Title
The Sierra Nevada-San Joaquin Hydrologic Observatory (SNSJHO): a WATERS network test bed

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The Sierra Nevada-San Joaquin Hydrologic Observatory (SNSJHO): A WATERS Network Test Bed

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Introduction: A mountain-to-valley "virtual" hydrologic observatory in Central California

Overview

- **Scope**
  Establish a ***virtual hydrologic observatory***, and provide direction for building new infrastructure in an actual observatory.
- **Focus**
  Build infrastructure for improving the knowledge base for sound ***hydrologic management*** in the Sierra Nevada, San Joaquin Valley and across the West.

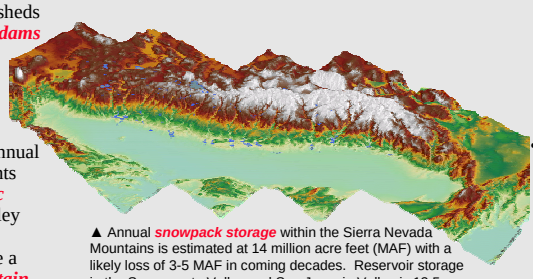
Planning Area

- **Central California**
  The hydrologic observatory planning area is the greater ***San Joaquin Watershed*** encompassing the American River to the north through the Kings River in the south. The watershed covers a total area of ***60,000 km²***. The test basins for the current project, the Merced and Tuolumne, together cover an area of 11,230 km².

Problem Description: Developing strategies for watershed management

- **Mountain Valley Disconnect**
  Physically, the multiple rivers and watersheds are physically ***disconnected by foothills dams*** that provide flood control, hydropower, seasonal water delivery and recreation.
- **Watershed Management**
  The ***winter snowpack*** and watershed conditions determine the magnitude of annual ***runoff***. Errors in snowpack measurements and runoff forecasts have huge ***economic implications*** for valley water users. Valley flood control, water quality, irrigation demand and hydropower operations have a very strong interest in influencing ***mountain watershed management***.

Water Storage and Distribution



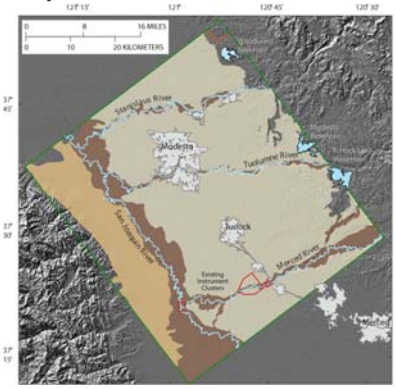
▲ Annual ***snowpack storage*** within the Sierra Nevada Mountains is estimated at 14 million acre feet (MAF) with a likely loss of 3-5 MAF in coming decades. Reservoir storage in the Sacramento Valley and San Joaquin Valley is 13.5 MAF and 11 MAF, respectively.

- **Science Questions**
  (1) How do hydrologic systems respond to multiple ***perturbations***? **(2)** How do pulses and changes ***propagate*** through the hydrologic system? **(3)** What are the ***time lags*** and ***delays of stresses*** in different systems? **(4)** How can the ***predictive ability*** for these responses be improved?
- **Link to Applications**
  This project addresses the gap between the demonstrated demand for new hydrologic information on the part of ***decision-makers***, ***researchers*** and other ***stakeholders*** versus the ever increasing supply of information, especially new information from ***satellite remote sensing***, embedded ***sensor networks*** & ***numerical models*** that help integrate satellite and ground-based measurements.

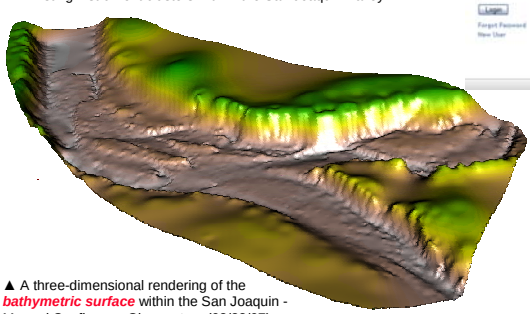
Proposed Solution: Build research infrastructure & promote research

Hydrologic Observatory

The broader aim of the Sierra Nevada-San Joaquin Hydrologic Observatory is to ***build research infrastructure*** and ***promote research*** for improving the knowledge base for ***sound hydrologic management*** in the Sierra Nevada, San Joaquin Valley and across the West.



▲ Existing instrument clusters within the San Joaquin Valley.



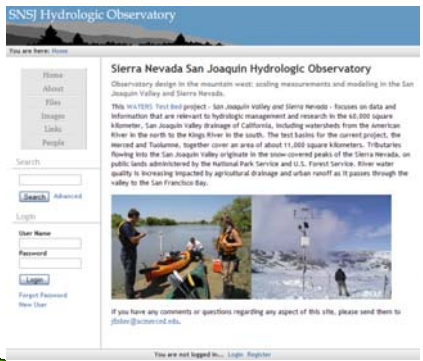
▲ A three-dimensional rendering of the ***bathymetric surface*** within the San Joaquin - Merced Confluence Observatory (08/28/07). The vertical exaggeration is 3x.

San Joaquin Valley

In the San Joaquin Valley, the focus is on ***sensor systems*** for observing and testing ***best practices and creating adaptive management to improve the quality of*** degraded agricultural and urban watersheds, ***groundwater-surface water exchanges*** in rivers, and flow and mixing in the ***confluence zones***, such as between the main stem San Joaquin and tributary Merced Rivers.

Digital Library

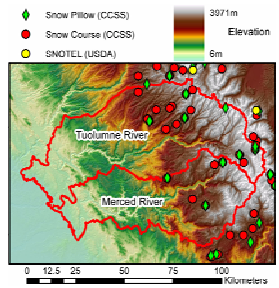
A common digital library and analysis framework (***http://snsjho.org***) further links the mountain and valley portions of the virtual observatory.



▲ Homepage of SNSJHO digital library.

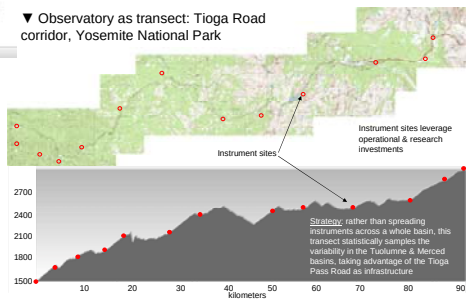
Sierra Nevada

In the Sierra Nevada the current focus is on ***developing instrument clusters*** for estimating distributed watershed water balances, ***blending satellite data with*** that from strategically placed, ***ground-based instrument clusters***. Five instrument clusters at or just above the rain-snow transition are in place and under development.



▲ In any single basin, measurements are sparse. There are 3 snow pillows in the Merced River Basin and 5 in Tuolumne River Basin.

▼ Observatory as transect: Tioga Road corridor, Yosemite National Park



WATERS NETWORK