On the advancement of Napa water resources and extension

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UC ANR Delivers California's Land Grant Mission

- Cooperative Extension established by Congress in 1914

- Dr. Qicheng Tang joined Napa UC ANR in 2023 April as a project scientist on Water Resources and Resiliency

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Water Program @ UC ANR Napa, how do we serve?

Research

- Water quality and quantity issues
- Irrigation strategies
- Wildfire hydrology
- Ecohydrology

Workshop

- What do people want to hear about water?
- Workshop already organized
  - Wastewater Treatment
  - Water Conservation
  - Field Soil Testing Lab

Individual Client Service/Consultant

- Is my pond safe?
- How do I irrigate?

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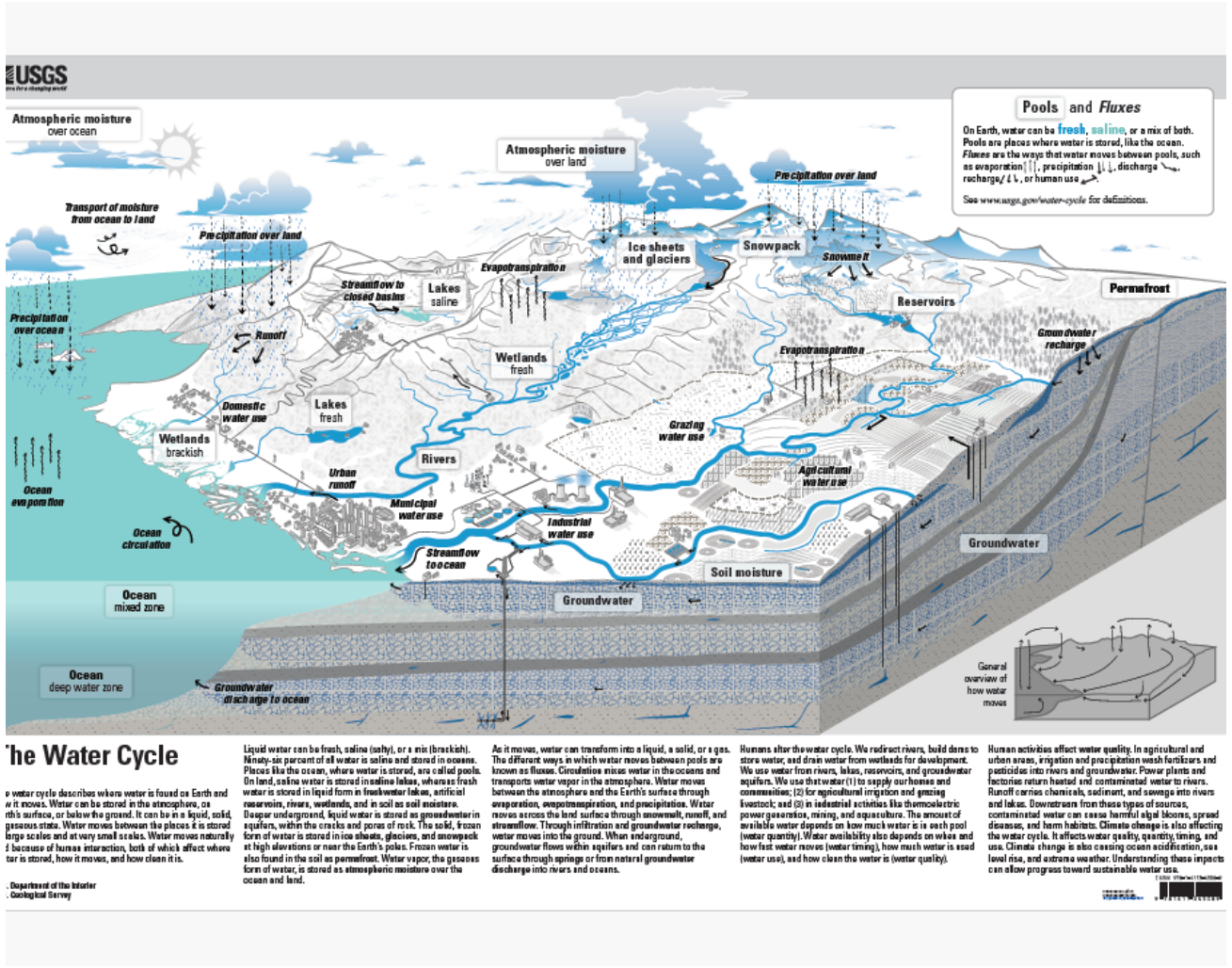
We need to understand water as a system

Water is connected through ***pools*** and ***fluxes***. (USGS)



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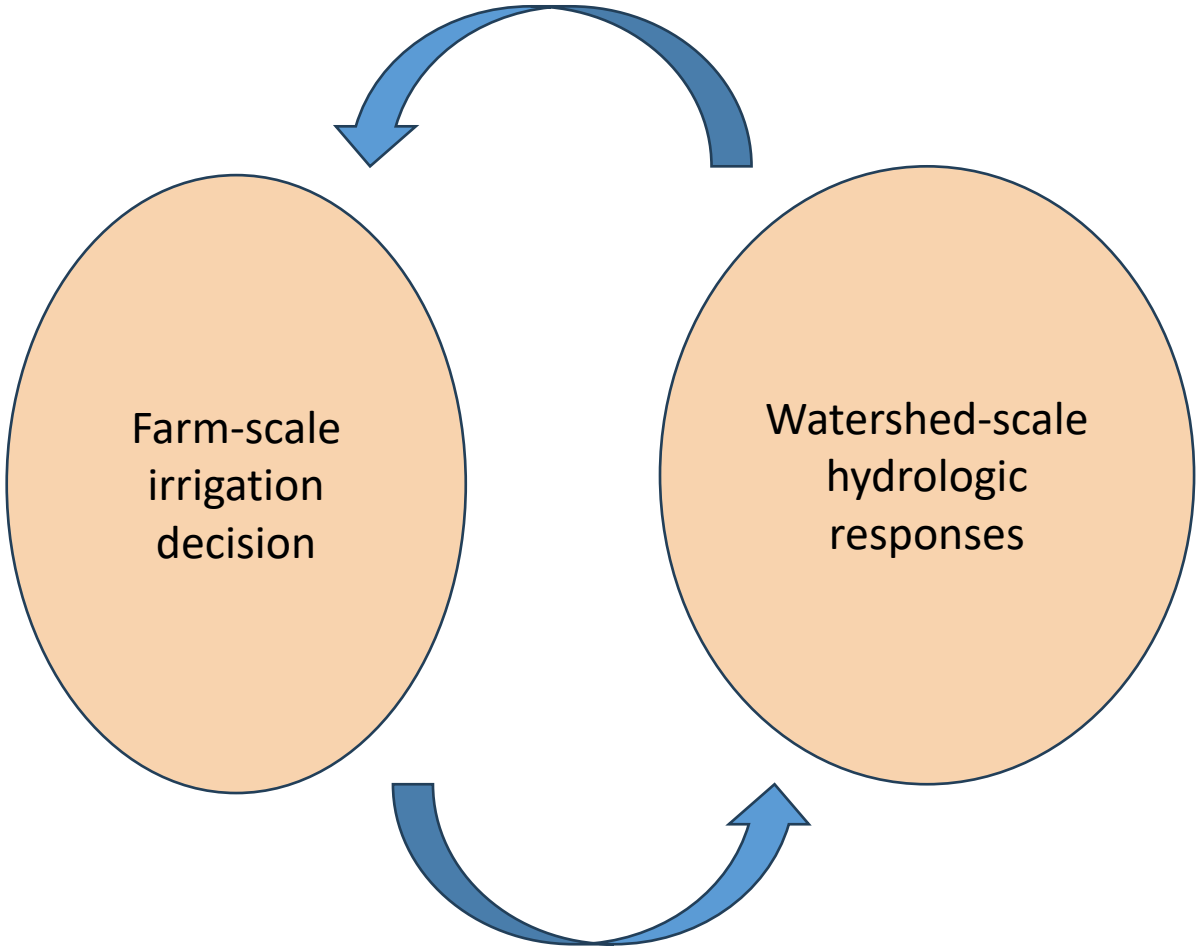


Irrigation decisions are tightly related to aquifer recharge, and "**return flow**", which is the streamflow diverted for irrigation and recovered in rivers.

Morrisett et al., *Frontiers in Environmental Science*, 2023

Napa water – a literature review

The soil erosion parameters in Napa Valley is similar as those obtained from vineyard erosion studies in Europe.
(Battany and Grismer, 2000, Hydrological Processes) *Soil Physics*

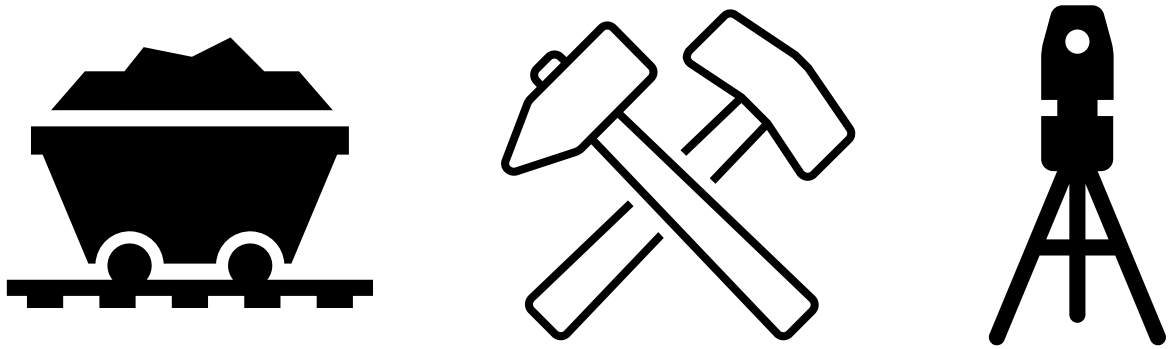
Significant transfer of sulfur (S) from agricultural fields to streams.
(Hermes et al., 2021, Science of the Total Environment) *Soil Chemistry*

Different climatic regions require different vine varieties with different hydraulic traits (e.g., stomatal management)
(Albasha and Bartlett, 2024, Agricultural and Forest Meteorology) *Viticulture*

Tang et al., a review of Napa Valley water research, *in prep*

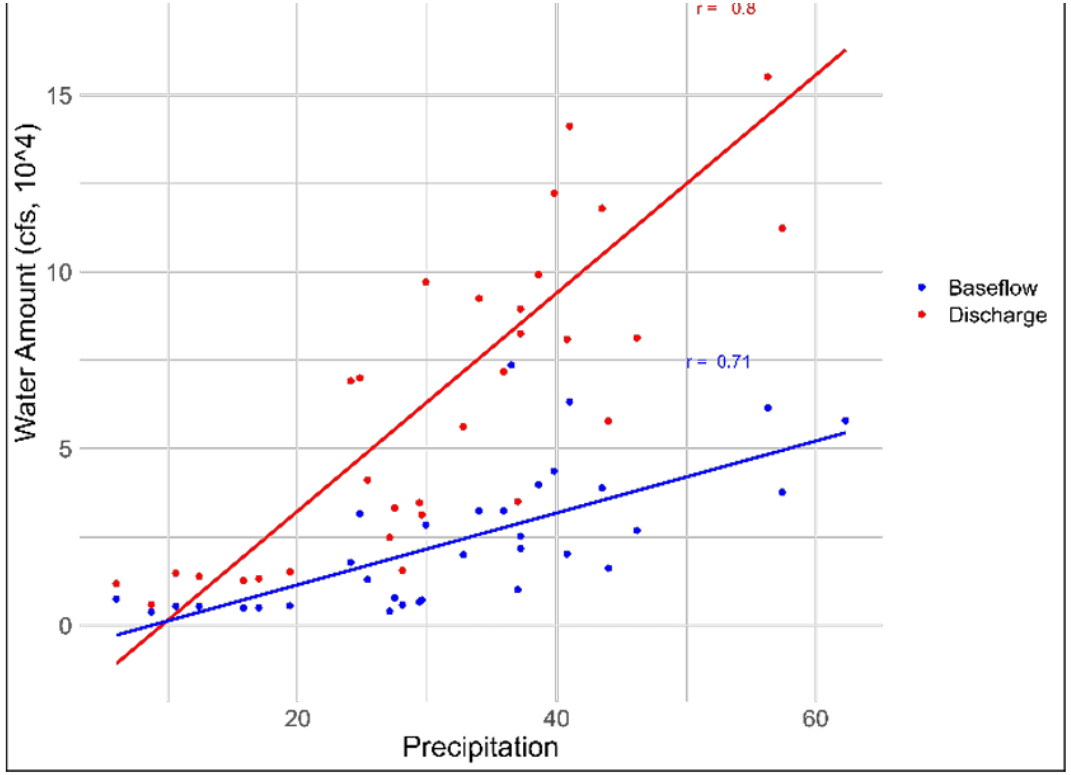
Napa water – data “mining”

“**Data mining** is the process of extracting and discovering patterns in large data sets involving methods at the intersection of machine learning, statistics, and database systems.”

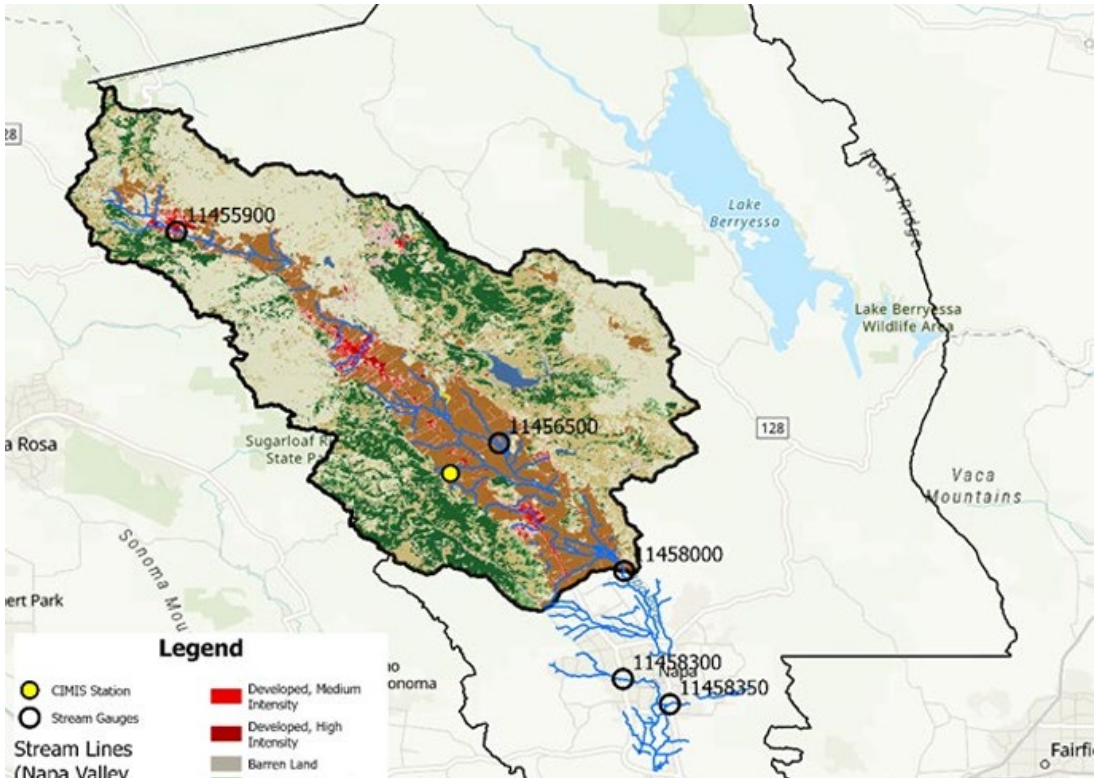


Data mining – an example of rainfall-runoff analysis

A direct response in runoff "jump" from the precipitation



CIMIS station, USGS gauges are all hydrometric data that are publicly available



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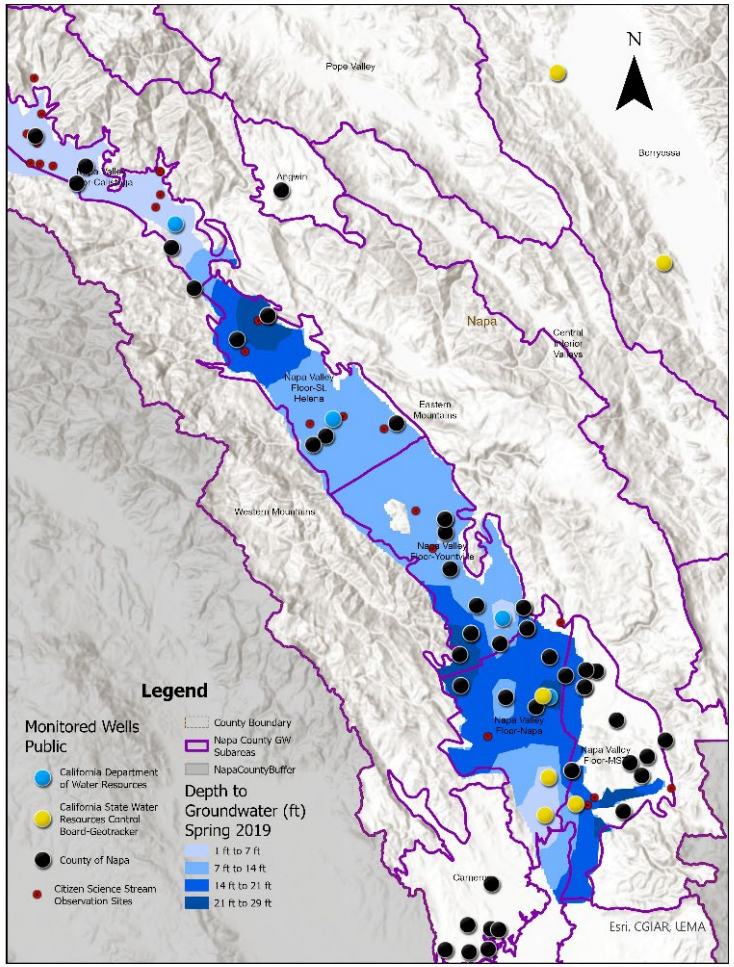
Other potential datasets for “mining”

- Groundwater Data
- Weather Data



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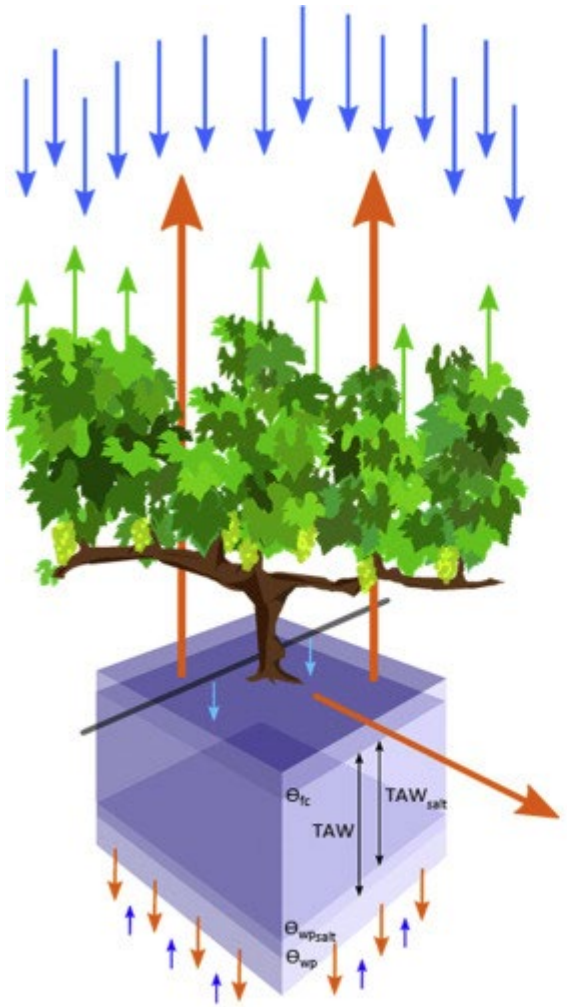
How is our work directly related to grape growers?



INPUTS

Rainfall (Blue water)
- Adjusting plant density
- Enhancing root distribution (rootstocks)

Irrigation (Green and Grey water)
- Irrigation needs calculation
- Deficit irrigation strategies

Capillary rise
- Soil management

OUTPUTS

Transpiration
- Genotype selection (scion and rootstock)
- Training system
- Row orientation
- Canopy and crop load management
- Weed control

Evaporation
- Mulching
- Soil management
- Irrigation scheduling (overnight)
- Irrigation systems (emitter flow, subsurface, etc.)

Runoff
- Soil management
- Cover crop
- Planting arrangement (contour lines)

Leaching
- Cover crop
- Irrigation scheduling (frequency-duration)

Decision-Makings

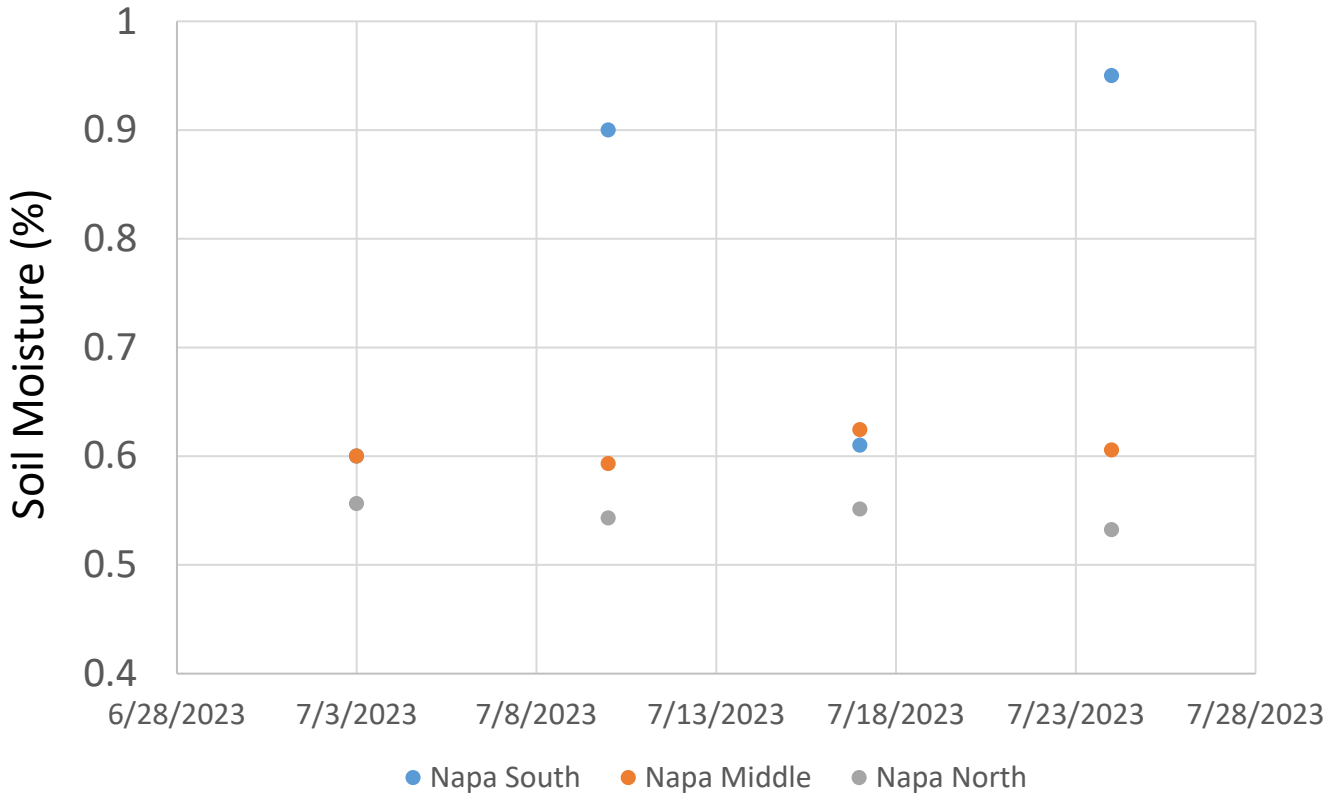
Figure modified from ***Improving Sustainable Viticulture and Winemaking Practices, Ch.6***

Benchmarking across different sites

Promote the sharing of information among growers, under anonymity.

Simple, and understandable narrative, "*We apply __ amount of water, and we see the yield impacted by __.*"

Soil Moisture Data Across different sites



(*Site Location and Name are kept anonymous*)

- Cabernet Sauvignon
- soil moisture higher in South Napa for two of the four dates

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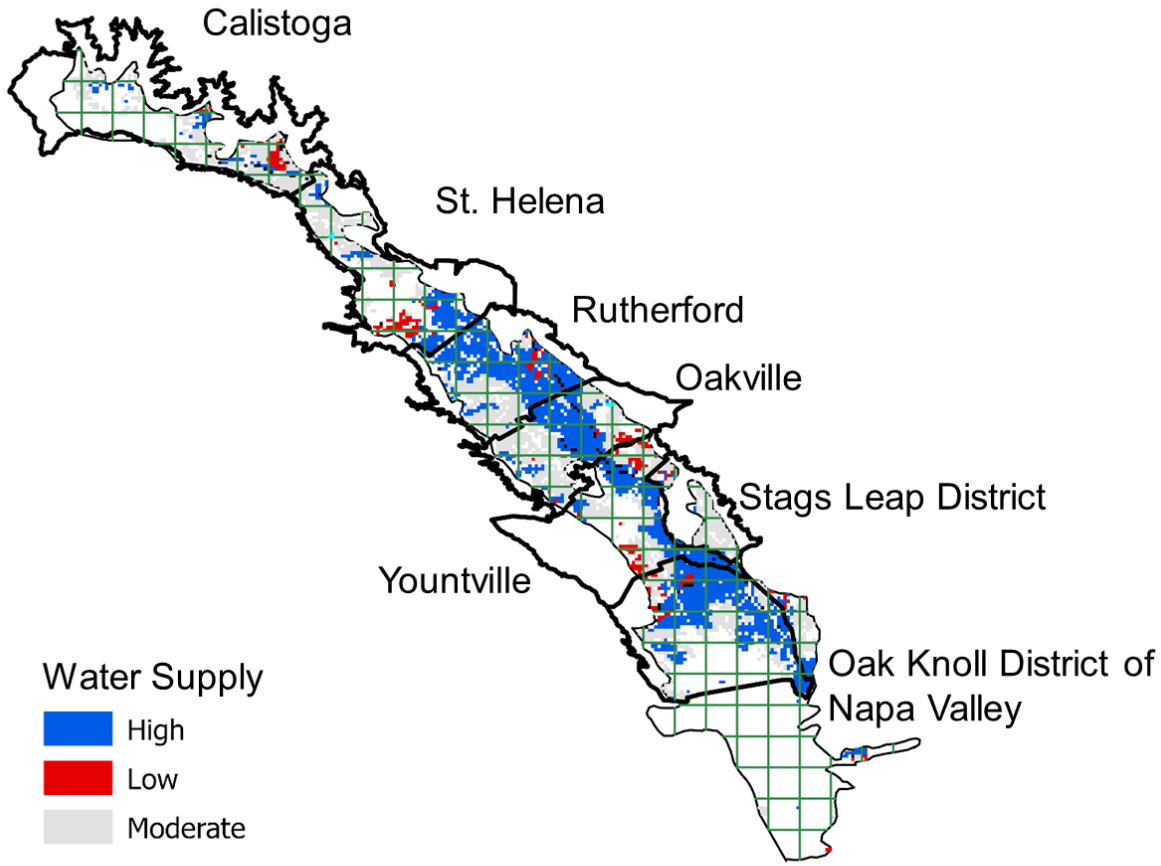
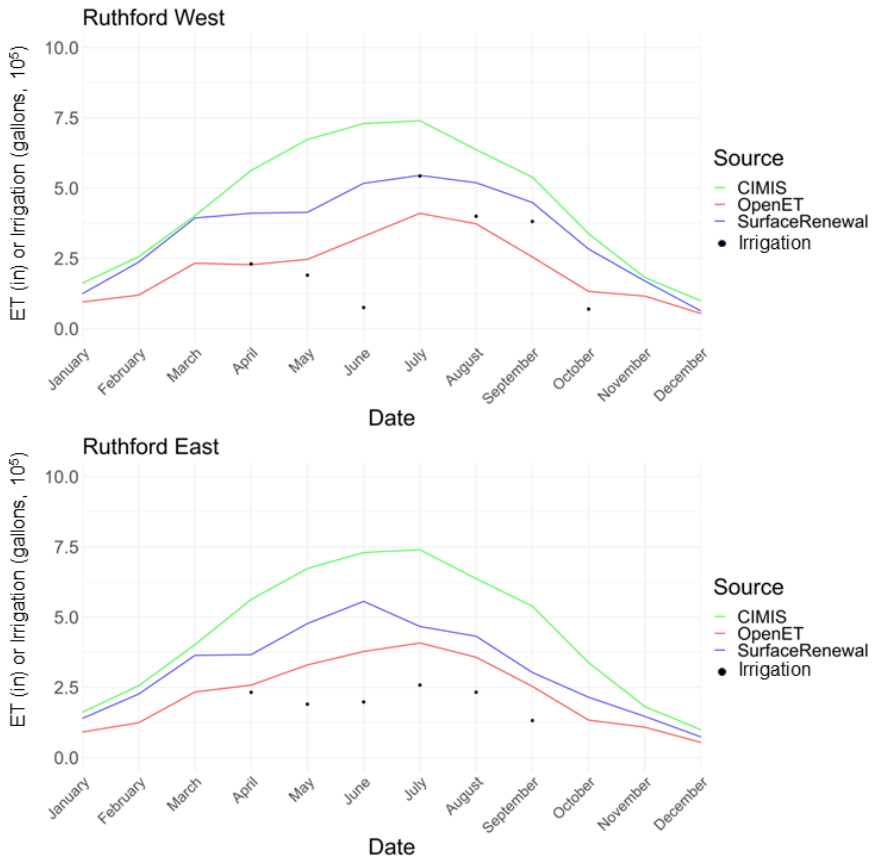
Soil Water Supply at different regions



(Data Compiled from NRCS)

Irrigation Decisions



Different ET products reveal different water needs.

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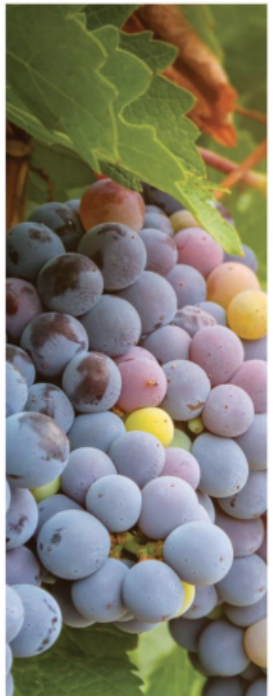
Pilot Site Study

NAPA VALLEY VINEYARDS: PROMOTING WATER CONSERVATION AND SUSTAINABILITY

Pilot Site Program Request



Background

In accordance with the 2014 Sustainable Groundwater Management Act, the Napa County Groundwater Sustainability Agency (GSA) submitted the required Napa Valley Subbasin Groundwater Sustainability Plan (GSP) to the California Department of Water Resources (DWR) on January 31, 2022. The Napa County GSA began GSP implementation in January 2022. On January 26, 2023, DWR approved the GSP.

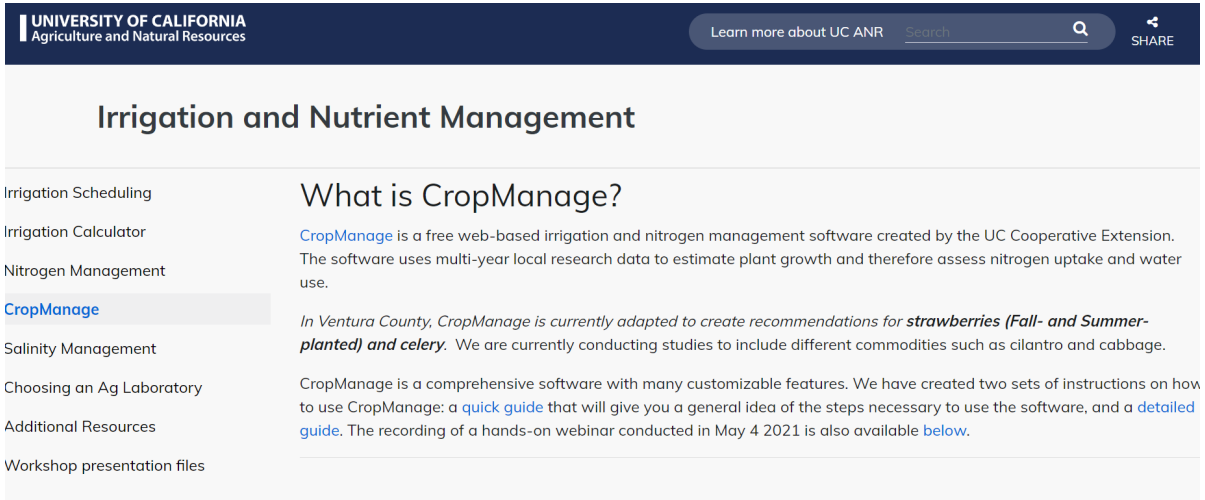
Since GSP implementation began in January 2022, the GSA has engaged with numerous agencies, vineyard and winery owners and operators, and stakeholder groups to outline paths forward to attain groundwater sustainability. Information exchange and data sharing are integral to the Napa community achieving sustainability. The Napa Valley Integrated Hydrologic Model (NVIHM) was developed during the preparation of the GSP to quantify basin-wide water budget components and establish sustainable management criteria. The hydrologic model is used to estimate total water use for vineyards, wineries, municipalities, and domestic users. The total amount of groundwater used is reported every year to DWR. Additional data would help refine water use estimates to better reflect ongoing conservation efforts.

A Pilot Sites Program for vineyards and wineries is underway to accomplish two overarching objectives: (1) to refine estimates of vineyard and winery water use in the Napa Valley and (2) to share, collaborate, and contribute information about management practices, lessons learned, and building climate resiliency.

Pilot Site launched by Napa Groundwater Sustainability Agency

UC role: better quantification of water use and irrigation scheduling

Crop Coefficient Measurements



Irrigation Decision-Making Software

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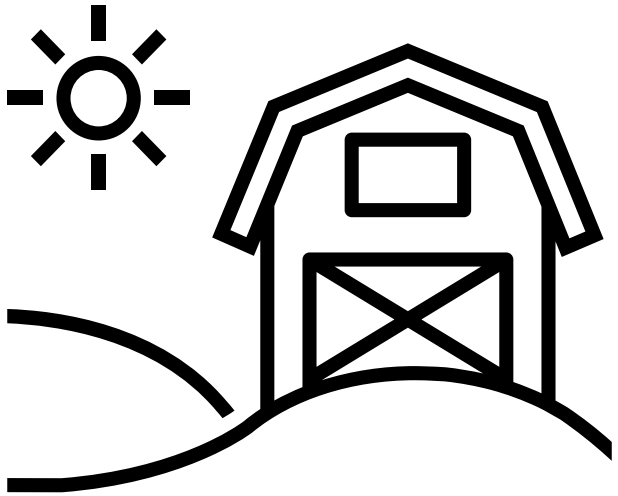
Facilitate Conversation of Business Partners and Individual Growers



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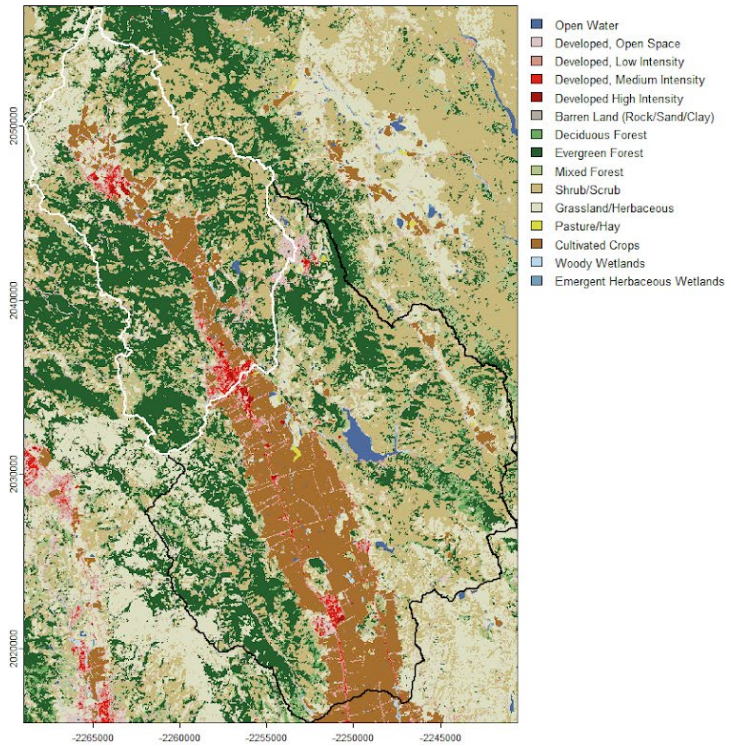
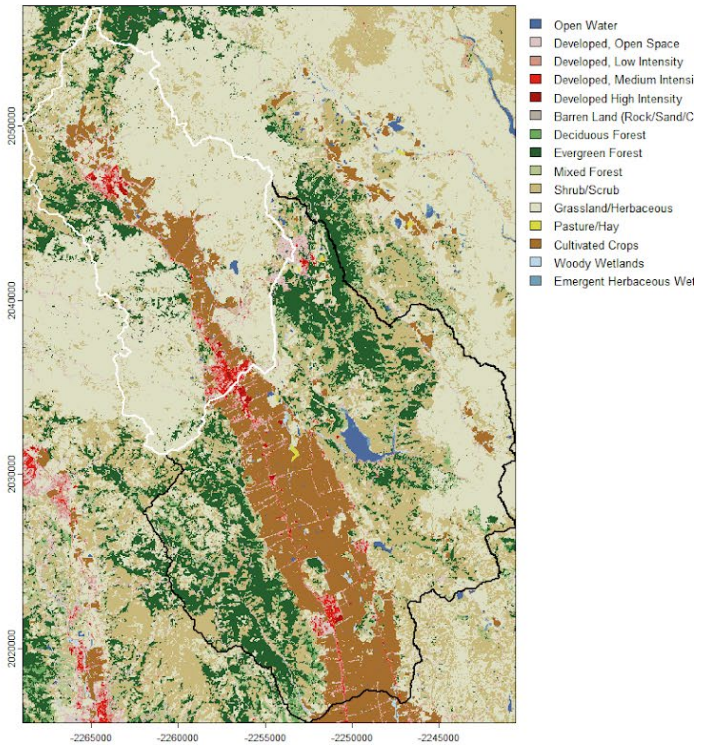
Natural Disturbance and Napa Water





Wildfire

- Hydrologic implications

Change in infiltration rates, water movement speed in the landscape

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Natural Disturbance and Napa Water

2014 South Napa earthquake

Article Talk

From Wikipedia, the free encyclopedia

The **2014 South Napa earthquake** occurred in the North San Francisco Bay Area on August 24 at 03:20:44 Pacific Daylight Time. At 6.0 on the moment magnitude scale and with a maximum Mercalli intensity of VIII (*Severe*), the event was the largest in the San Francisco Bay Area since the 1989 Loma Prieta earthquake. The epicenter of the earthquake was located to the south of Napa and to the northwest of American Canyon on the West Napa Fault.[7]

Total damage in the southern Napa Valley and Vallejo areas was in the range of $362 million to $1 billion, with one person killed and 200 injured. Other aspects of the event included an experimental earthquake warning system that alerted seismologists several seconds before the damaging shear waves arrived, temporary changes in springs and wells, and the potential for postseismic fault creep.

Earthquake
- Hydrologic implications

Groundwater Recharge Workshop – register today!

Save Water: Napa Valley Water Conservation Workshop

Workshop Contents:

- Learn About Implementing Groundwater Recharge On Agricultural Land.
- Discover New Drought-Resilient Practices Such As Dry Farming.
- Hear From Experts From UC Davis and UC Cooperative Extension.

Registration Fee: $10

Guest Speakers

Dr. Helen Dahlke,
Professor in
Integrated Hydrologic
Sciences,
UC Davis

Dr. Ellie Marie Andrews,
Specialty Crops Advisor, Sonoma,
Marin, and Napa Counties,
UC Cooperative Extension

April 12th 1-4 pm
Ag Comm Office, 1710 Soscol Avenue, Suite 3

Sign up today by scanning the QR code!

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Contact Information

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- Sign up Napa water newsletter to get updates of most recent research and extension events

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