



River Hydrology Monitoring: Water Year 2020

The Sierra Nevada Network (SIEN) River Hydrology Monitoring Protocol reports on 14 stations located throughout Devils Postpile National Monument and Sequoia, Kings Canyon and Yosemite national parks (Figure 1). The purpose of this resource brief is to disseminate information on this data collection and the dataset access for the three SIEN-managed sites for water year 2020 (October 2019 – September 2020).

Streamflow Connections

Streamflow data can be used along with SIEN lakes and wetlands data to understand and monitor interconnected components of the big-picture systems throughout the region.

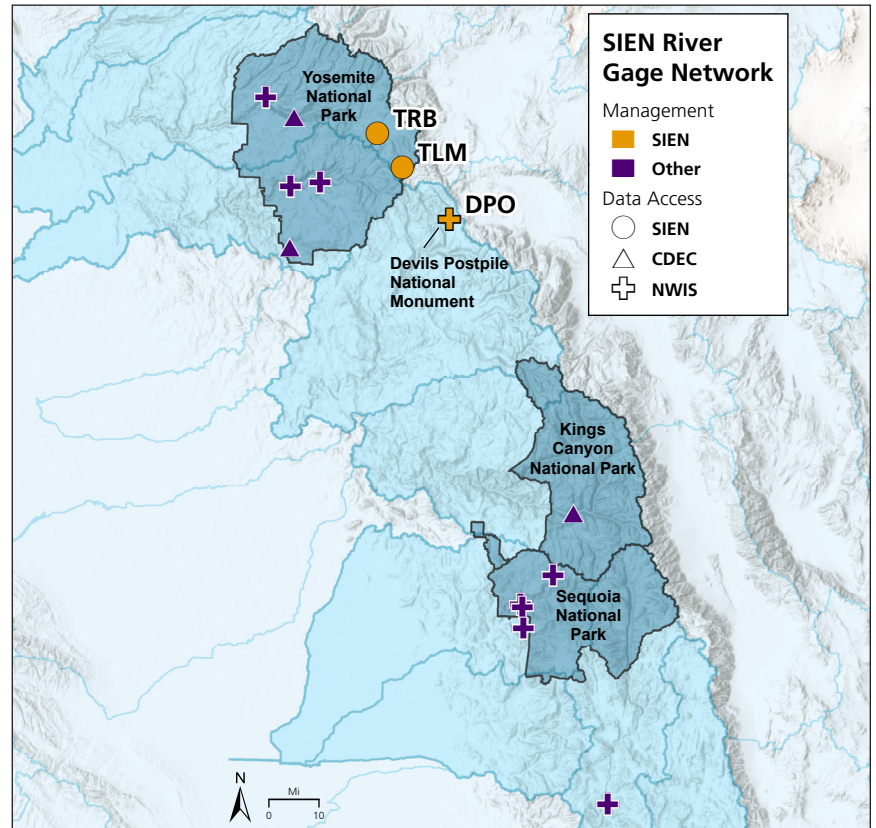
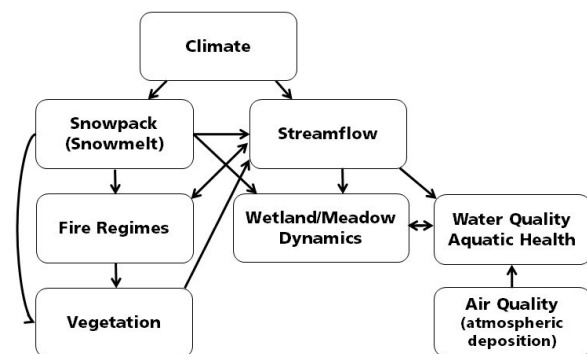


Figure 1. Gages included in the SIEN rivers monitoring protocol. Orange-colored symbols indicate the SIEN-managed gages (TRB and TLM in Yosemite and DPO in Devils Postpile) that are reported on in this brief. Data access is available from SIEN, the California Data Exchange Center (CDEC), or the USGS National Water Information System (NWIS), depending on who manages the gage. Map by: K. Bessem and A. Eddy.

Measuring a River's Vital Signs



Yosemite scientists survey the river channel near the Lyell Fork to the Tuolumne gage station. NPS photo

A river acts as a living entity, with a pulse, temperature, and flow. The SIEN rivers protocol uses the surface water dynamics vital sign to measure these qualities. The primary goal of the project is to monitor long-term trends in surface water hydrology and water temperature so managers can better understand how aquatic resources are changing, especially in the face of climate change, and use this information to inform planning and management decisions.

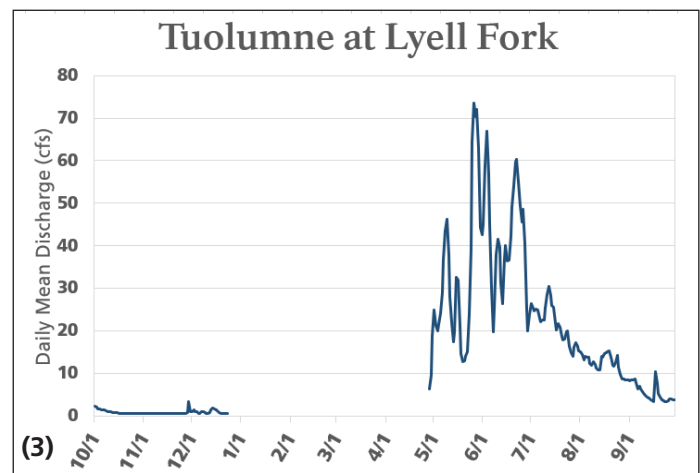
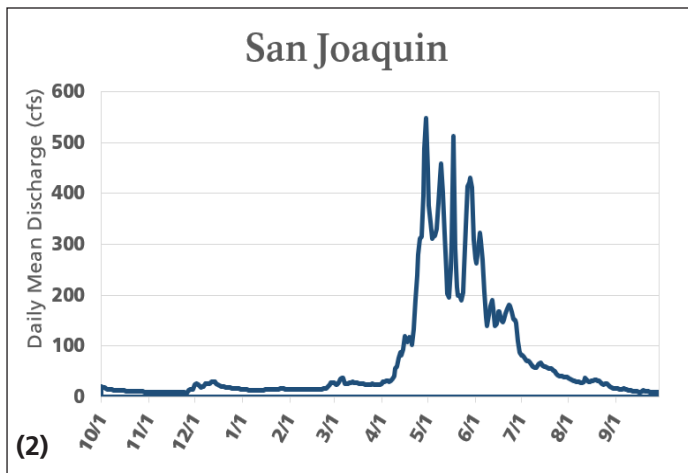
Information collected can address a wide range of questions related to surface water dynamics, including:

- How are climatic trends affecting regional water and fire regimes?

- How are stream and river discharge rates, and the timing and magnitude of peak flows changing?
- How are water dynamics changing in response to climate change and fire regimes?

Measurements for timing and volume of streamflow are taken by fixed, continuous, water stage recording stations and accompanying continuous temperature loggers. To capture large-scale patterns, gages were selected across varied elevations within the different SIEN watersheds. The SIEN protocol leverages a network of existing stream gages and associated long-term records, which range from 3 to 104 years in length.

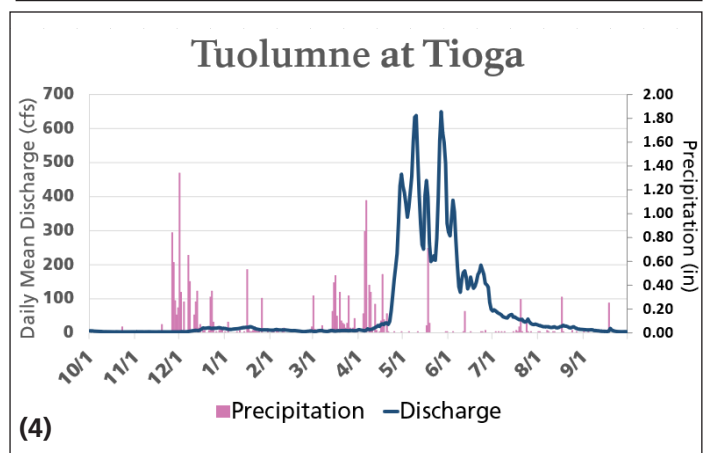
What did Rivers Look Like This Water Year?



Figures 2-4. Mean discharge in cubic feet per second for the three SIEN river protocol gage stations during the 2020 water year. Figure 4 (right) shows both discharge (blue) and precipitation (purple) for the Tioga Gage.

Water Year 2020 Discharge Data

Typical snowmelt runoff patterns occurred at all three sites, though the snow year and subsequent runoff was lower than the average (Figures 2-4). Statewide surveys showed snow water equivalent (SWE) to be around 55% of the April 1st average. The SWE for the Tulare Lake and San Joaquin hydrologic regions, where SIEN parks are located, was even lower at 45% of the April 1st average (CA Dept. of Water Resources, 2020). Significant ice effect was observed at the Lyell Fork gage between December 25th, 2019 and April 28th, 2020 and thus data were flagged and omitted from the WY20 hydrograph.



River Hydrology Monitoring Project Updates

Rachel Hallnan, Yosemite Hydrologist, made significant updates to the Yosemite (YOSE) gage rating curves and conducted an analysis comparing rating curve methods. She compared traditional rating curve methods currently implemented by SIEN and YOSE programs to a Bayesian Monte Carlo Markov Chain rating curve used by University of Washington cooperators. Preliminary results found that the extent of differences between the methods varied by gage and are sensitive to high flow sample sizes. These efforts informed recommendations to improve YOSE stream gages, including data collection and management and rating curve analysis.

Andi Heard, SIEN Physical Scientist, is leading a national Inventory and Monitoring Division Aquatics working group presently focused on a national-level analysis of river water temperature, which includes SIEN river temperature datasets. The work group seeks to understand how water temperature in flowing waters is changing across national parks, identify the attributes that indicate waters most sensitive to temperature change, and project water temperature patterns under future climate scenarios. More information can be found on the [Aquatics working group sharepoint page](#) (available to Department of Interior employees only).

Contact Information and Gage Data Access

Contact Andi Heard (andi_heard@nps.gov), Physical Scientist, Sierra Nevada Network, for more information. Some of the data are available by request only and some are publicly available online.

[Sierra Nevada Network Inventory & Monitoring Program website](#)

Skancke J and Others. 2017. [Sierra Nevada Network river hydrology monitoring protocol: Narrative version 1.0](#). National Park Service. Fort Collins, Colorado.

Lyell Fork of the Tuolumne River: Contact Andi Heard for datasets.

Tuolumne River at Tioga Road Bridge: [California Data Exchange Center \(CDEC\)](#), 'Tuolumne Meadows' site (note: these online data are not QA/QC checked, please contact Andi Heard for final dataset).

Devils Postpile: [USGS National Water Information System \(NWIS\)](#), station id 'USGS 11224000 MF SAN JOAQUIN R NR MAMMOTH LAKESCA'.