equation (1.8813774452 - [0.050433063928 * field temp] + [0.00058561144042 * field temp^2]) * Field specific conductance

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Preliminary and subject to revision

Table 7. Field Observer Log
Little Truckee River at Middle Perazzo Meadow Outlet (LTPM), WY2014

Site Conditions				*Streamflow*			*Water Quality Observations*				*High-Water Marks*		*Remarks*
Date/Time (observer time) *(mm/dd/yr)*	Observer	Stage *(feet)*	Hydrograph *(R/F/S/B)*	Measured Discharge *(cfs)*	Instrument Used *(AA/PY)*	Estimated Accuracy *(e/g/f/p)*	Water Temperature *(deg C)*	Field Specific Conductance *(µmhos/cm)*	Adjusted Specific Conductance *(at 25 deg C)*	Additional sampling? *(Qbed, etc.)*	Estimated stage at staff plate *(feet)*	Inferred dates? *(mm/dd/yr)*	
9/16/2013 15:15	bkh	1.12	b	1.59	PY	f	15.8	100	121	…	…	…	beavers built dam at gaging pool riffe, stage is artificially elevated, water is cloudy, difficult to see meter at 0.6 depth
5/29/2014 16:30	ds	1.45	…	…	…	…	…	…	…	…	1.59	n/a	No Qmeas, download only. No beaver dam present.
7/15/2014 11:00	de/dm	0.48	b	2.95	PY	f	…	…	…	…	1.60	n/a	
8/7/2014 13:30	bkh	0.70	f/u	6.04	MMB	f	14	87	110	…	0.80	prev. night	Rain yesterday. "Red" cell over Little Truckee watershed yesterday. Roads are ponded in places. Water slightly turbid. No beaver dams this summer.
8/29/2014 11:00	rw	0.34	b	0.94	PY	g	…	…	…	…	…	…	Flow split by large boulders. Captured 98% of flow. Water slightly turbid. Overcast but no recent precip.
9/4/2014 10:30	dm	0.35	b	0.75	PY	f	…	…	…	…	…	…	
9/25/2014 15:30	pk	0.45	r/u	1.41	PY	g	…	…	…	…	…	…	Staff plate read 0.49 after Qmeas. Rain earlier in day. Stage possibly rose 0.04 during Qmeas. LTPMc was hanging 2-3 ft above water. LTPMd in good condition.

Observer Key: (bkh) is Brian Hastings, (ds) is David Shaw, (de) is Dylan Esmonde, (dm) is Dave McComb, (pk) is Peter Kulchawik, (rw) is Randy Westmoreland
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 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 * field temp] + [0.00058561144042 * field temp^2]) * Field specific conductance
Additional Sampling: Qbed = Bedload, Qss = Suspended sediment, Nutr = nutrients; other symbols as appropriate

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Table 3. Field Observer Log
Little Truckee River below Lower Perazzo Meadow (LTLM), WY2014

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	Additional sampling?	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)*	*(Qbed, etc.)*	*(feet)*	*(mm/dd/yr)*	
9/16/2013 16:12	bkh	4.09	B	2.31	PY	f	18.3	105	121	…	6.2	4/29/2013	Low flow; beaver dam ~400 feet upstream; many thunderstorms/rain over last 2 weeks
7/15/2014 11:30	de/dm	4.11	B	2.19	PY	g/f	…	…	…	…	5.38	spring	
8/7/2014 14:00	bkh	4.32	F/U	6.85	MMB	g	18.0	94	108	…	4.40	41857	Water slightly turbid. Gage in good condition. Chance of t-storms today (30%).
9/25/2014 9:30	pk	4.10	B	2.28	PY	g	…	…	…	…	…	…	Only one logger. Rain from earlier in day mostly stopped. Water clear. Many pine needles in eddies though don't appear to affect stage.

Observer Key: (bkh) is Brian Hastings, (de) is Dylan Esmonde, (dm) is Dave McComb, (pk) is Peter Kulchawik
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-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 * field temp] + [0.00058561144042 * field temp^2]) * Field specific conductance
Additional Sampling: Qbed = Bedload, Qss = Suspended sediment, Nutr = nutrients; other symbols as appropriate

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Table 9. Annual Runoff, Perazzo Meadows, Little Truckee River Watershed, Sierra County, California, water year 2014

Gaging Station	Gage ID	Drainage Area (mi^2)	Measured Runoff (acre-feet)	*Estimated Runoff* (acre-feet)	Unit Runoff (acre-feet/square mile)	Unit Runoff (cfs/square mile)	Remarks
Perrazo Creek above Upper Perazzo Meadow	PCAP	6.1	5,625	--	922	2.3	Unregulated perennial tributary to the Upper Perazzo Meadow
Little Truckee above Upper Perazzo Meadow	LTAP	15.8	9,011	--	570	1.7	Streamflow is regulated by Webber Lake (reservoir); tributary to the Upper Perazzo Meadow
Remaining ungaged contributing area above LTUM	--	3.6	--	*3,501*	*973*	--	This area includes lower Perazzo Creek canyon (~70%) and portions of the Upper Perazzo Meadow (~30%); lower estimated unit-runoff may be associated with storage in the meadow
Little Truckee, below Upper Perazzo Meadow	**LTUM**	**25.5**	**18,137**		**711**	**1.8**	**Outlet to the Upper Perazzo Meadow;**
Cold Stream, above Middle Perazzo Meadows	CSAP	3.1	2,004	--	646	1.8	Unregulated perennial tributary to the Middle Perazzo Meadow
Remaining ungaged contributing area above LTPM	--	4.2	--	*-1,816*	*-432*	--	Lower Cold Stream canyon and two unnamed perennial tributaries; negative values are likely attributable to uncertainty in the LTPM flow record arising from beaver dams and limited flow measurements during the water year.
Little Truckee, below Middle Perazzo Meadow	**LTPM**	**32.8**	**18,325**	**--**	**559**	**1.7**	**Outlet to the Middle Perazzo Meadow;** beaver dam construction affected stage-discharge rating curve at times, likely leading to an underestimate in total annual flow calculations from the Middle Meadow.
Remaining ungaged contributing area	--	1.4	--	*4,226*	*3,019*	--	See above
Little Truckee, below Lower Perazzo Meadow	**LTLM**	**34.2**	**22,551**	**--**	**659**	**1.8**	**Outlet to the Lower Perazzo Meadow (unrestored as of 2014)**

Notes:

1. Webber Lake Reservoir is located on the Little Truckee River above LTAP gaging station;
2. Values in *italics* indicate calculated values computed from other data
3. Unit runoff is expressed as cfs/square mile for the annual mean flow

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Table 10. Snowmelt recession runoff, Perazzo Meadows, Little Truckee River Watershed, Sierra County, California
May through September, 2014

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	1,696	384	36	30	8	
Little Truckee above Upper Perazzo Meadow	LTAP	15.8	3,249	522	92	38	1	Streamflow ceased between September 5-26, 2014
Little Truckee, below Upper Perazzo Meadow	**LTUM**	**25.5**	**6,463**	**1,244**	**141**	**75**	**17**	Includes an ungaged area of 3.6 square miles
Cold Stream, above Middle Perazzo Meadows	CSAP	3.1	628	332	88	47	35	Maintained flow through summer
Little Truckee, below Middle Perazzo Meadow	**LTPM**	**32.8**	**6,267**	**1,260**	**254**	**191**	**83**	Includes an ungaged area of 4.2 square miles
Little Truckee, below Lower Perazzo Meadow	**LTLM**	**34.2**	**7,150**	**1,594**	**270**	**284**	**161**	Includes an ungaged area of 1.4 square miles

Notes:

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Table 11. Groundwater monitoring observations, Water Years 2010 to 2014
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?	
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
9/23/09 17:16	ds	7.1	4.14	6563.3	8.8	66	97		stratified: 122uS at top (82@9.4)
10/23/09 9:43	bc	4.64	1.68	6565.8	7.9	73	108	n	labelled top of casing
12/4/09 12:39	bc	4.60	1.64	6565.8	4.3	62	102	n	water clear, no odor
5/21/10 16:00	ds,rw	3.04	0.08	6567.4	2.8	31	55		DTSW=2.83 (several inches deep and flowing), SCTsw=20@2.9C, 35@25
7/19/10 13:45	bc	3.64	0.68	6566.8	11.0	47	65	n	ground is wet
8/23/10 16:40	bc	4.78	1.82	6565.7	12.5	68	90	y	water clear
9/28/10 15:40	bc	4.98	2.02	6565.5	11.0	90	124	n	water clear, no odor
11/2/10 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; downloaded datalogger
7/8/11 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
8/11/11 10:40	bc	--	--	--	--	--	--	--	silted in, no standing water, ground dry
9/12/11 11:25	bc	--	--	--	--	--	--	--	silted in
10/9/11 0:00	bc	--	--	--	--	--	--	--	silted in
11/3/11 0:00	ds	--	--	--	--	--	--	--	unable to locate
12/5/11 0:00	bc	--	--	--	--	--	--	--	silted in
5/18/12 0:00	bc, ds	--	--	--	--	--	--	--	silted in
6/15/12 0:00	bc	--	--	--	--	--	--	--	silted in
7/17/12 0:00	bc	--	--	--	--	--	--	--	silted in
8/14/12 0:00	bc	--	--	--	--	--	--	--	silted in
5/2/2014 0:00	bc, ds	--	--	--	--	--	--	--	silted in
7/29/14 0:00	bc	--	--	--	--	--	--	--	silted in
9/11/14 0:00	bc	--	--	--	--	--	--	--	silted in
10/30/14 0:00	bc, ds	--	--	--	--	--	--	--	silted in

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Table 11. Groundwater monitoring observations, Water Years 2010 to 2014
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?	
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*								
8/21/09 0:00	ds, bc	4.34	2.58	6554.3					piezometer installed; DTW does necessarily reflect static water level
9/23/09 15:51	ds	4.02	2.26	6554.6	8.0	105	157		wp230
10/23/09 10:03	bc	2.43	0.67	6556.2	5.8	107	168	n	
12/4/09 11:45	bc	2.26	0.50	6556.3	2.8	112	194	n	water clear, no odor
5/21/10 13:30	ds, rw	2.06	0.30	6556.5	4.4	24	40		
6/12/10 14:10	bc	2.26	0.50	6556.3	6.9	33	50		
7/19/10 12:15	bc	2.72	0.96	6555.9	8.3	53	74	n	
8/23/10 15:00	bc	2.97	1.21	6555.6	6.6	98	150	y	water clear, no odor
9/28/10 16:05	bc	2.68	0.92	6555.9	6.3	114	176	n	water clear, no odor
11/2/10 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
7/8/11 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, 62.3@25
8/11/11 10:50	bc	2.48	0.72	6556.1	8.3	154	227	n	no stratification, water clear
9/12/11 11:30	bc	2.36	0.60	6556.2	8.0	137	203	y	no stratification
10/9/11 11:35	bc	2.13	0.37	6556.5	6.6	133	206	y	water clear
11/3/11 11:00	ds	2.29	0.53	6556.3	4.0	142	237	y	dry at surface
12/5/11 11:20	bc	2.04	0.28	6556.6	1.7	154		n	
5/18/12 10:25	ds, bc	2.13	0.37	6556.5	5.1	92	148	n	no stratification
6/15/12 11:00	bc	2.41	0.65	6556.2	4.7	133	217	y	water clear. SCT (depth) 174.6@3.2, 301.2@25
7/17/12 0:00	bc								couldn't get cap off.
8/14/12 0:00	bc								couldn't get cap off.
9/17/12 12:30	bc	3.43	1.67	6555.2	7.3	124	188	y	slightly muddy
10/18/12 0:00	ds	2.67	0.91	6555.9	5.0	121	196	n	ground is dry, slight strat. SC @ 25 = 210 at depth
5/24/13 13:40	ds, bc	2.29	0.53	6556.3	6.6	135	210	n	stratified: SC @ 25 = 250 at depth, 5.5 degC
6/20/13 12:30	bc	2.51	0.75	6556.1	4.9	131	213	y	stratifie: SC = 53@8.1, 250@25 at depth
7/24/13 11:00	bc	2.82	1.06	6555.8	9.6	162	229	n	no stratification
8/30/13 11:55	bc	3.02	1.26	6555.6	5.7	139	221	y	stratified: SC = 149@4.5, 247@25
9/18/13 12:45	ds	2.95	1.19	6555.7	8.4	150	218	n	no stratification
5/2/14 14:00	bc, ds	2.25	0.49	6556.4	-0.8	40	76	y	stratified: SC = 153@-1.2, 297@25
7/29/14 11:35	bc	3.23	1.47	6555.4	4.6	165	269	y	not stratified
9/11/14 11:30	bc	3.63	1.87	6555.0	4.2	151	252	y	clear not stratified
10/30/14 14:45	bc, ds	2.28	0.52	6556.3	0.9	92	169	y	stratified: 137.8 @ 1.1 , 252 @ 25

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Table 11. Groundwater monitoring observations, Water Years 2010 to 2014
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?	
Piezometer 09-3 - Lower Upper Meadow, near confluence Upper Truckee / Perazzo Cr									
Total Depth		8.00 *ft bgs*							
Depth to bottom =		10.10 *ft btoc*							
Total Stickup =		2.10 *ft above gs*							
Ground Elevation =		6544.2 *ft*							
8/21/09 0:00	ds,bc	8.33	6.23	6538.0					piezometer installed; DTW does necessarily reflect static water level
9/23/09 12:50									piezo is filled with sediment to depth 3.52 below toc; adjacent to constr. Access road
10/23/09 11:25	bc	1.7	-0.40	6544.6	7.5	77	117	n	water ponded on ground surface
12/4/09 11:04	bc								water ponded on surface and frozen solid
5/21/10 14:30	ds, rw	0.93	-1.17	6545.4	2.1	83	142	n	water flowing at sfc, SCT(sw) = 18@3C, 31@25; depth to SW = 1.16
6/12/10 15:30	bc								unable to access due to high water
7/19/10 10:40	bc	1.15	-0.95	6545.2	12.7	101	132	n	water ponded at sfc
8/23/10 14:00	bc	1.49	-0.61	6544.8	12.2	102	136	y	water ponded at sfc; water clear, no odor
9/28/10 15:00	bc	1.89	-0.21	6544.4	10.3	122	170	n	water ponded at sfc; water clear, no odor
11/2/10 12:48	ds	1.59	-0.51	6544.7	40.7	114	182	n	waetr ponded at sfc, slightly lower elevation (by 0.10') than groundwater impling downward hydraulic gradient; sfc water SC=64@25
7/8/11 13:13	ds, bc	0.38	-1.73	6545.9	4.5	74	122		depth to SW = .53', SCT (top) = 58.5@11, 80.1@25
8/11/11 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, 144.7@25
9/12/11 0:00	bc								couldn't find, water on surface 1-4" deep, grasses really tall
10/9/11 13:00	bc	1.31	-0.79	6545.0	8.00	99.50	146	y	water clear, depth to SW = 1.31
11/3/11 13:30	ds	1.63	-0.47	6544.7	5.00	133.00	212	n	SCT (sfc) 73@25, 42@3.1
12/5/11 12:46	bc	1.30	-0.80	6545.0	0.8	120		n	
5/18/12 12:25	ds, bc	0.37	-1.74	6545.9	10.4	59	82	n	no stratification, SCT (sfc) 23@10.5, 32.9@25. Depth to surface 6.75", water higher in well than in streams water surface. No cap
6/15/12 10:10	bc	0.91	-1.19	6545.4	10.1	63	88	y	in standing water, water clear.
7/17/12 0:00	bc								couldn't locate, carex waist high, water ponded on surface
8/14/12 12:00	bc	1.74	-0.36	6544.6	10.3	94	131	y	muddy, no strat
9/17/12 11:45	bc	2.69	0.59	6543.6	7.9	112	166	y	muddy, well almost dry
10/18/12 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
5/24/13 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.
6/20/13 11:25	bc	0.90	-1.20	6545.4	9.5	47	66	y	minor stratication: SC=53@8.1, 78@25
7/24/13 12:00	bc								could not locate, sedges waist high; standing water on ground
8/30/13 12:00	bc								could not locate, ground is moist, but no standing water
9/18/13 13:45	ds								could not locate; DTW value is estimated based on nearby water ponded in channels
5/2/14 14:00	bc, ds	0.78	-1.32	6545.5	7.0	46	68	y	no stratification; surface water @ aprox 1ft
7/29/14 0:00	bc								Could not locate
9/11/14 10:45	bc	2.13	0.03	6544.2	5.6	151	252	y	very muddy; not stratified
10/30/14 13:30	bc, ds	1.86	-0.24	6544.4	0.9	117	215	y	no strat, surface water SC=65.2, @3.1

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Table 11. Groundwater monitoring observations, Water Years 2010 to 2014
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?	
Piezometer 09-4 - North Side lower upper meadow, adjacent to volcanic bedrock outcrop									
Total Depth	7.34 *ft bgs*								
Depth to bottom =	10.10 *ft btoc*								
Total Stickup =	2.76 *ft above gs*								
Elevation =	6546.2 *ft*								
8/21/09 0:00	ds,bc	6.92	4.16	6542.0					piezometer installed; DTW does necessarily reflect static water level
9/23/09 14:59	ds	7.43	4.67	6541.5	8.7	69	101		wp228; installed levelogger
10/23/09 12:02	bc	3.18	0.42	6545.7	7.1	99	150		
12/4/09 10:32	bc	3.18	0.42	6545.7	1.7	68	122		
5/21/10 17:25	ds, rw	2.23	-0.53	6546.7	3.7	56	95		SCTsfc=23@4.9C, 38@25
6/12/10 16:00	bc								unable to access due to deep water and channels at well
7/19/10 13:15	bc	2.85	0.09	6546.1	11.6	67	90	n	ground saturated but no standing water
8/23/10 17:15	bc				12.0	65	87	y	water clear, no odor
9/28/10 16:50	bc	3.26	0.50	6545.7	9.4	79	113	n	water clear, no odor
11/2/10 12:10	ds	2.65	-0.11	6546.3	6.8	64	99	n	not stratified; surface water is 76@25
7/8/11 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, 81.1@25
8/11/11 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, 130.3@25
9/12/11 12:50	bc	3.03	0.27	6545.9	10.3	85	119	y	no stratification
10/9/11 12:20	bc	2.87	0.11	6546.1	8.0	98	146	y	water clear, no strat
11/3/11 12:50	ds	3.05	0.29	6545.9	6.7	107	165	n	saturated just below SFC, LL time 1250 PC time 1247
12/5/11 12:00	bc	3.09	0.33	6545.8	2.1	111	196	y	
5/18/12 11:00	ds, bc	1.98	-0.78	6546.9	6.2	55	85	n	DTS 1.98'. SCT (depth) 140@1.3, SCT (sfc) 21.6@5.8
6/15/12 11:40	bc	2.62	-0.14	6546.3	8.5	68	100	y	no stratification, water clear, surfrace water at ground level
7/17/12 12:40	bc	3.38	0.62	6545.5	11.9	122	163	y	water slightly muddy. SCT (depth) 142.2@8.7, 200.4@25
8/14/12 13:15	bc	3.98	1.22	6544.9	10.7	180	251	y	SCT (depth) 173.6@7.7, 258.3@25
9/17/12 13:05	bc	5.44	2.68	6543.5	8.4	125	183	y	slightly muddy. Stream dry, island pools.
10/18/12 16:15	ds	5.57	2.81	6543.4	5.8	152	238	n	LL time = 1632, PC time = 16:31. data downloaded.
5/24/13 14:15	ds, bc	2.61	-0.15	6546.3	9.8	58	82	n	stratified; SC = 255 @ 25, 4.9 deg C at bottom of well.
6/20/13 13:15	bc	3.08	0.32	6545.8	8.6	65	94	y	not stratified
7/24/13 11:45	bc	3.07	0.31	6545.9	14.0	127	158	n	stratified; SC = 162@10.3; 226@25 at bottom of well
8/30/13 12:35	bc	3.98	1.22	6544.9	7.9	117	174	y	no stratification
9/18/13 13:20	ds	4.17	1.41	6544.8	10.5	208	287	n	minor stratification: SC=215@8.6, 312@25 at bottom of well
5/2/14 15:45	bc, ds	0.78	-1.98	6548.1	7.2	71	110		Stratified: SC=156@0.3, 291@25
7/29/14 12:25	bc	2.86	0.10	6546.1	7.9	149	218	y	clear
9/11/2014 12:10	bc	3.7	0.94	6545.2	4.9	163	263	y	clear; stratified: 206 @ 4.4, 340.1@25
10/30/2014 15:50	bc, ds	2.69	-0.07	6546.2	1.2	170	310		stratified: sc=200 @ 2.2 , 357@ 25

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Table 11. Groundwater monitoring observations, Water Years 2010 to 2014
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?	
Piezometer 09-5 - North side, lower upper meadow, upland terrace									
Total Depth	5.26 *ft bgs*								
Depth to bottom =	10.01 *ft btoc*								
Total Stickup =	4.75 *ft above gs*								
Elevation =	6553.8 *ft*								
8/21/09 0:00	ds,bc	dry							piezometer installed
9/23/09 14:46	ds	9.78	5.03	6548.8	11.2	145	197	y	wp227; very little water in bottom of well.
10/23/09 12:12	bc	9.65	4.90	6548.9	9.3	362	517	n	murky brown color, water level near bottom of well
12/4/09 10:18	bc	8.91	4.16	6549.6	6.8	298	459	n	water clear, no odor; capped
6/12/10 15:45	bc	4.77	0.02	6553.8	9.2	174	250	n	
7/19/10 13:05	bc	5.80	1.05	6552.7	10.6	171	237	n	
8/23/10 17:00	bc	7.87	3.12	6550.7	10.1	194	270	y	water clear, no odor
9/28/10 16:40	bc	8.62	3.87	6549.9	9.9	280	393	n	water clear, no odor
11/2/10 11:58	ds	6.18	1.43	6552.4	7.3	96	145	n	stratified: 374@25 at depth
7/8/11 11:48	ds, bc	4.85	0.10	6553.7	7.1	154	233	y	water clear, SCT (top) = 127.1@15.4, 155.7@25
8/11/11 12:05	bc	5.71	0.96	6552.8	8.6	112	163	n	SCT (top) = 128.3@12.3, 169@25
9/12/11 12:40	bc	7.31	2.56	6551.2	10.1	112	158	y	water clear, no stratification
10/9/11 12:10	bc	8.23	3.48	6550.3	9.0	756	1080	y	water clear, no stratification
11/3/11 12:20	ds	8.33	3.58	6550.2	7.9	1092	1620	n	ground is dry, stratified, SCT (top) 250@25
12/5/11 11:50	bc	7.98	3.23	6550.6	5.6	124	197	n	
5/18/12 11:35	ds, bc	4.91	0.16	6553.6	8.2	105	154	n	
6/15/12 11:50	bc	5.41	0.66	6553.1	8.4	105	152	y	water clear, no stratificaiton
7/17/12 13:00	bc	7.50	2.75	6551.0	7.7	98	147	y	a little clear, no strat
8/14/12 13:25	bc	8.71	3.96	6549.8	7.5	101	152	y	water muddy, no strat
9/17/12 13:15	bc	9.47	4.72	6549.1	7.5	127	187	y	muddy
10/18/12 0:00	ds	9.75	5.00	6548.8	6.7	107	165	n	
5/24/13 14:25	ds, bc	5.44	0.69	6553.1	9.4	71	101	n	
6/20/13 13:30	bc	6.82	2.07	6551.7	7.5	70	104	y	no stratification
7/24/13 11:50	bc	8.22	3.47	6550.3	10.4	75	105	n	no stratification
8/30/13 12:45	bc	9.26	4.51	6549.3	6.6	119	184	y	
9/18/13 13:35	ds	9.51	4.76	6549.0	10.5	127	178	n	
5/2/14 16:05	bc, ds	4.94	0.19	6553.6	3.0	154	264		Stratified: 142.6 @ 1.9 255@25
7/29/04 12:35	bc	8.91	4.16	6549.6	5.0	149	241	y	clear, no strat
9/11/14 12:25	bc	9.39	4.64	6549.1	6.0	151	238	y	clear, no strat
10/30/14 16:10	bc, ds	9.24	4.49	6549.3	3.7	155	266	y	no strat

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Table 11. Groundwater monitoring observations, Water Years 2010 to 2014
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?	
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 btoc*							
Total Stickup =		3.25 *ft above gs*							
Elevation =		6492.6 *ft*							
8/27/09 0:00	ds, tb	4.23	0.98	6491.7					piezometer installed; water level not static, but fairly stable
9/23/09 10:35	ds	4.01	0.76	6553.0	9.3	95	137	y	replaced SCT meter battery just prior to measurement; installed levelloger after bailing well
10/1/09 9:30	ds,bc	4.00	0.75	6553.0	7.3	82	124	n	downloaded levelogger
10/23/09 12:58	bc	3.69	0.44	6553.3	6.4	82	127	n	water clear, no odor
12/4/09 13:56	bc	3.83	0.58	6553.2	2.8	79	137	n	water clear, no odor
6/11/10 15:00	ds	3.28	0.03	6553.8	4.6	98	160	n	stratified; SCT at water table = 94.4@9.3degC, 135@25; downloaded DL; saturated at sfc
7/19/10 9:24	bc	3.47	0.22	6553.6	10.4	116	161	n	
8/23/10 12:35	bc	4.21	0.96	6552.8	8.3	100	148	y	water clear, no odor; cap replaced with loose oversized cap
9/28/10 13:45	bc	3.71	0.46	6553.3	6.4	86	133	n	water clear, no odor
11/2/10 13:43	ds	3.41	0.16	6553.6	5.2	83	131	n	stratified: 88@25 in upper portion of well; water ponded in nearby depressions, evidence of surface flow in willows; downloaded datalogger
7/8/11 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, 118@25
8/11/11 9:02	bc	3.25	0.00	6553.8	9.6	83	117	n	no stratification, water clear
9/12/11 9:30	bc	3.61	0.36	6553.4	8.6	112	163	y	water clear, SCT (top) = 95.4@8.6, 126.5@25
10/9/11 13:40	bc	3.32	0.07	6553.7	7.0	108	165	y	no stratification
11/3/11 14:00	ds	3.44	0.19	6553.6	6.3	103	160		minimal stratification
12/5/11 13:35	bc	3.45	0.20	6553.6	2.8	89	154	n	
5/18/12 12:55	ds, bc	2.82	-0.43	6554.2	9.5	117	165	n	in standing water. SCT (depth) 120@1.6
6/6/12 11:28	merced	3.02	-0.23	6554.0	--	--		--	
6/15/12 9:00	bc	3.20	-0.05	6553.8	6.2	103	161	y	water slightly muddy. SCT (depth) 139.4@4.7, 226.9@25
7/17/12 10:30	bc	3.63	0.38	6553.4	7.5	128	193	y	no stratification
8/14/12 13:50	bc	3.60	0.35	6553.4	7.5	138	211	y	no strat, water clear
9/17/12 10:55	bc	3.29	0.04	6553.7	6.9	101	155	y	no strat, water slightly muddy
10/18/12 12:58	ds	3.24	-0.01	6553.8	6.9	113	177	n	downloaded
5/24/13 11:35	ds, bc	2.98	-0.27	6554.1	7.7	97	146	n	stratified; SCT = 220@25, 137@5.4 at depth
6/20/13 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, 173@25
7/24/13 12:45	bc	3.10	-0.15	6553.9	12.5	103	136	n	no stratification
8/30/13 10:05	bc	3.17	-0.08	6553.9	6.2	108	168	y	water clear; stratified: SC = 162@5.4, 259@25
9/18/13 14:05	ds	3.20	-0.05	6553.8	9.4	142	203	n	no stratification; downloaded
5/2/14 12:45	bc, ds	2.91	-0.34	6554.1	5.1	79	127	y	stratified; SC = 171 @ 0.5, 317@ 0.5
7/29/14 13:25	bc	3.40	0.15	6553.6	6.5	167	258	y	no strat; clear
9/11/14 9:25	bc	3.27	0.02	6553.8	3.8	120	202	y	no strat; clear
10/30/14 12:00	bc, ds	3.14	-0.11	6553.9	1.4	105	190	y	clear; stratification: sc = 112 @ 1.0 , 205 @ 25 ; ground moist

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Table 11. Groundwater monitoring observations, Water Years 2010 to 2014
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?	
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*								
8/27/09 0:00	ds, tb	7.19	3.45	6469.3	11.2	101	139		coupler driven onto pipe, could not remove, no cap installed
9/23/09 11:16	ds	7.01	3.27	6469.5	9.7	102	72	y	SC rises slightly after purcging, ~10uS; water slightly turbid after bailing
10/1/09 11:55	ds,bc	6.97	3.23	6469.5	9.5	81	115		downloaded levellogger; measurement from top of inside casing, not coupling
10/23/09 14:30	bc	6.50	2.76	6470.0	8.1	73	107		water clear in color, no odor
12/5/09 10:44	bc	6.38	2.64	6470.1	4.5	68	113	n	water clear, no odor; no cap installed; bird droppings
6/11/10 16:00	ds	4.23	0.49	6472.3	8.5	95	142	n	temperature stratified, 4.1degC at bottom of well; downloaded DL
7/19/10 8:13	bc	5.96	2.22	6470.5	8.3	96	142	n	no cap
8/23/10 11:20	bc	6.59	2.85	6469.9	8.9	92	133	y	water clear, no odor, replaced cap
9/28/10 0:00									unable to located piezo
11/3/10 16:23	ds			6472.7	6.6	119	183		well stickup is broken off, replaced; downloaded and removed datalogger to avoid damage.
7/8/11 16:47	ds, bc				7.2	453	691		SCT (top) 66.5@25
8/11/11 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
9/12/11 8:45	bc	4.05	0.31	6472.4	11.6	110	148	y	no stratification, slightly muddy water
10/9/11 15:30	bc	3.74	0.00	6472.7	9.2	100	143	y	water clear
11/3/11 16:00	ds	3.98	0.24	6472.5	5.4	93	149		did now download UC Merced LL, Stickup = 3.5'
12/5/11 10:00	bc	3.99	0.25	6472.5	2.7	94	163	n	
5/18/12 15:15	ds, bc				7.9	126	187	n	levelogger embedded in mud. Removed but is now resting on top of mud.
6/6/12 12:22	merced	3.48							
6/15/12 8:10	bc	3.78	0.04	6472.7	8.0	135	200	y	water muddy, no stratification
7/17/12 9:45	bc	4.66	0.92	6471.8	7.2	106	161	y	muddy, no strat
8/14/12 15:40	bc	4.57	0.83	6471.9	8.2	111	164	y	very muddy
9/17/12 10:15	bc	4.22	0.48	6472.3	7.9	102	154	y	water clear, no strat
10/18/12 14:06	ds	4.08	0.34	6472.4	5.6	89	140	n	downloaded
5/24/13 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
6/20/13 9:25	bc	4.09	0.35	6472.4	5.2	82	131	y	water clear, with a little turbidity at bottom, no stratification
7/24/13 9:00	bc	4.52	0.78	6472.0	10.4	99	138	n	no stratification
8/30/13 9:25	bc	4.23	0.49	6472.3	6.0	89	140	y	water clear, no strat
9/18/13 11:15	ds	4.25	0.51	6472.2	9.2	82	119	n	not stratified; downloaded levellogger
5/2/14 11:00	bc, ds	3.54	-0.20	6472.9	1.6			y	not stratified
7/29/14 9:40	bc	4.88	1.14	6471.6	6.4	85	132	y	no strat; muddy
9/11/14 8:40	bc	4.81	1.07	6471.7	4.5	69	114	y	muddy, no strat
10/30/14 11:00	bc, ds	4.12	0.38	6472.4	1.3	71	128	y	no strat

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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?	
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*								
8/27/09 0:00	ds,tb	8.53	3.58	6493.8					piezometer installed; not static, fairly steady
9/23/09 16:05	ds	8.42	3.47	6493.9	10.6	115	160	y	wp238; no stratification
10/1/09 9:01	ds,bc	8.41	3.46	6493.9	10.4	97	135	n	
10/23/09 13:20	bc	7.96	3.01	6494.4	9.4	104	149	n	water clear; no odor
12/4/09 13:29	bc	7.82	2.87	6494.5	6.6	93	144	n	water clear no odor; capped
6/12/10 16:30	bc	5.14	0.19	6497.2	9.7	149	209	n	
7/19/10 9:45	bc	7.52	2.57	6494.8	9.4	117	167	n	
8/23/10 13:00	bc	7.03	2.08	6495.3	10.7	101	140	y	water muddy at bottom, next to active construction
9/28/10 14:15	bc	5.50	0.55	6496.8	10.2	98	134	n	water clear, no odor
11/2/10 14:54	ds	4.97	0.02	6497.4	8.6	140	206		not stratified; no evidence of overland flow at this location
7/8/11 14:30	ds, bc	4.69	-0.26	6497.6	6.0	104	163	y	SCT (top) = 62.4@12.6, 80.6@25
8/11/11 9:20	bc	5.46	0.51	6496.9	9.6	136	192	n	SCT (top) = 64.1@10.8, 84.8@25
9/12/11 10:10	bc	5.81	0.86	6496.5	11.0	155	211	y	water clear, no stratification
10/9/11 14:05	bc	5.41	0.46	6496.9	9.1	161	232	n	couldn't get bailer in deep enough to bail.
11/3/11 14:28	ds	5.95	1.00	6496.4	7.0	127	193	n	meadow dry, UC Merced levelogger pulled and replaced but not downloaded
12/5/11 13:45	bc	5.95	1.00	6496.4	3.8	137	231	n	
4/24/12 0:00	ds	4.54	-0.41	6497.8	10.8	158	210		SCT (depth) 113@1.6. SCT (sfc) 53.4@ 15.9, 64.7@25, new cap installed with levelogger
4/24/12 0:00	ds	4.50	-0.45	6497.8					
5/18/12 13:30	ds, bc	4.71	-0.24	6497.6	6.2	124	194		no stratification
6/6/12 13:27	merced	4.89	-0.06	6497.4					
6/15/12 9:25	bc	5.23	0.28	6497.1	7.2	136	205	y	slightly muddy, SCT (depth) 127.8@4.9, 208.6
7/17/12 10:55	bc	6.47	1.52	6495.9	7.3	133	200	y	water clear, no strat
8/14/12 14:10	bc	6.80	1.85	6495.5	8.8	127	182	y	no stratification
9/17/12 11:15	bc	6.62	1.67	6495.7	8.5	135	196	y	water clear, no strat
10/18/12 12:20	ds	6.64	1.69	6495.7	7.1	135	206	n	downloaded
5/24/13 11:55	ds, bc	5.29	0.34	6497.0	7.2	53	80	n	stratified: SC = 106.8@6.2, 166@25 at depth
6/20/13 10:35	bc	5.95	1.00	6496.4	6.9	105	161	y	stratified: SC = 112@5.6, 179@25 at depth
7/24/13 13:15	bc	6.79	1.84	6495.5	10.3	142	196	n	
8/30/13 10:35	bc	6.74	1.79	6495.6	7.9	145	216	y	water muddy, no stratification
5/2/14 12:15	bc, ds	5.04	0.09	6497.3	4.9	111	183	y	Stratified: SC 122 @ 1.1, 223 @ 25
7/29/14 14:05	bc	6.99	2.04	6495.3	7.3	122	180	y	no strat; slightly muddy
11/9/14 9:55	bc	7	2.05	6495.3	6.0	122	191	y	no strat; slightly muddy
10/30/14 12:40	bc, ds	6.36	1.41	6496.0	2.8	130	225	y	no strat

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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?	
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*								
8/29/09 0:00	ds,tb	4.04	2.42	6490.8	13.6	90	116	n	piezometer installed; water level not static
9/23/09 18:00	ds				11.7	162	216		stratified: 147uS at top (111@12.3); installed levellogger
10/1/09 8:48	ds,bc	3.87	2.25	6491.0	11.1	88	123	n	changed levellogger id to "09-9"; downloaded data
10/23/09 13:12	bc	3.36	1.74	6491.5	9.4	102	145	n	water clear, no odor
12/4/09 13:22	bc	3.20	1.58	6491.7	4.7	88	143	n	water clear, no odor
6/11/10 14:07	ds				9.4	76	108	n	
7/19/10 9:40	bc	3.50	1.88	6491.4	11.8	121	162	n	
8/23/10 13:15	bc	4.47	1.16	6492.1	12.4	94	124	y	water clear, no odor
9/27/10 11:00	ds	2.29	-1.02	6494.3	10.7	103	142	n	downloaded levellogger
9/28/10 14:10	bc	2.38	-0.93	6494.2	11.2	101	137	n	water clear, no odor
11/2/10 14:27	ds	1.92	-1.39	6494.6	7.1	100	150	n	not stratified, downloaded datalogger, HWM is 0.55' above ground surface
7/8/11 14:14	ds, bc	1.07	-2.24	6495.5	7.8	76	113		depth to SW same as in well. SCT (top) = 69@10.5, 95.1@25
8/11/11 9:15	bc	1.86	-1.45	6494.7	12.1	126	167	n	water clear, SCT (top) 144.4@12.7, 185.6@25
9/12/11 9:50	bc	2.11	-1.20	6494.4	12.6	182	238	y	no stratification
10/9/11 13:55	bc	2.08	-1.23	6494.5	9.3	190	270	y	water clear
11/3/11 14:20	ds	2.19	-1.12	6494.4	7.1	173	262		no stratification, meadow surface dry
12/5/11 13:15	bc	2.12	-1.19	6494.4	2.7	144	250	n	
4/24/12 12:57	ds	0.94	-2.37	6495.6	3.4	112	192	n	SCT (depth) 102@.6, SCT (sfc water) 21.4@4.3, 35@25, downloaded levelogger. Depth to surface water 11.25"
5/18/12 13:20	ds, bc	1.04	-2.27	6495.5	7.7	131	195	n	SCT (sfc) 27@11.3, 36@25. in flowing water, no stratification, datalogger downloaded
6/6/12 13:22	merced	1.38	-1.9325	6495.1727	--	--		--	
6/15/12 9:15	bc	1.81	-1.50	6494.7	10.5	147	203	y	no stratification
7/17/12 10:40	bc	2.48	-0.83	6494.1	11.8	206	276	y	water clear, SCT(depth) 204.9@10.1, 285.4@25
8/14/12 14:05	bc	2.58	-0.73	6494.0	12.1	214	283	y	water clear
9/17/12 11:05	bc	2.45	-0.86	6494.1	10.2	192	267	y	no strat, water slightly muddy
10/18/12 11:50	ds	2.32	-0.99	6494.2	7.3	161	242	n	cap is off and missing, SCT at 25 = 234 at bottom, downloaded
5/24/13 11:50	ds, bc	1.76	-1.55	6494.8	9.2	141	202	n	no stratification
6/20/13 10:20	bc	2.20	-1.11	6494.4	9.1	178	256	y	no stratification
7/24/13 13:00	bc	2.58	-0.73	6494.0	13.4	179	230	n	no stratification
8/30/13 10:20	bc	2.35	-0.96	6494.2	8.8	164	238	y	no stratification
9/18/13 14:30	ds	2.54	-0.77	6494.0	11.3	168	227	n	no stratification
5/2/14 12:00	bc, ds	1.58	-1.73	6495.0	3.8	60	100	y	no stratification
7/29/14 13:50	bc	2.63	-0.68	6493.9	8.6	206	301	y	no stratification
9/11/14 10:05	bc	2.32	-0.99	6494.2	6.0	158	247	y	no stratification, clear
10/30/14 12:25	bc, ds	2.08	-1.23	6494.5	0.3	143	267	y	stratification: sc= 153 @ 2.1 , 272@25

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Table 11. Groundwater monitoring observations, Water Years 2010 to 2014
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?	
Piezometer 09-10 - Lower Middle Meadow, S side, opposite and corral									
Total Depth	6.70 *ft bgs*								
Depth to bottom =	10.01 *ft btoc*								
Total Stickup =	3.31 *ft above gs*								
Elevation =	6477.1 *ft*								
8/29/09 0:00	ds,tb	5.76	2.45	6474.7	13.2	127	165	n	piezometer installed; water level not static
9/23/09 12:35	ds	5.21	1.90	6475.2	9.0	120	174	y	
10/1/09 11:04	ds,bc	5.11	1.80	6475.3	9.2	103	148	y	
10/23/09 14:47	bc	4.38	1.07	6476.1	7.4	102	154	n	water clear, no odor
12/5/09 10:13	bc	4.40	1.09	6476.1	2.6	91	158	n	water clear, no odor
6/11/10 13:35	ds	3.85	0.54	6476.6	9.5	102	144	n	temp stratified; 5.3 degC at depth
7/19/10 8:30	bc	5.00	1.69	6475.5	11.4	101	136	n	
8/23/10 10:55	bc	5.80	2.49	6474.7	10.4	91	126	y	water clear, no odor
9/28/10 12:00	bc	--		--	--	--		--	destroyed by cows
11/3/10 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.
7/8/11 16:20	ds, bc	--		--	15.6	25	30	n	knocked over by cows, water .75' deep at well, SCT is of SW
8/11/11 8:30	bc	--		--	--	--		n	ground damp, no standing water
9/12/11 8:20	bc	2.88	-0.43	6477.6	10.7	83	114	y	water clear, brown at bottom, no stratification
10/9/11 15:10	bc	2.88	-0.43	6477.6	7.9	87	129	y	water clear
11/3/11 15:00	ds	2.93	-0.38	6477.5	6.2	77	120		SCT (sfc) 160@25, UC Merced LL pulled but not downloaded, could not get LL back to bottom due to silt/mud
12/5/11 10:17	bc	2.78	-0.53	6477.7	2.0	90	160	n	
5/18/12 14:55	ds, bc	2.03	-1.28	6478.4	8.7	105	154		SCT (depth) 97.8@6.5, 151.6@25
6/6/12 14:05	merced	2.66	-0.6525	6477.7926					
6/15/12 7:50	bc	2.82	-0.49	6477.6	10.4	146	203	y	a little muddy, no odor, no strat
7/17/12 9:25	bc	2.99	-0.32	6477.5	9.7	133	188	y	water clear, no strat
8/14/12 15:20	bc	2.55	-0.76	6477.9	9.6	150	212	y	slightly muddy, no strat
9/17/12 9:55	bc	2.86	-0.45	6477.6	7.6	122	182	y	water clear. SCT at depth = 115.9@7C, 177@25C
10/18/12 11:13	ds	2.95	-0.36	6477.5	4.8	126	207	n	SCT at bottom = 172@25C. Downloaded
5/24/13 10:20	ds, bc	2.72	-0.59	6477.7	8.1	128	188	n	no stratification
6/20/13 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
7/24/13 8:40	ds	3.08	-0.23	6477.4	11.0	136	186	n	no stratification
8/30/13 9:05	bc	2.99	-0.32	6477.5	6.2	117	182	y	water clear, no stratification
5/2/14 10:40	bc, ds	2.57	-0.74	6477.9	2.0	122	217	y	no stratification
7/29/14 9:20	bc	3.09	-0.22	6477.4	7.3	146	220	y	no stratification; clear then slightly muddy
9/11/14 8:15	bc	3.05	-0.26	6477.4	4.2	142	236	y	no stratification; clear
10/30/14 10:35	bc, ds	2.88	-0.43	6477.6	0.8	110	203	y	no stratification; clear then muddy at bottom

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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?	
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*								
8/29/09 0:00	ds,tb	9.88	7.05	6467.7	11.9	199	267		piezometer installed, water level not static, still rising
9/23/2009 12:00	ds	5.16	2.33	6472.4	10.8	111	151	y	
10/1/2009 11:26	ds,bc	5.01	2.18	6472.5	10.5	116	160		no stratification
10/23/2009 15:03	bc	3.98	1.15	6473.6	8.7	103	150	n	water clear, no odor
12/5/2009 10:28	bc	3.23	0.40	6474.3	2.6	81	141	n	
6/11/2010 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; 211@25 at depth; depth to SW from TOC = 2.65, suggests upward vertical hydraulic gradient
7/19/2010 7:50	bc	3.92	1.09	6473.6	12.8	178	137	n	
8/23/2010 10:35	bc	5.15	2.32	6472.4	11.6	148	198	y	water clear, 'oily' odor
9/28/2010 12:10	bc	4.85	2.02	6472.7	9.6	157	223	n	water clear, no odor
11/3/2010 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, appears to be spring fed from base of N hillside alluvial fan
7/8/2011 15:51	ds, bc	2.30	-0.53	6475.2	20.3	185	203	y	depth to SW = 2.62. No stratification
8/11/2011 7:30	bc	3.59	0.76	6474.0	12.4	135	180	n	no stratfication
9/12/2011 8:00	bc	4.38	1.55	6473.2	11.9	118	157	y	water clear, no stratification
10/9/2011 14:50	bc	3.23	0.40	6474.3	10.3	113	157	y	
11/3/2011 15:30	ds	3.14	0.31	6474.4	6.7	99	151		no stratification
12/5/2011 10:30	bc	2.99	0.16	6474.6	3.2	80	136	n	
5/18/2012 14:40	ds, bc	2.40	-0.43	6475.1	8.4	83	121	n	no stratification, datalogger downloaded
6/6/2012 13:56	merced	2.49	-0.343333333	6475.0533					
6/15/2012 7:35	bc	2.98	0.15	6474.6	7.6	90	134	y	water clear, no odor, no strat
7/17/2012 9:10	bc	4.46	1.63	6473.1	8.6	100	146	y	water clear, no strat
8/14/2012 15:05	bc	4.97	2.14	6472.6	8.7	109	159	y	water clear, no strat
9/17/2012 9:40	bc	4.75	1.92	6472.8	8.6	122	176	y	water clear, no strat
10/18/2012 10:50	ds	4.25	1.42	6473.3	7.1	128	196	n	downloaded
5/24/2013 10:05	ds, bc	2.57	-0.26	6475.0	7.5	91	136	n	stratified: SC = 86@5.4, 137@25 at depth
6/20/2013 8:40	bc	3.81	0.98	6473.7	7.3	87	131	y	
7/24/2013 8:20	bc	4.84	2.01	6472.7	11.3	131	177	n	minor temperature stratification: 9.3 degC at depth
8/30/2013 8:45	bc	4.90	2.07	6472.6	7.5	121	181	y	not stratified
9/18/13 10:30	ds	4.79	1.96	6472.8	10.5	141	195	n	9.4 degC at bottom, no SCT stratification; downloaded levellogger
5/2/14 10:20	bc, ds	2.73	-0.10	6474.8	1.8	98	176	y	not stratified
7/29/14 9:00	bc	5.17	2.34	6472.4	6.9	146	221	y	clear; Stratified: 135 @ 5.0 , 217.8 @25
9/11/14 8:00	bc	5.24	2.41	6472.3	6.0	146	229	y	clear, not stratified
10/30/14 10:10	bc, ds	3.96	1.13	6473.6	2.4	124	218	y	clear; Stratified: 128 @ 3.7 , 218 @25

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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?	
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*								
7/19/09 0:00	ds	7.14	3.47	6550.3	9.5	102	145	n	
9/23/09 16:19	ds	5.3	1.63	6552.1	9.9	90	122	n	stratified: 49 uS/cm at top (37@10.8)
10/23/09 10:22	bc	6.98			7..6	85	127	n	stinky; well seems disturbed and data point is an outlier, omitted from the record
12/4/09 12:18	bc	5.60	1.93	6551.8	4.7	36	59	n	water clear, no odor
5/21/10 15:30	ds, rw	7.77	4.10	6549.7					SCT reading Lerr
6/12/10 0:00	bc								unable to remove cap
7/19/10 11:55	bc								unable to remove cap
8/23/10 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)
9/28/10 15:50	bc	4.32	0.74	6553.0	9.7	64	90	n	water clear, no odor
11/2/10 11:17	ds	3.96	0.38	6553.4	6.5	62	40		stratified: 112@25 in bottom 1-2" of well; 78@25 in adjacent pond
7/8/11 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, 31.9@25
8/11/11 11:20	bc	3.65	0.07	6553.7	10.4	35	47	n	ground wet, but no standing water, no stratification
9/12/11 12:20	bc	4.06	0.48	6553.3	10.5	41	57	y	no stratification
10/9/11 11:15	bc	3.97	0.39	6553.4	8.0	42	63	y	water clear, no strat
11/3/11 11:20	ds	4.01	0.43	6553.3	5.2	41	66		
12/5/11 11:05	bc	4.30	0.72	6553.1	3.3	37	64	n	
5/18/12 10:05	ds, bc	7.87	4.29	6549.5	4.3	22	36	n	no stratification, water ponded in depression at sfc
6/15/12 10:40	bc	4.25	0.67	6553.1	10.8	45	61	y	water clear, no strat
7/17/12 11:50	bc	4.59	1.01	6552.8	12.2	48	64	y	water clear, no strat
8/14/12 12:25	bc	4.60	1.02	6552.8	13.8	75	95	y	slightly muddy, SCT (depth) 65.4@11, 89.8@25
9/17/12 12:10	bc	4.63	1.05	6552.7	11.0	69	95	y	water clear
10/18/12 12:00	ds	4.57	0.99	6552.8	8.0	71	105	n	not stratified
5/24/13 13:30	ds, bc	7.88	4.30	6549.5	8.5	30	44	n	not stratified
6/20/13 12:00	bc	4.32	0.74	6553.0	10.8	41	56	y	water clearn, not stratified
7/24/13 10:40	bc	4.50	0.92	6552.9	16.1	61	73	n	no stratification
8/30/13 11:35	bc	4.60	1.02	6552.8	9.9	67	94	y	water clear, no strat
9/18/13 12:15	ds	4.61	1.03	6552.7	12.3	71	94	n	not stratified
5/2/14 14:20	bc, ds	4.01	0.43	6553.3	2.5	33	58	y	not stratified
7/29/14 11:15	bc	4.75	1.17	6552.6	10.3	69	97	y	not stratified, clear
9/11/14 11:10	bc	4.62	1.04	6552.7	9.4	82	118	y	not stratified, clear
10/30/14 14:10	bc, ds	4.43	0.85	6552.9	4.1	67	113	y	

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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*								
7/19/09 0:00	ds	5.69	2.44	6552.8	8.4	102	145	n	stratified: 75 uS/cm at top of water table
9/23/09 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
10/23/09 10:14	bc	3.09	-0.16	6555.4	6.5	41	63	n	labeled well; standing water at base of well
12/4/09 12:09	bc								frozen
5/21/10 14:20	ds, rw	7.49	4.24	6551.0	4.4	24	39		1" water on sfc, SCTsfc same as piezo; checked meas several times.
6/12/10 14:40	bc	3.59	0.34	6554.9	7.0	26	38	n	water ponded on sfc
6/16/10 12:30	ds	2.53	-0.72	6556.0				n	water flowing at sfc; downloaded LL
7/19/10 11:55	bc	2.66	-0.59	6555.8	11.7	30	46	n	water ponded on sfc
8/23/10 15:45	bc	3.54	0.29	6555.0	15.4	177	216	y	ground wet, no standing water; water brown, no odor
9/28/10 15:55	bc	3.48	0.23	6555.0	10.8	151	207	n	water clear, no odor
11/2/10 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
7/8/11 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. SCT (top) = 18.1@4.9, 29.3@25
8/11/11 11:30	bc	2.65	-0.60	6555.8	11.3	27	37	n	depth to SW = 2.65', no stratification
9/12/11 12:15	bc	2.85	-0.40	6555.6	14.7	50	63		ground wet, no stratification
10/9/11 11:25	bc	2.75	-0.50	6555.7	8.6	44	63	y	water slightly muddy, depth to SW = 2.75'
11/3/11 11:10	ds	2.78	-0.47	6555.7	2.4	38	67	y	file downloaded, cap missing
12/5/11 11:15	bc	2.64	-0.61	6555.9	--	--	--	--	frozen depth to ice
5/18/12 10:10	ds, bc	2.45	-0.80	6556.0	3.8	21	36	n	depth to surface 29.375", water flowing on surface, datalogger downloaded
6/15/12 10:45	bc	2.61	-0.64	6555.9	9.6	30	43	y	in standing water. 2.48' to surface water
7/17/12 11:55	bc	3.34	0.09	6555.2	12.5	137	180	y	water clear, no strat
8/14/12 12:35	bc	3.41	0.16	6555.1	12.5	143	189	y	light brown, no strat
9/17/12 12:20	bc	3.54	0.29	6555.0	10.4	152	208	y	slightly muddy
10/18/12 0:00	ds	3.39	0.14	6555.1	7.8	141	208		not stratified, downloaded
5/24/13 13:30	ds, bc	2.59	-0.66	6555.9	7.0	22	34	n	not stratified
6/20/13 12:10	bc	2.73	-0.52	6555.8	10.1	35	48	y	water muddy, not stratified, ponded at surface
7/24/13 10:45	bc	3.34	0.09	6555.2	12.9	146	190	n	not stratified
8/30/13 11:45	bc	3.45	0.20	6555.0	7.3	131	198	y	not stratified
9/18/13 12:20	ds	3.47	0.22	6555.0	9.6	136	193	n	slightly stratified at bottom: SC=154@5.8, 218@25; downloaded logger
5/2/14 14:25	bc, ds	2.58	-0.67	6555.9	5.4	26	41	y	not stratified
7/29/2014 11:25	bc	3.52	0.27	6555.0	8.1	118	174	y	slightly muddy; stratified: 123 @ 7.6, 184.4 @25
9/11/2014 11:20	bc	3.67	0.42	6554.8	5.4	116	185	y	slightly muddy
10/30/2014 14:30	bc, ds	3.26	0.01	6555.2	2.2	115	204	y	Stratified: sc= 152 @ 3.4 , 261 @ 25

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Table 11. Groundwater monitoring observations, Water Years 2010 to 2014
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?	
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*								
7/19/09 0:00	ds	7.64	4.84	6549.0	9.5	471	671	n	
9/23/09 16:33	ds	7.05	4.25	6549.6	9.6	413	580	y	stratified: 412 uS at bottom (413@9.6); smells bad, like feces or rotting flesh; no levelogger installed
10/23/09 10:37	bc	4.50			8.3	41	60	n	water clear, no odor; data point is an outlier, omitted from the record
12/4/09 11:21	bc	7.93	5.13	6548.7	4.5	63	104	n	water clear, no odor, no cap
6/12/10 15:00	bc	7.02	4.22	6549.6	6.5	23	36		no cap
7/19/10 11:40	bc	4.33	1.53	6552.3	10.7	36	50	n	no cap
8/23/10 15:15	bc	4.7	1.90	6551.9	11.8	59	79	y	water clear, no odor, replaced cap
9/28/10 16:25	bc	4.68	1.88	6552.0	10.8	72	99	n	water clear, no odor
11/2/10 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.
7/8/11 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, 75@25
8/11/11 11:05	bc	4.17	1.37	6552.5	8.1	50	73	n	SCT (top)= 52.3@9.2, 74.8@25
9/12/11 11:45	bc	4.38	1.58	6552.3	9.3	70	100	y	a little sediment in water (light tan), no stratification
10/9/11 11:50	bc	4.25	1.45	6552.4	8.7	81	118	y	water clear
11/3/11 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, 132@25
12/5/11 11:30	bc	4.42	1.62	6552.2	4.0	75	125	n	
5/18/12 10:40	ds, bc	4.02	1.22	6552.6	2.4	73	128	n	dry ground, missing cap
6/15/12 11:15	bc	4.32	1.52	6552.3	5.6	71	114	y	no strat, water clear/slightly muddy
7/17/12 12:20	bc	4.89	2.09	6551.7	6.2	65	102	y	water clear, no strat
8/14/12 12:55	bc	5.09	2.29	6551.5	7.5	80	122	y	water clear, no strat
9/17/12 12:45	bc	5.32	2.52	6551.3	7.7	65	97	y	water clear
10/18/12 0:00	ds	5.05	2.25	6551.6	6.4	65	100	n	minimal strat, SCT at bottom = 110@25C
5/24/13 13:30	ds	4.45	1.65	6552.2	8.4	72	106	n	stratification: 107@6, 168@25 at depth
6/20/13 12:40	bc	4.69	1.89	6551.9	6.6	90	138	y	no stratification
7/24/13 11:10	bc	4.96	2.16	6551.7	10.6	97	133	n	no stratification
8/30/13 12:10	bc	5.12	2.32	6551.5	6.4	79	122	y	water clear, no strat
9/18/13 13:00	ds	5.25	2.45	6551.4	9.8	68	95	n	not stratified; willows have dropped leaves
5/2/14 14:55	bc, ds	4.06	1.26	6552.6	1.8	49	89	y	Stratified, 62.4@ 0.3, 116@25
7/29/14 11:50	bc	5.13	2.33	6551.5	6.4	89	138	y	clear to slightly muddy; no strat
9/11/14 11:50	bc	5.37	2.57	6551.3	6.6	85	131	y	muddy; no stratification
10/30/14 15:05	bc, ds	4.77	1.97	6551.9	3.6	96	162	y	no strat

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Table 11. Groundwater monitoring observations, Water Years 2010 to 2014
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?	
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*								
7/19/09 0:00	ds								not measured (locking cap)
9/23/09 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
10/23/09 11:04	bc	4.04	1.84	6546.5	9.6	54	79		water clear, no odor; added label
12/4/09 10:47	bc	3.88	1.68	6546.6	6.7	53	83	n	water clear, no odor;
6/12/10 15:15	bc	3.74	1.54	6546.8	4.7	43	70	n	
7/19/10 11:07	bc	3.93	1.73	6546.6	9.9	53	74	n	
8/23/10 14:30	bc	4.13	1.33	6547.0	14.6	59	73	y	clear on top, brown on bottom, no odor
9/28/10 15:10	bc	4.05	1.25	6547.0	12.7	63	83	n	water clear, no odor
7/8/11 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, 67.2@25
8/11/11 12:45	bc	3.58	0.78	6547.5	9.2	57	82	n	SCT (top) = 57.1@11.7, 76.8@25
9/12/11 13:00	bc	4.08	1.28	6547.0	11.4	62	84	y	water brown, no stratification
10/9/11 12:30	bc	3.39	0.59	6547.7	11.7	50	67	y	water clear
11/3/11 13:00	ds	3.9	1.10	6547.2	9.1	50	71	n	ground dry, not stratified
12/5/11 12:10	bc	3.92	1.12	6547.18	6.1	44	69	n	
5/18/12 10:50	ds, bc	3.4	0.60	6547.70	3.0	58	101	n	missing cap, SCT (depth) 430@2.2, 750@25.
6/15/12 11:30	bc	3.74	0.94	6547.36	5.5	69	110	y	medium muddy. SCT (depth) 98.1@4.9, 159.8@25
7/17/12 12:30	bc	4.56	1.76	6546.54	9.5	92	130	y	water muddy, no strat
8/14/12 13:05	bc	5.02	2.22	6546.08	10.8	105	146	y	very muddy, no strat
9/17/12 13:00	bc	5.61	2.81	6545.49	11.3	92	125	y	muddy, well just about dry
10/18/12 0:00	ds	5.03	2.99	6545.31	10.6	84	115	n	not stratified, PVC broken, stickup = 24.5" on N side.
5/24/13 14:05	ds, bc	3.91	1.87	6546.43	8.2	65	96	n	stratified: SC=75@6.3, 117@25
6/20/13 13:00	bc	4.08	2.04	6546.26	10.7	65	89	y	no stratification
7/24/13 11:30	bc	4.54	2.50	6545.80	14.8	103	127	n	no stratification
8/30/13 12:25	bc	5.07	3.03	6545.27	12.4	107	135	y	water muddy, no strat
9/18/13 13:20	ds	4.92	2.88	6545.42	15.3	103	126	n	some of the transplanted willows still have leaves
5/2/14 15:20	bc, ds	3.71	1.67	6546.63	1.4	67	121	y	Stratified SC: 84 @ 0.9, 154 @ 25
7/29/14 12:15	bc	4.58	2.54	6545.76	11.4	108	147	y	clear; no strat
9/11/14 12:00	bc	5.2	3.16	6545.14	10.9	114	153	y	muddy
10/30/14 15:30	bc, ds	3.86	1.82	6546.48	6.4	72	111	y	no stratification

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Table 11. Groundwater monitoring observations, Water Years 2010 to 2014
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 *[f]t, NGVD/NAVD)*	Temperature *(°C)*	Specific Conductance (at field temp.) *(µS/cm)*	Specific Conductance (at 25 °C) *(at 25 °C)*	Bailed?	

Notes:
1) ds is David Shaw (Balance); bc is Beth Christman (Truckee River Watershed Council); rw is Randy Westmoreland (USFS); tb is Travis Bagget (Balance)
2) NR is not recorded, -- is not applicable
3) Water surface elevationsare 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 * field temp] + [0.00058561144042 * field temp^2]) * Field specific conductance

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FIGURES

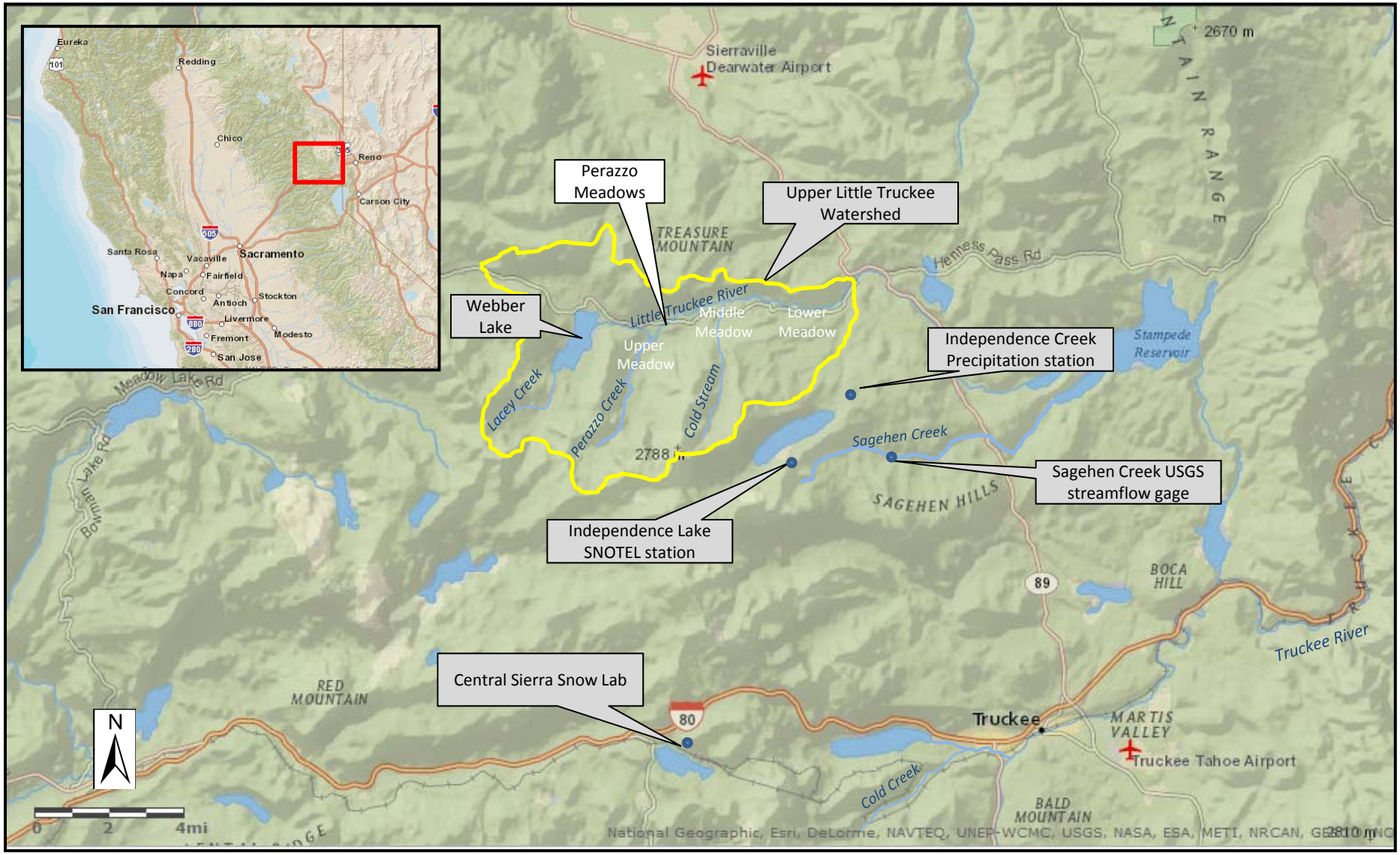

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Figure 1. **Perazzo Meadows, Sierra County, California**
Perazzo Meadows is part of the Upper Little Truckee watershed, in the headwaters of the Truckee River. Other locations discussed in this report are identified on this map.

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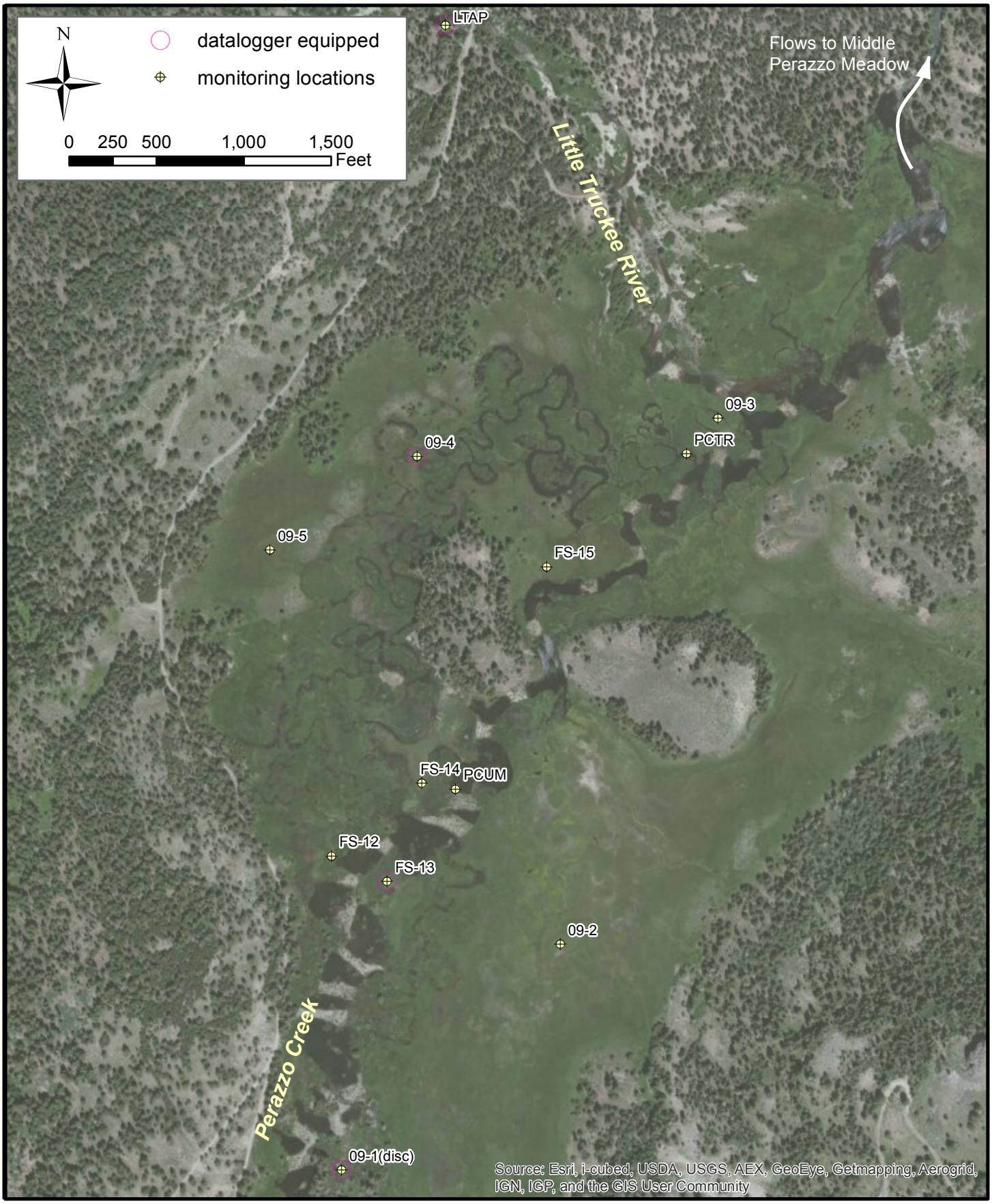

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Figure 2. Location of groundwater and surface water monitoring stations Upper Perazzo Meadow, Sierra County, California

W:\Projects\209116\209116 Perazzo-upper.mxd

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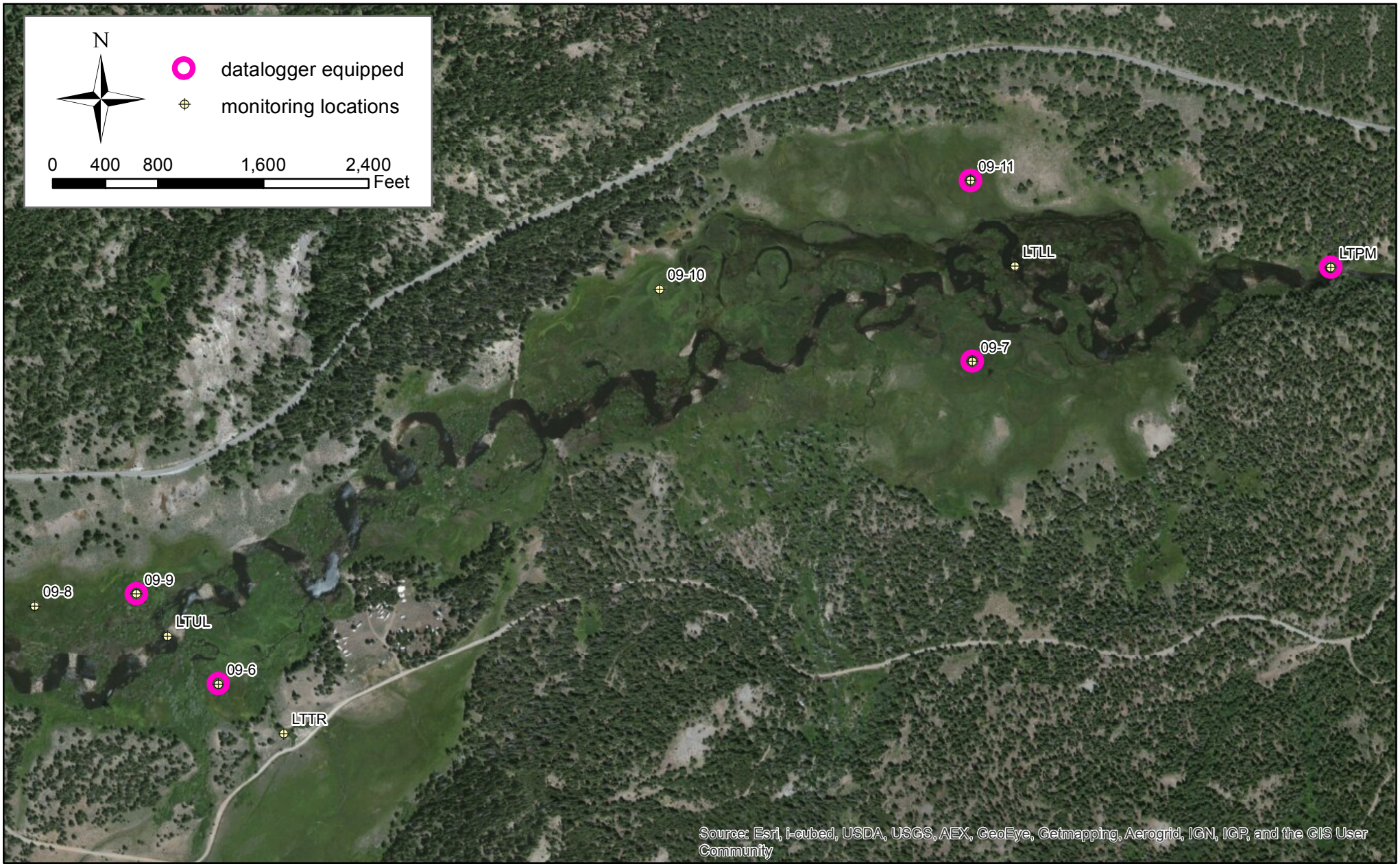

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Figure 3. Location of groundwater and surface water monitoring stations Middle Perazzo Meadow, Sierra County, California

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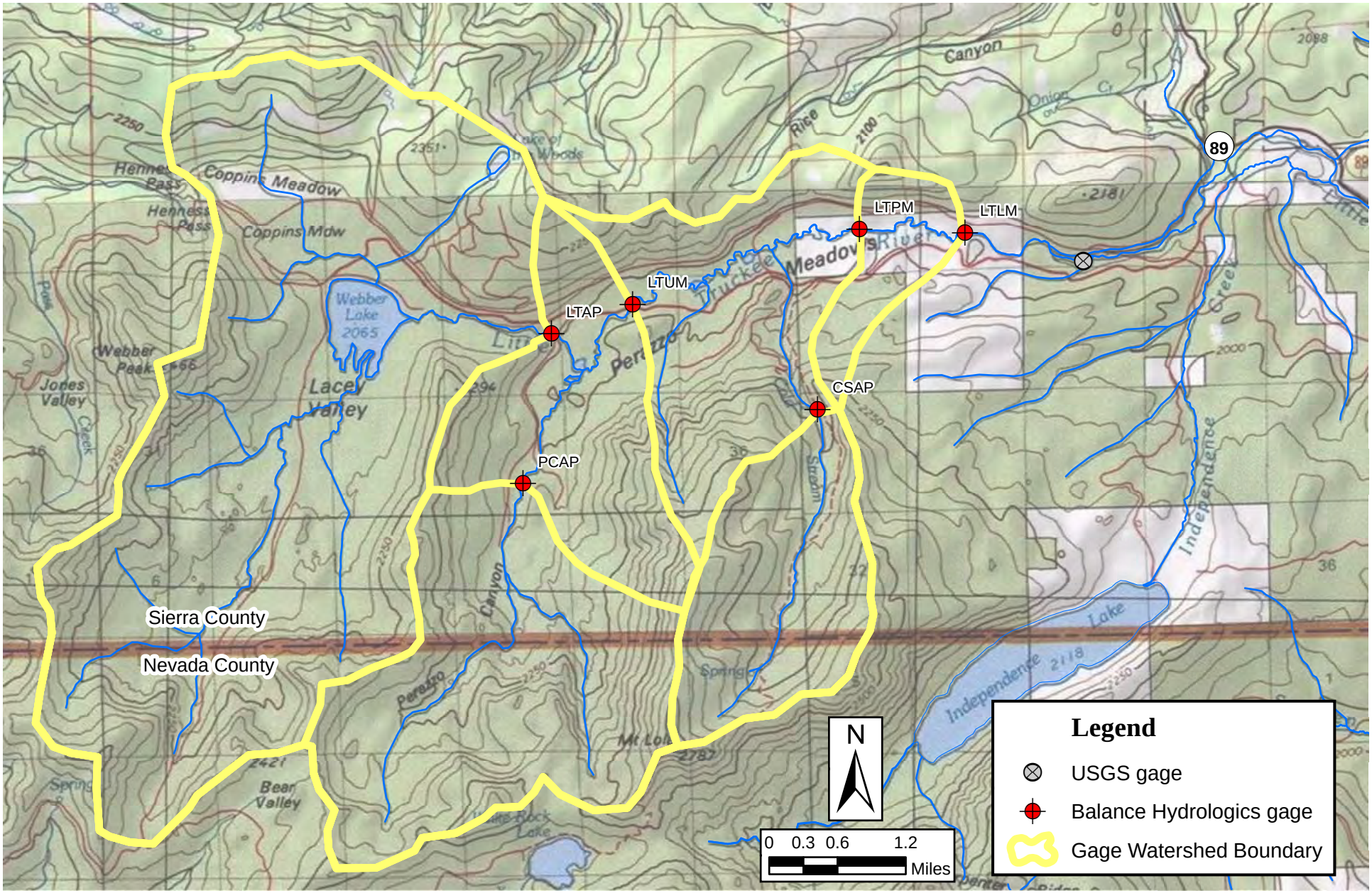

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Figure 4. **Stream gaging locations and contributing watersheds, Perazzo Meadows, Sierra and Nevada Counties, California**

209116 streamgage locations.mxd

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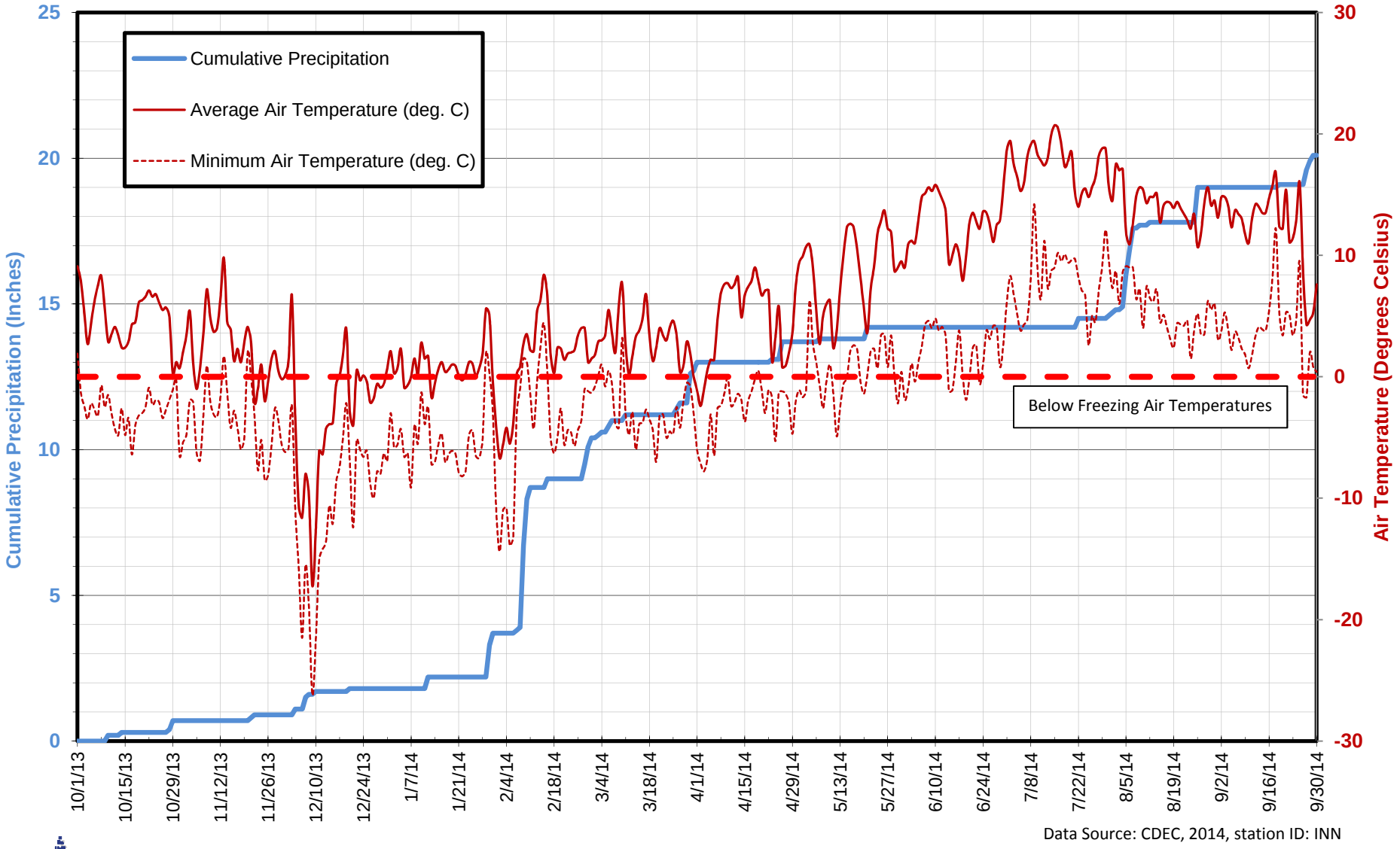

Data Source: CDEC, 2014, station ID: INN

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Figure 5. **Cumulative precipitation and daily minimum and mean temperatures, Independence Creek, Sierra County, California, Water Year 2014.** Weather station located approximately 3.5 miles southeast of Perazzo Meadows at 6,500 feet elevation.

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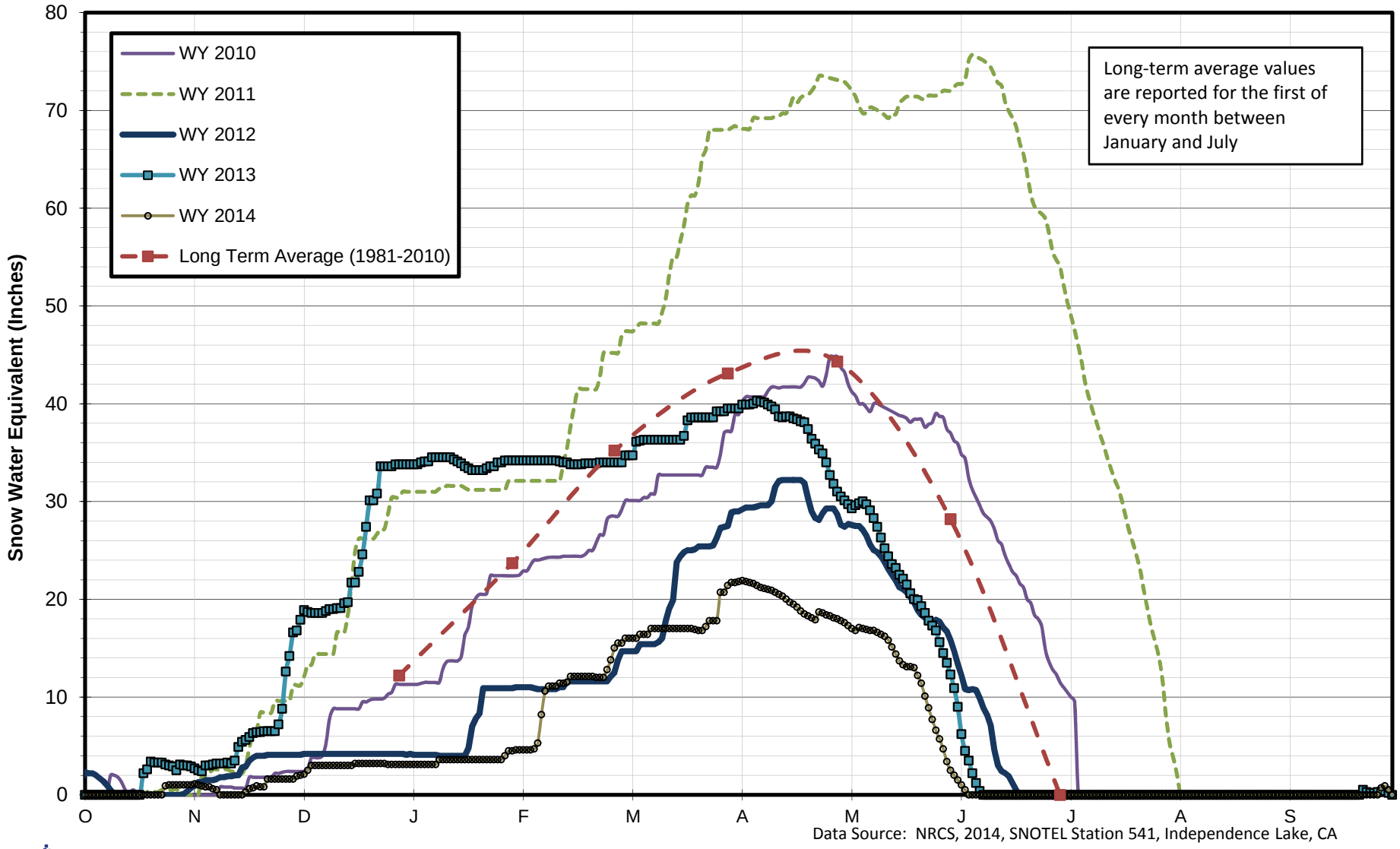

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Figure 6. Snow water equivalent, Independence Lake, Nevada County, California, water years 2010, 2011, 2012, 2013, and 2014 as compared to long-term average. SNOTEL station is located approximately 3.5 miles south-southwest of Perazzo Meadows at 8,352 feet elevation. WY 2010 was average, WY 2011 was wet, while WY 2012, WY 2013, and WY 2014 were dry.

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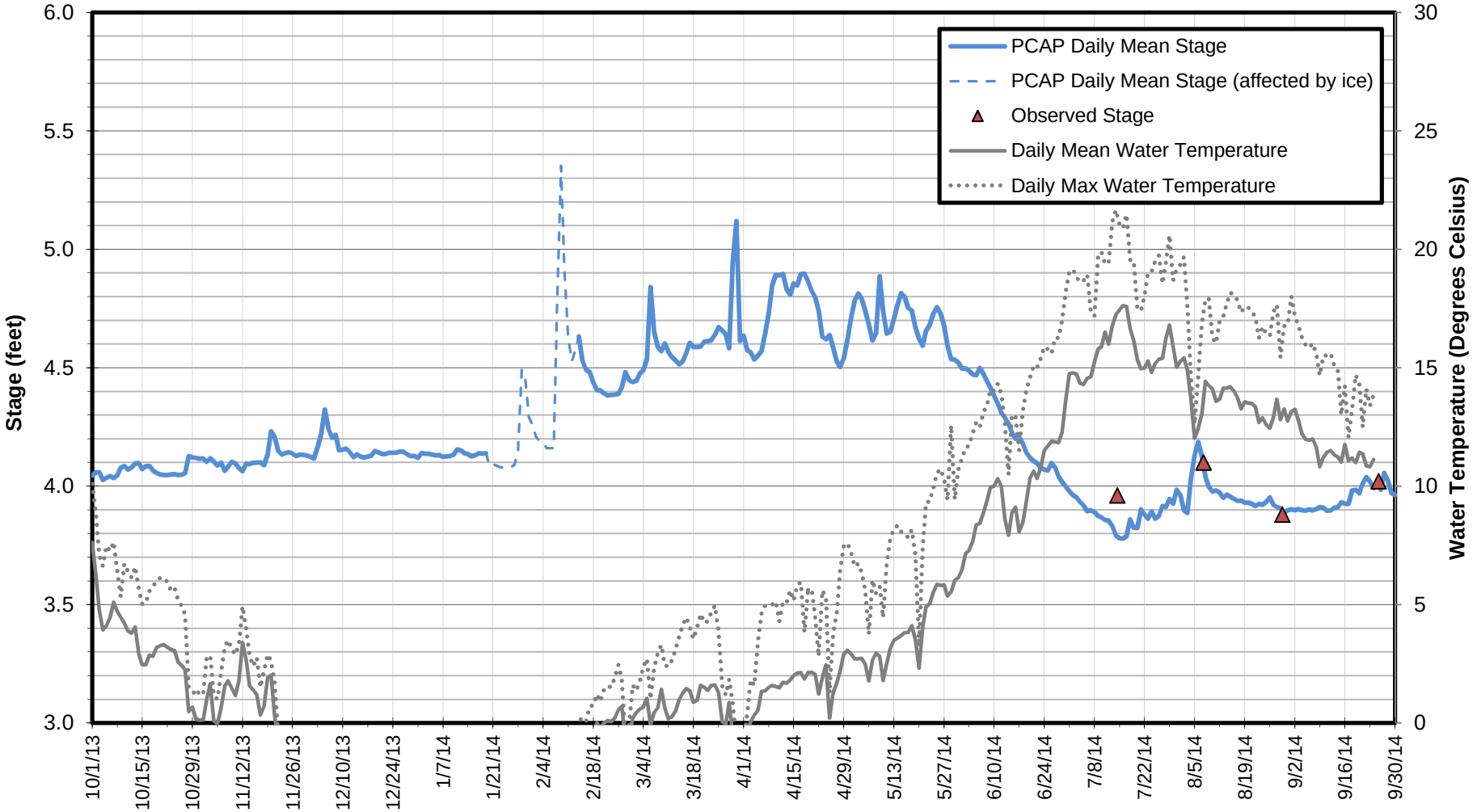

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Figure 7. **Daily stage and water temperature: Perazzo Creek above Perazzo Meadows (PCAP), Sierra County, California, water year 2014.**

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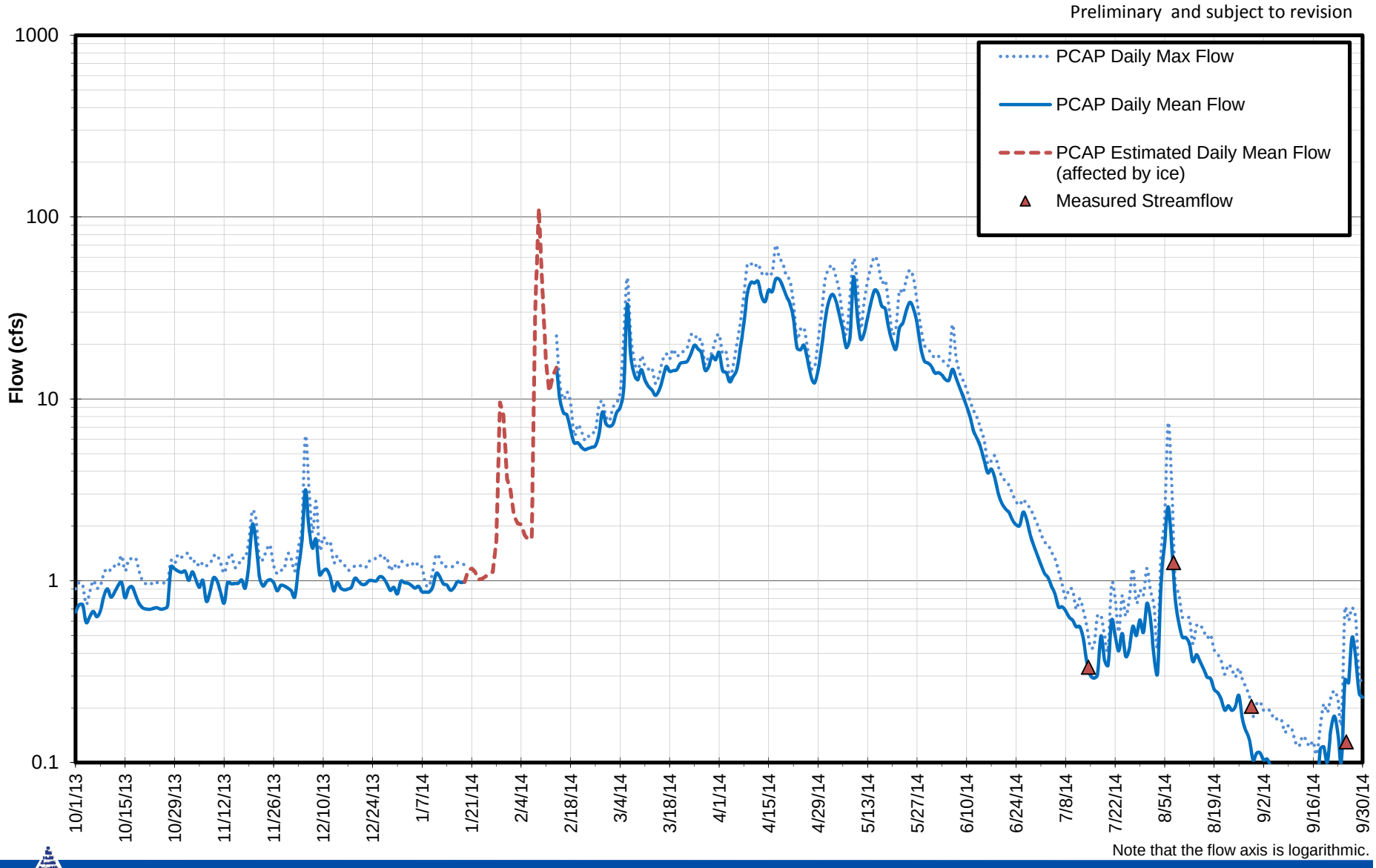

Figure 8. Daily flow hydrograph, Perazzo Creek above Perazzo Meadows (PCAP), Sierra County, California, water year 2014.

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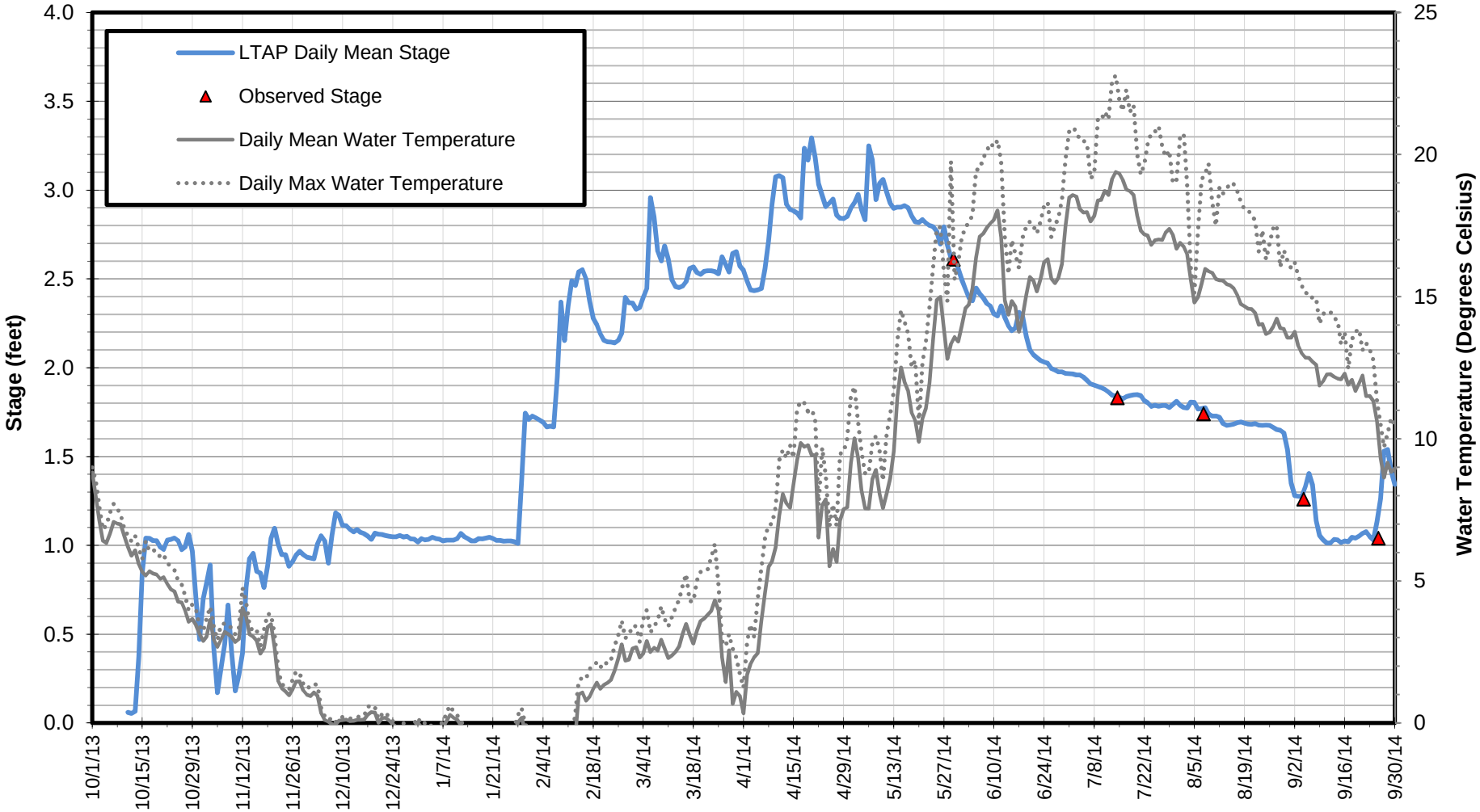

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Figure 9. **Daily stage and water temperature: Little Truckee above Perazzo Meadows (LTAP), Sierra County, California, water year 2014.** No flow is associated with a stage less than approximately 1.26 feet.

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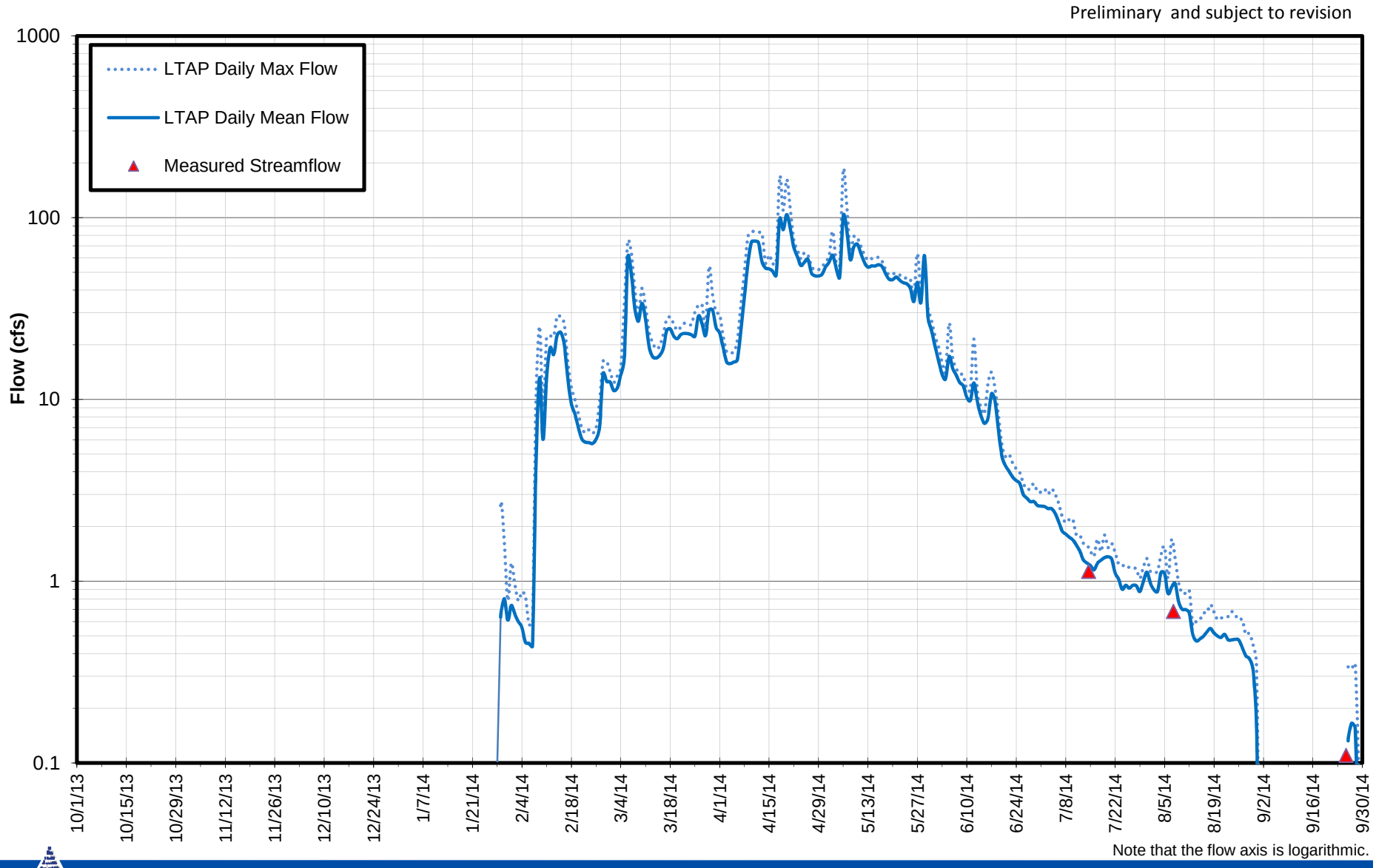

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Figure 10. **Daily flow hydrograph, Little Truckee River above Perazzo Meadows (LTAP), Sierra County, California, water year 2014.** Little Truckee River was dry for much of the beginning of the 2014 water year. A rain-on-snow event on February 8, 2014 initiated flow at the gaging station. Annual peak flow of 182 cfs occurred on May 6, 2014 as the result of snowmelt runoff.

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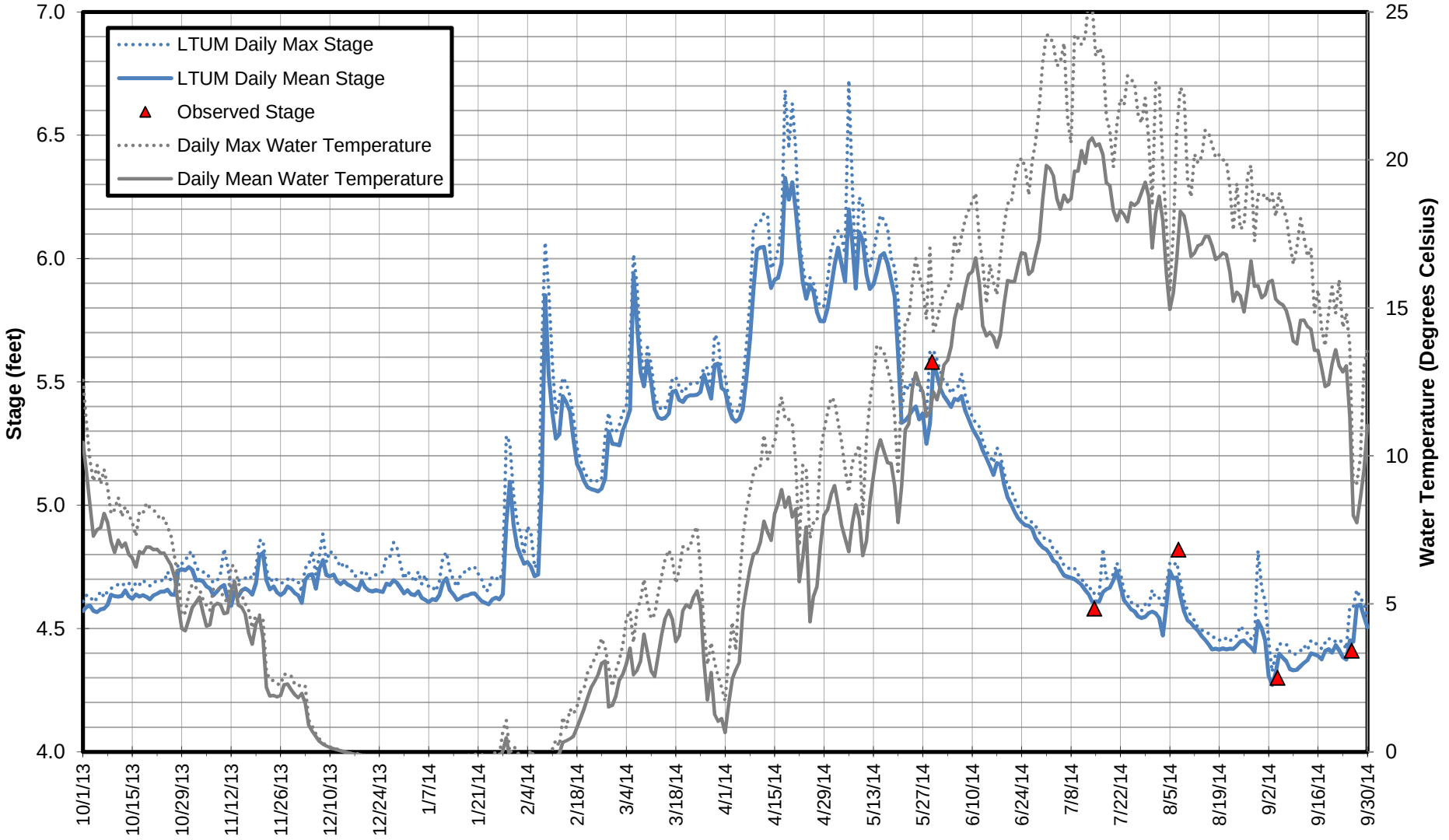

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Figure 11. Daily stage and water temperature, Little Truckee River, below Upper Perazzo Meadows (LTUM), Sierra County, California, water year 2014.

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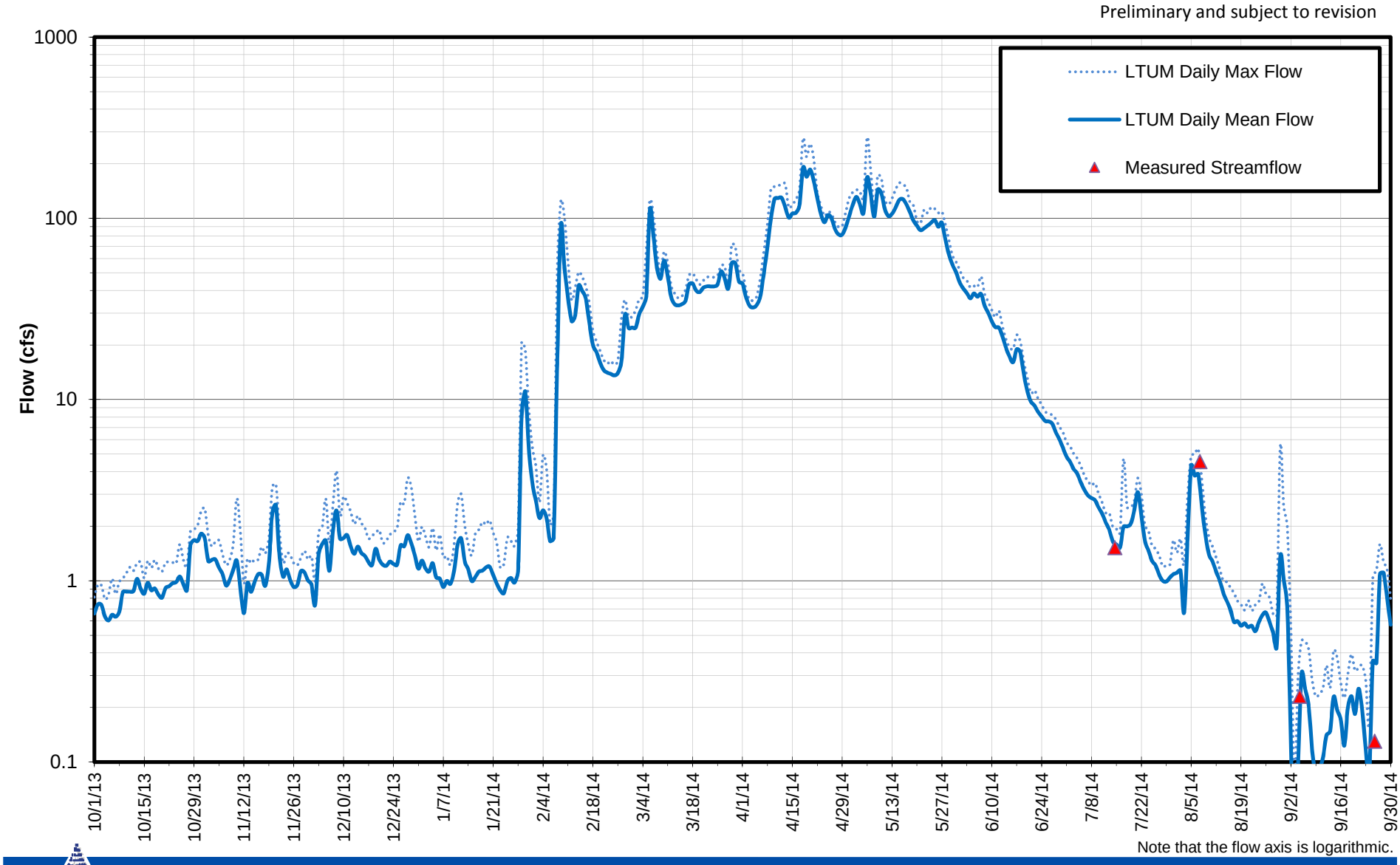

Figure 12. **Daily flow hydrograph, Little Truckee River, below Upper Perazzo Meadow (LTUM), Sierra County, California, water year 2014.**

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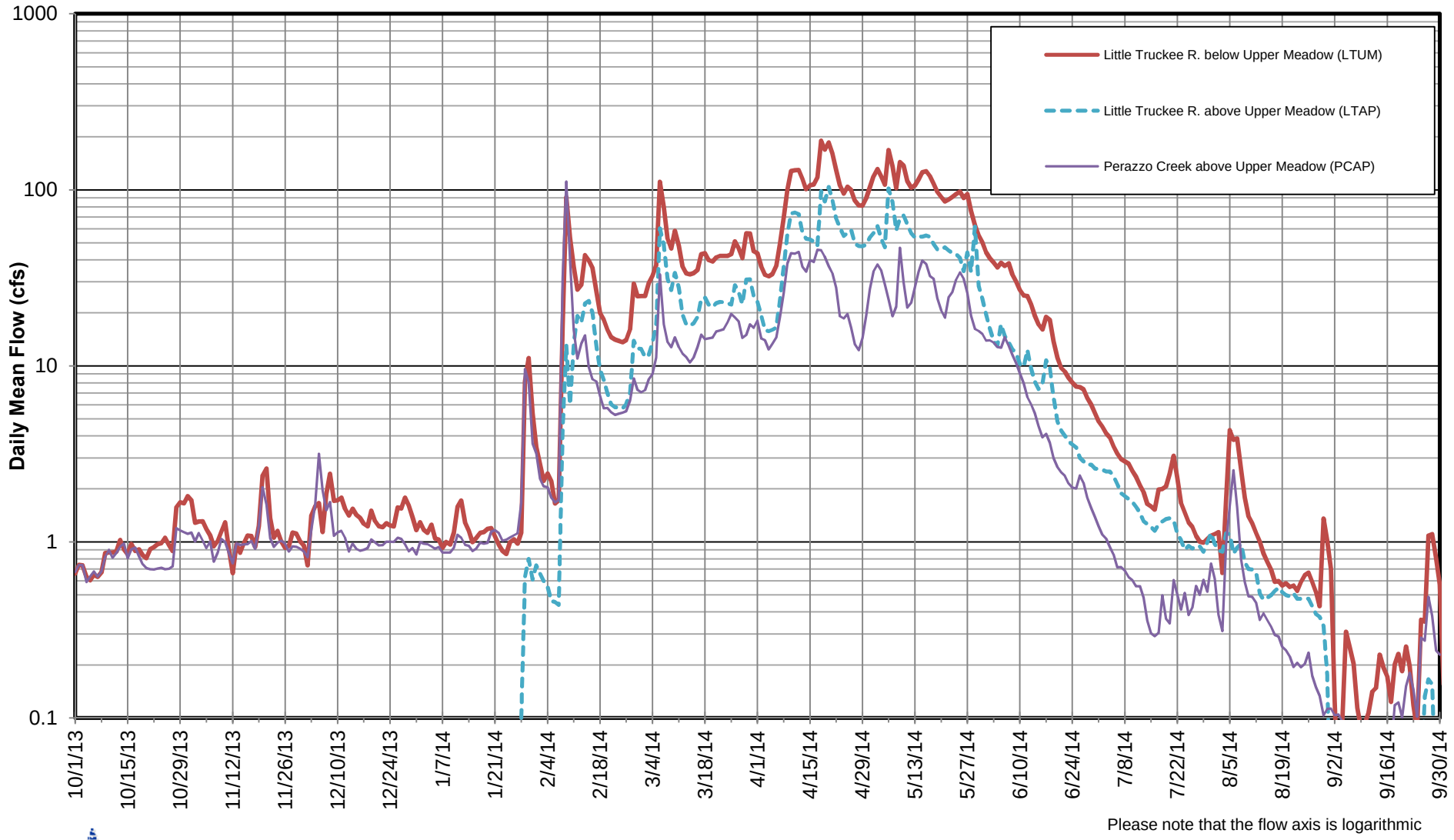

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Figure 13. Daily flow hydrographs: Upper Perazzo Meadow Inflow and Outflow, Sierra County, California, water year 2014.

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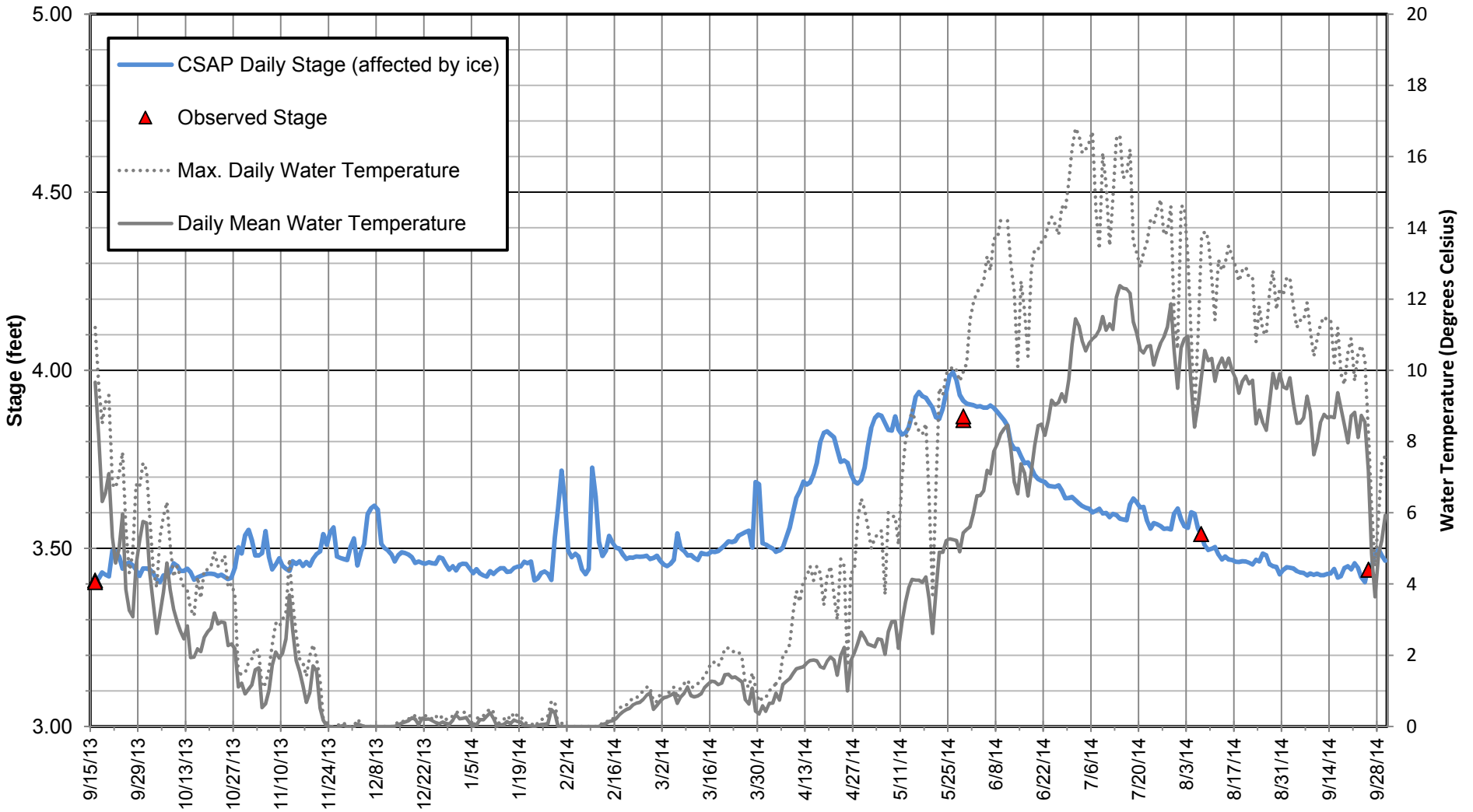

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Figure 14. Daily stage and water temperature, Cold Stream above Perazzo Meadows (CSAP), Sierra County, California, water year 2014.
Ice jam during the January 20-21, 2012 rain-on-snow event likely attributed to a super-elevated stage reading.

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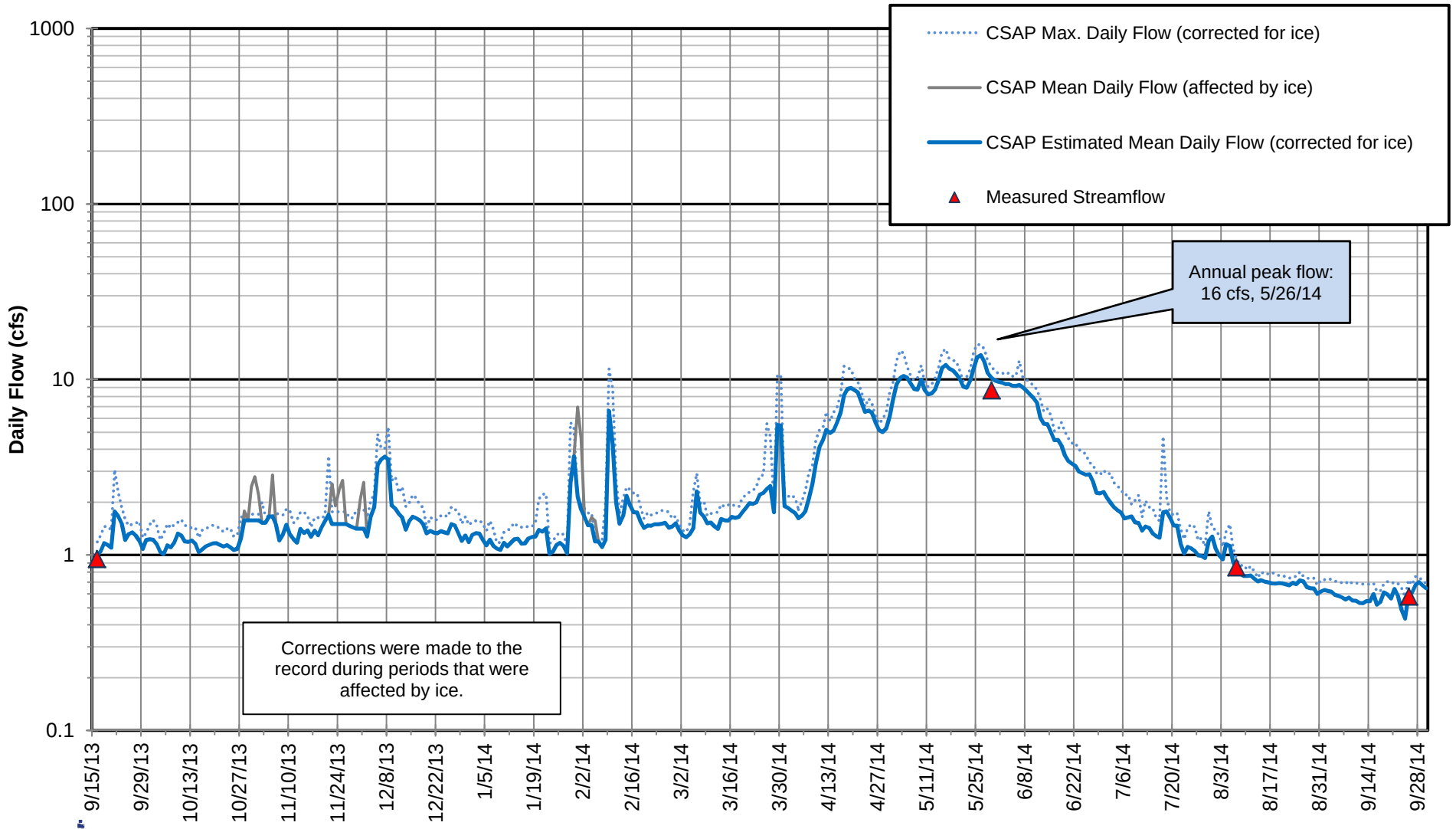

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Figure 15. Daily flow hydrograph, Cold Stream above Perazzo Meadows (CSAP), Sierra County, California, water year 2014. Annual peak flow of 16 cfs occurred on May 26, 2014. Baseflow was lower at the end of the water year than at the beginning, which reflects water year 2014 being a low-precipitation year.

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Preliminary and subject to revision

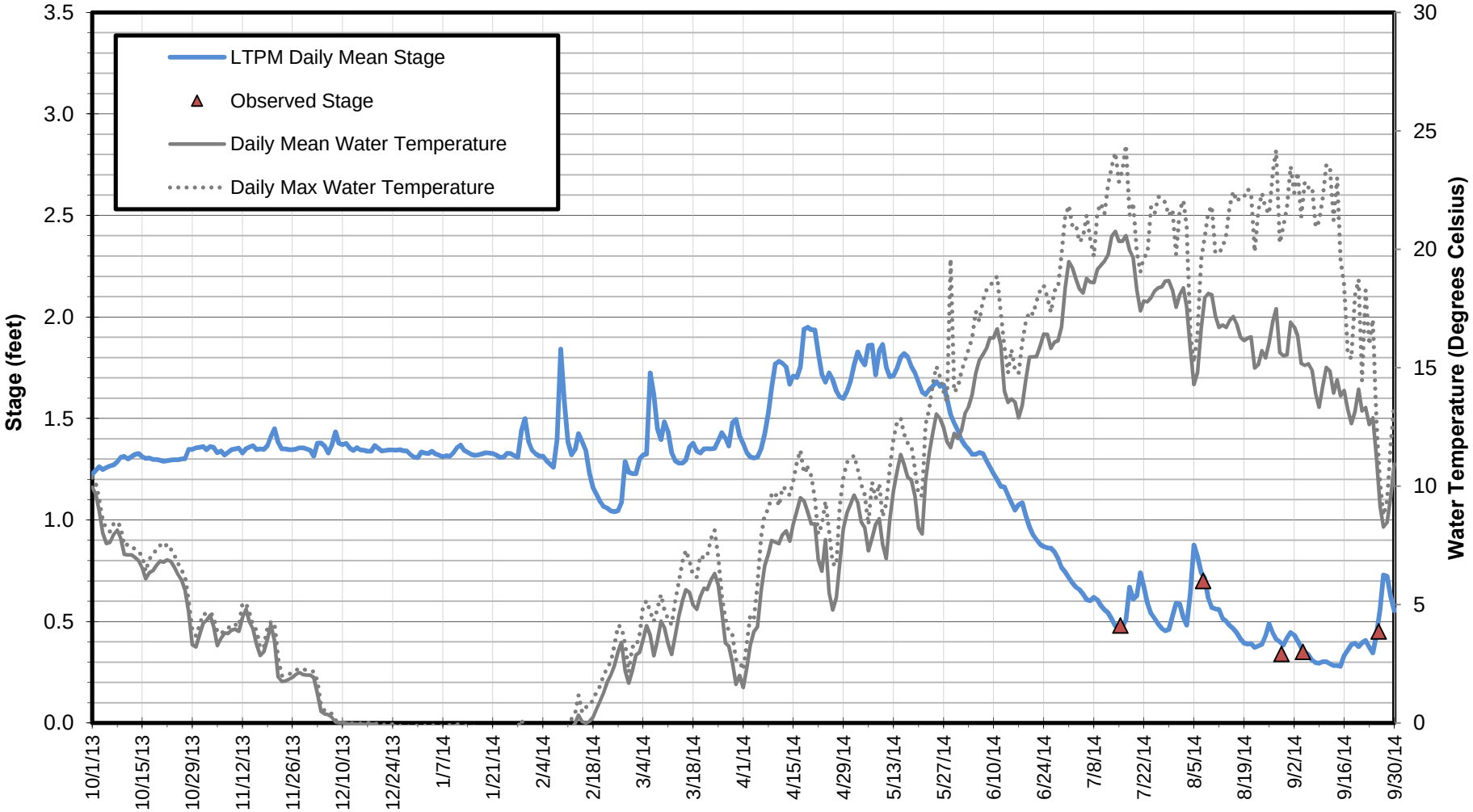

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Figure 16. **Daily stage and water temperature: Little Truckee River below Middle Perazzo Meadow (LTPM), Sierra County, California, water year 2014.**

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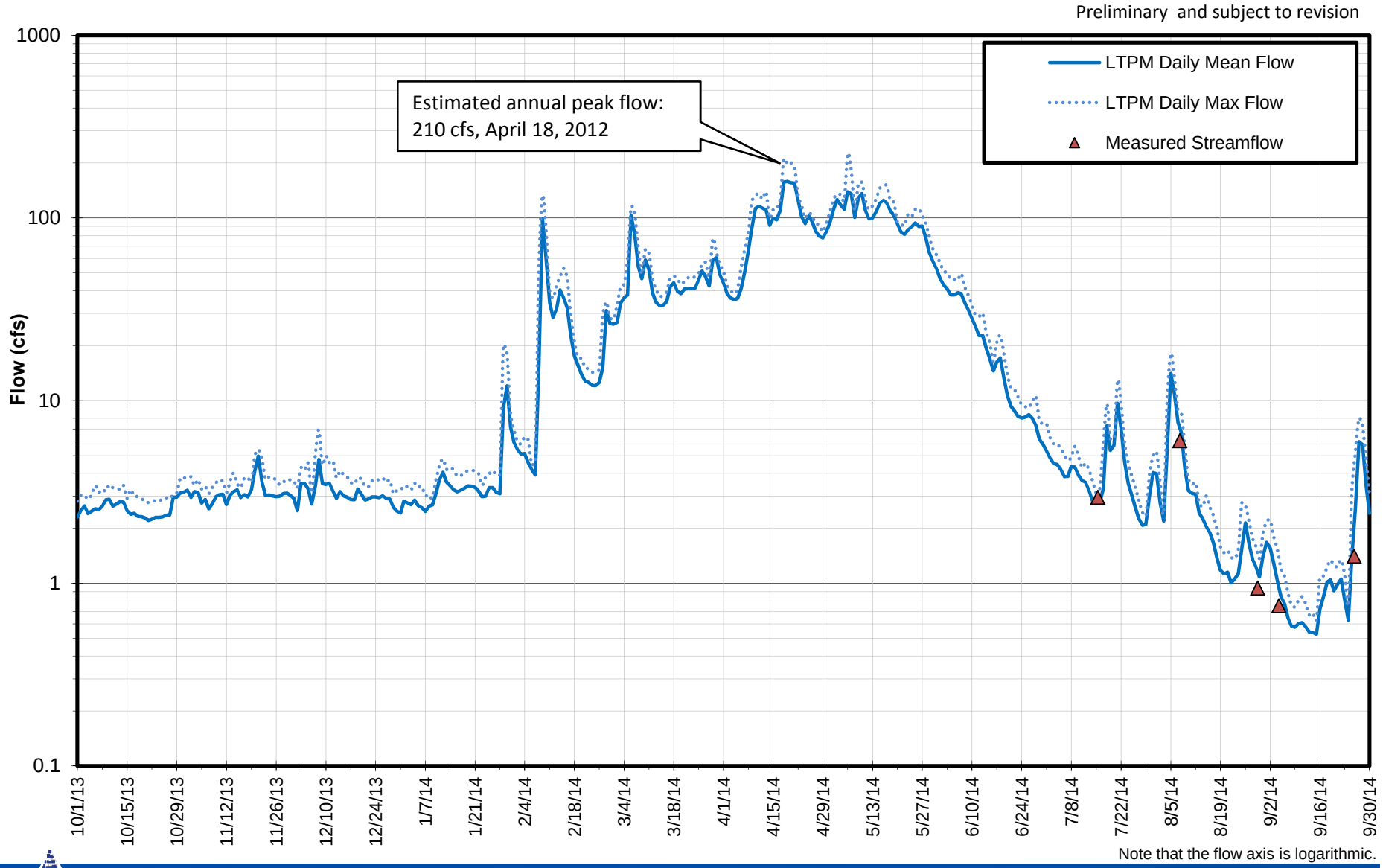

Figure 17. Daily flow hydrograph, Little Truckee River below Middle Perazzo Meadow (LTPM), Sierra County, California, water year 2014.

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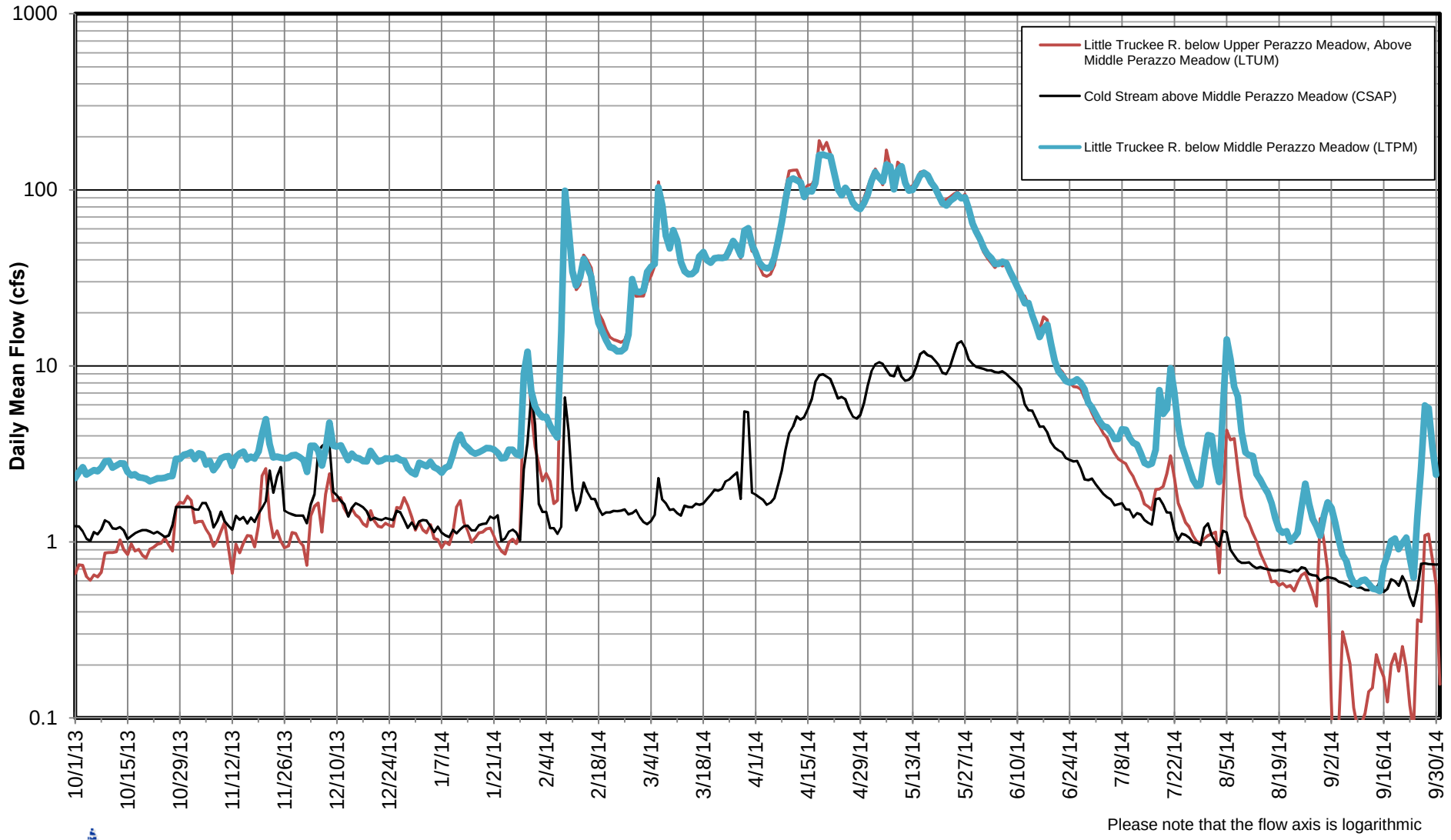

Figure 18. Daily flow hydrographs: Middle Perazzo Meadow Inflow and Outflow, Sierra County, California, water year 2014.

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Preliminary and subject to revision

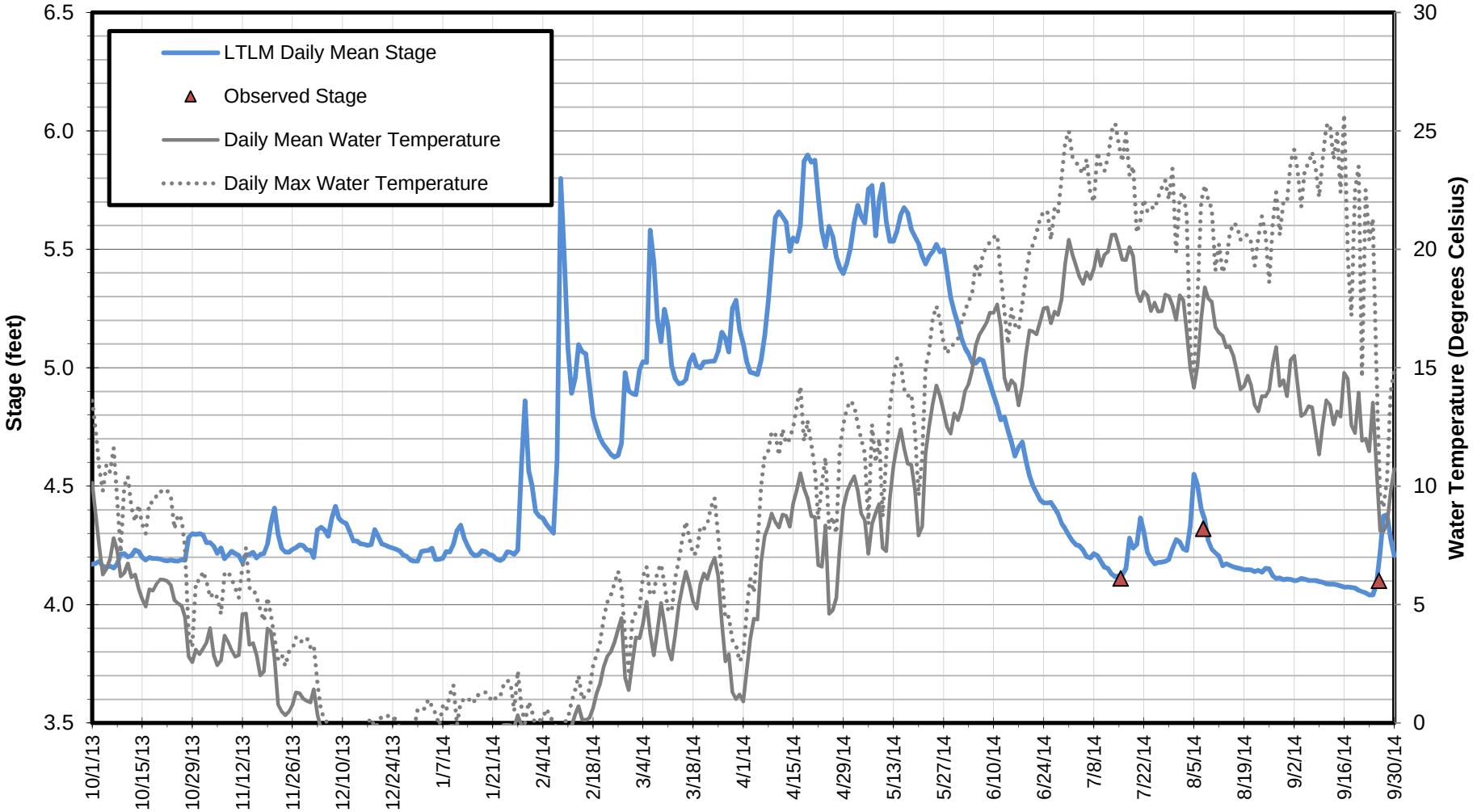

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Figure 19. **Daily stage and water temperature: Perazzo Creek below Middle Perazzo Meadow (LTLM), Sierra County, California, water year 2014.**

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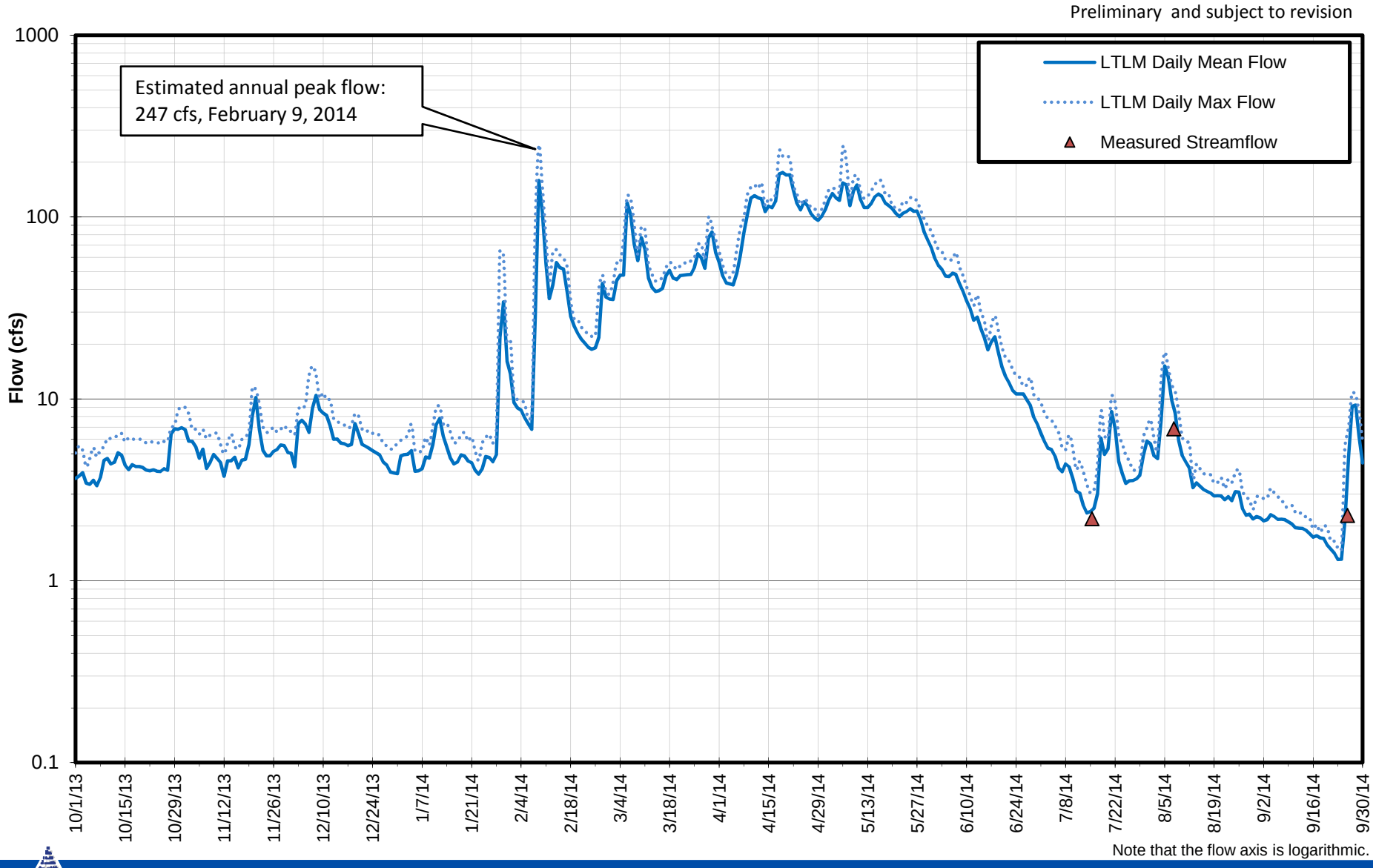

Figure 20. Daily flow hydrograph, Perazzo Creek below Middle Perazzo Meadow (LTLM), Sierra County, California, water year 2014.

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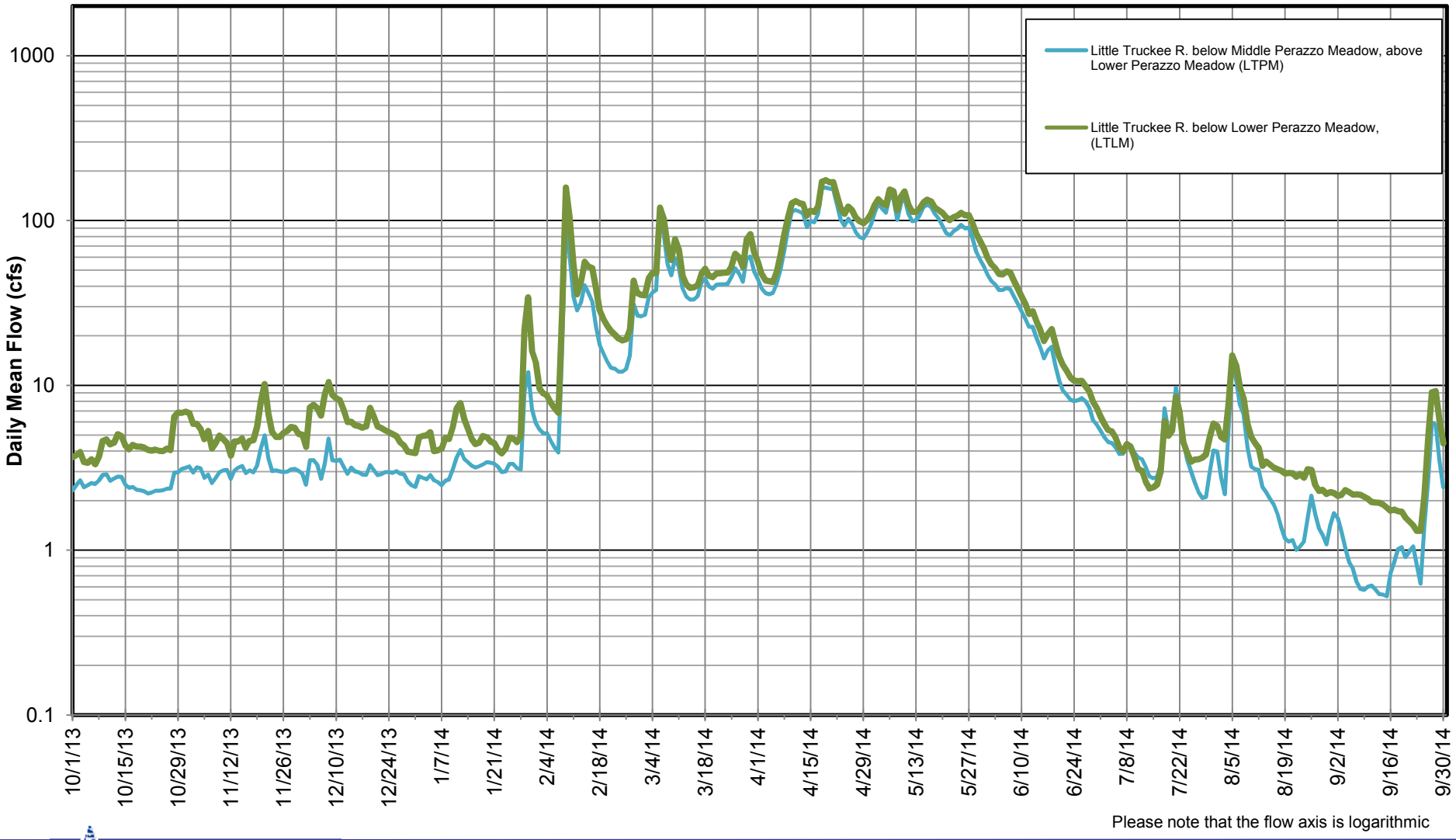

Figure 21. Daily flow hydrographs: Lower Perazzo Meadow inflow and outflow stations, Sierra County, California, water year 2014.

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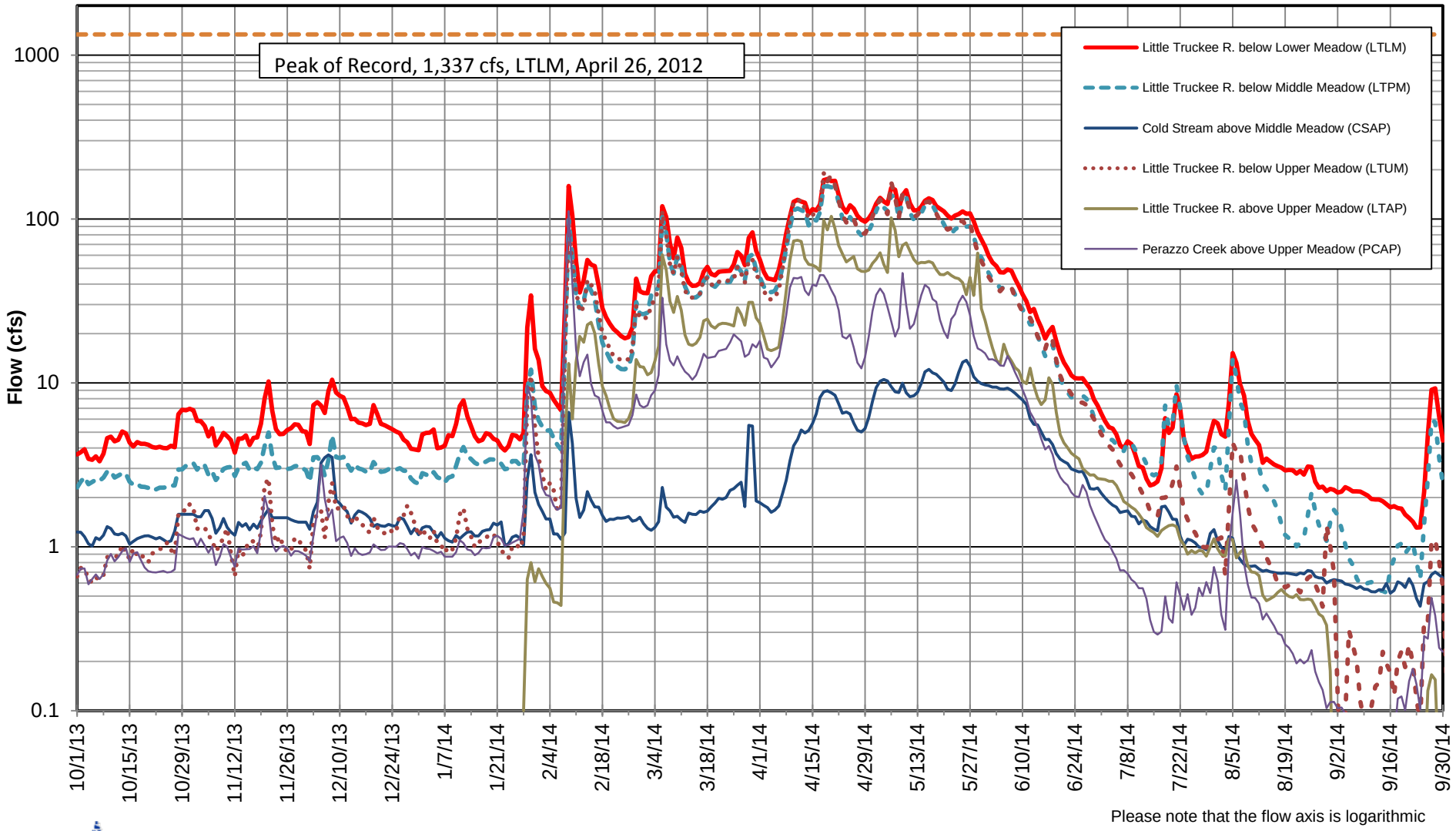

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Figure 22. **Flow hydrographs for all stations, Perazzo Meadows, Sierra County, California, water year 2014.** Peak flows in WY2014 were an order of magnitude less than the peak of record. At the outlet of Lower Perazzo Meadow (Station LTLM), peak flow in WY2014 was 247 cfs, compared to peak flow in WY2012 of 1,337 cfs.

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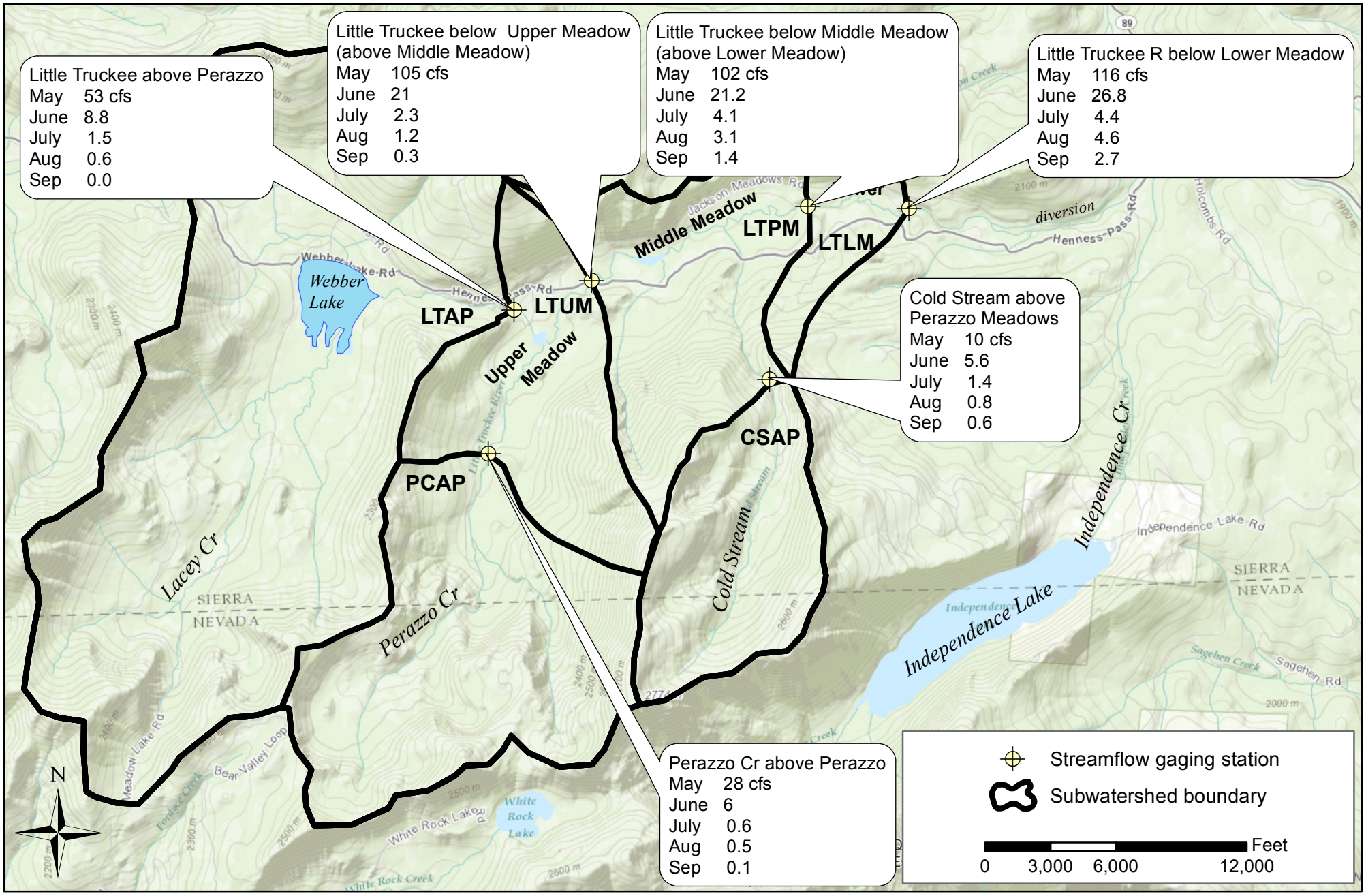

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Figure 23. Monthly streamflow during the snowmelt recession period, WY2014, Perazzo Meadows, Sierra County, California

W:\Projects\209116\209116 Gage Summary map WY14.mxd

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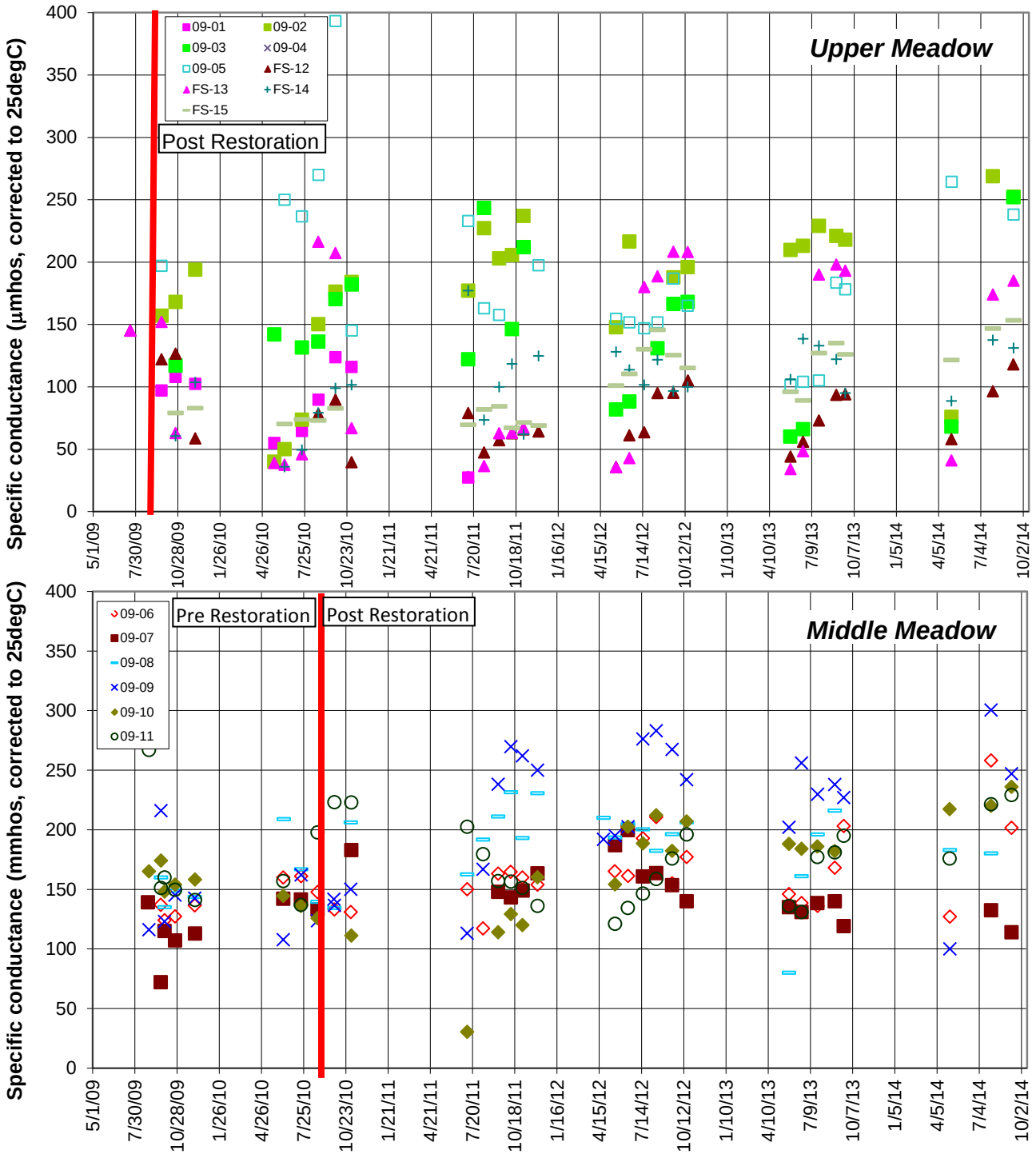

Figure 24. Specific conductance of groundwater, Upper and Middle Perazzo Meadows, Sierra County, California, June 2009 to September 2014
See Figures 2 and 3 for piezometer locations.

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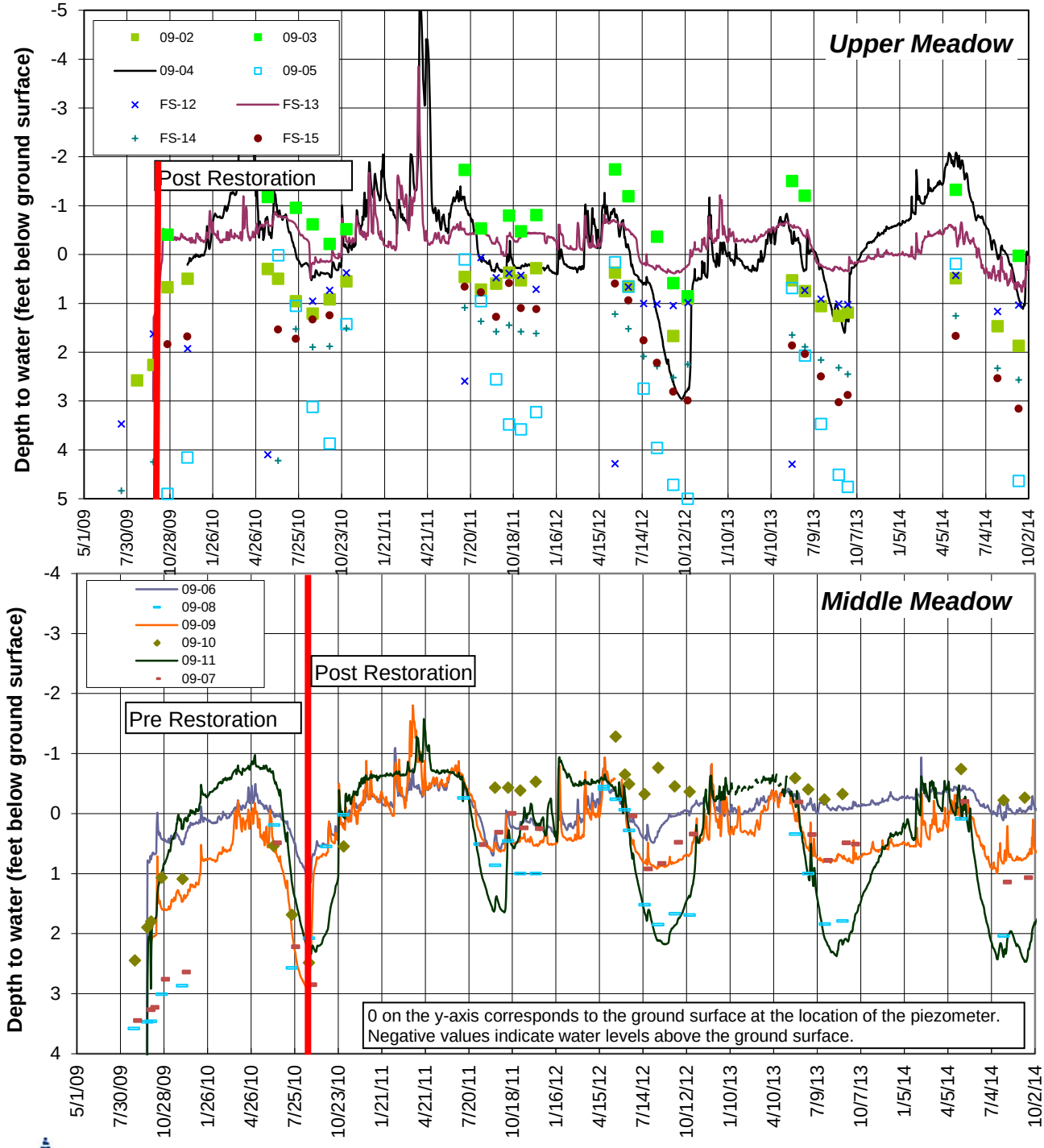

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Figure 25. Depth to groundwater for the monitoring period, Upper and Middle Perazzo Meadows, Sierra County, California, June 2009 to September 2014.

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