WATER SUPPLY AND DEMAND MODELING IN THE MATTOLE RIVER WATERSHED INFORMATIONAL FACT SHEET

The State Water Resources Control Board is developing tools to better understand water supply and demand in select watersheds across California. The project involves several watersheds of interest, including the Mattole River watershed.

Background

The State Water Board is responsible for allocating surface water through California's water rights priority system. Watershed-specific supply information from year to year is generally lacking, making water management planning difficult, especially in times of water shortage. Recent droughts (2013-2016, 2021-2023) highlight the need for specialized data and tools to assess water availability and demand and evaluate how limited water resources are allocated.

In 2021, in response to the drought emergency in Sonoma and Mendocino Counties, the State Water Board developed tools and information to better understand water supply and demand in the Russian River watershed. Staff developed a water supply model and evaluated water diversion data to estimate watershed demand. Staff also used a tool to allocate water to right holders based on the modeled available surface water supply, water demand data, and water right priorities. The supply and demand data, when integrated into the water allocation



Figure 1. The Mattole River watershed subbasins and flowlines

tool, was a key component in the board's implementation of drought emergency actions in the watershed.

The State Water Board established the Supply and Demand Assessment Unit in 2022 to develop supply models and demand assessments for new watersheds using an approach similar to that used for the Russian River during the most recent drought. This effort will enable the board to prepare for future dry conditions in other watersheds and provide data to help local water managers better understand supply constraints, develop local responses, and plan for droughts. The work could also inform future curtailments, if needed.



Water Supply and Demand Modeling

Evaluating water supply and demand in a watershed enables improved comparison of the amount of water available in the system with the demands associated with different water uses. State Water Board staff are working with Paradigm Environmental, Inc. to develop water supply (hydrologic) models that assess surface water availability in select watersheds where low flows and drought conditions may threaten water supplies, impair critical habitats, and create uncertainty for water users. Water supply modeling tasks are underway in Butte Creek (tributary to the Sacramento River), the Napa and Navarro Rivers, and six additional watersheds, including the Mattole River. These watersheds were selected because: 1) Water demand in the watersheds is highly dependent on surface water and any board decisions regarding future curtailment would benefit from the modeling analysis; and 2) The watersheds contain areas of salmonoid habitat and important fisheries. In addition, the hydrologic modeling will provide details regarding watershed characteristics and conditions that will inform future work and outreach and engagement protocols.

Modeling watershed-specific scenarios improves our understanding of water availability based on available surface water, water demands, and water right priority. All tools developed and data produced as part of this effort will be open source and available to the public so local water managers and other interested parties can assess surface water availability conditions and evaluate potential management options.

Mattole River Watershed

Watershed Background

The Mattole River watershed is located in Humboldt and Mendocino counties and has a drainage area of 932 square miles. The elevation ranges from just above sea level near Petrolia to over 3,600 feet near the King Range. The Mattole River originates as a small stream in the King Range National Conservation Area, travels north 62 river miles, and is joined by 74 perennial tributaries before draining into the Pacific Ocean about 10 miles South of Cape Mendocino. It is joined by the Bear River to the north, the Eel River to the east, and the Kings Range to the west. The watershed has a mediterranean climate with distinct wet and dry seasons and a mean annual precipitation of 75.9 inches. The primary land covers in the watershed are evergreen forest and shrubland, comprising 63% and 12% of the total area. Other land covers include grassland (11%), mixed forest (6%), or developed, open space (3%).

The Mattole watershed is a spawning ground for three species of anadromous salmonids: Chinook, coho, and steelhead. Anadromous fish populations within the watershed have declined due to extensive logging, rural residential development, and road usage. These factors have increased sediment loads and caused stream temperatures to rise above the range supporting salmonid life. As a result, the U.S. Environmental Protection Agency developed a Total Maximum Daily Load (TMDL) analysis for sediment and temperature in 2002, and partnered with the California Department of Forestry and Fire Protection Fire and Resource Assessment Program to control erosion and reduce sediment loading.



Model and Data Specifications

The water supply model utilizes a large library of publicly available data from state and federal agencies, including the following data types:

- Meteorological: Historical weather data such as precipitation, evapotranspiration (the amount of water evaporated or used by plants), air temperature, vapor pressure, and wind speed are input to model conditions that affect water supply.
- Hydrological: Current and historical data on the river's streamflow rate is used for calibration and validation of the model.
- Surface water use and diversion: Data showing how much water has been taken out of the river in the past serves as a proxy for the surface water demand in the watershed and how it affects streamflow.
- Geospatial: Data that describes where the boundaries and channels of the watershed are, as well as its physical properties (such as soil type, land cover type, and topography). Geospatial datasets are important for understanding characteristics that influence how water moves through and is absorbed by the landscape.

All datasets used in the water supply model are subject to extensive quality assurance and quality control procedures that ensure their accuracy. This is particularly important when it comes to incorporating required water use and diversion data that is self-reported by water right holders. The cleaned data is then used to run the water supply model to simulate hydrological processes in the watershed at the scale of small tributaries (small catchments), allowing for water management decisions to be made at a very fine geographic scale.

The Loading Simulation Program in the programming language C++ (LSPC) is the water supply (hydrologic) model selected for this watershed. LSPC has been used extensively in California to model and manage the state's unique watersheds. Calibration of the LSPC model of the Mattole River watershed involves analyzing critical hydrology parameters. The calibrated model will then be validated using observed streamflow that was not incorporated during the calibration phase. Data produced by the LSPC model will be used as an input for the Drought Water Rights Allocation Tool (DWRAT, or Allocation Tool) to allocate water within each catchment based on the amount of available surface water, water demands, and water right priorities. Further details on the model are available in the Mattole River Watershed Model Work Plan, submitted by Paradigm Environmental, Inc.

Additional Resources

For more information, see the Supply and Demand Assessment <u>Mattole River Watershed webpage</u>. To receive email updates, please visit <u>bit.ly/swb-subscribe</u> and select the Water Rights "Watershed Supply & Demand Allocations" email subscription list.

With additional questions, please contact State Water Board project staff at <u>DWR-SDA@waterboards.ca.gov.</u>