Groundwater Dependent Ecosystem Monitoring 2024

Stillwater Sciences

Luhdorff & Scalmanini Consulting Engineers

NAPA RCD

Workplan Objectives

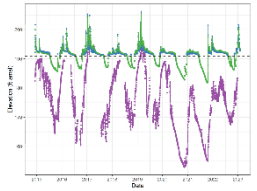
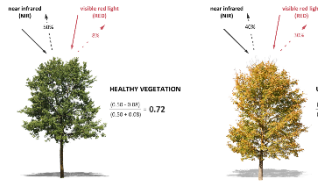
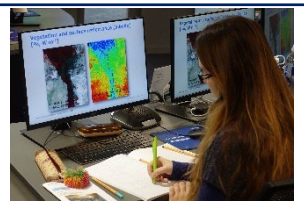
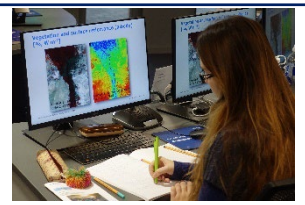
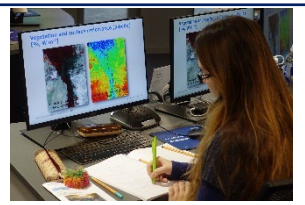
Monitoring

- What ecosystem components are at intensive monitoring sites (what species are present)?
- What are the groundwater elevation and surface water dynamics?

Analysis

- What are the biological flow and groundwater needs for each ecosystem component?
- Use California Environmental Flows Framework (CEFF) to assess ecological flow needs.

Ongoing Monitoring Schedule

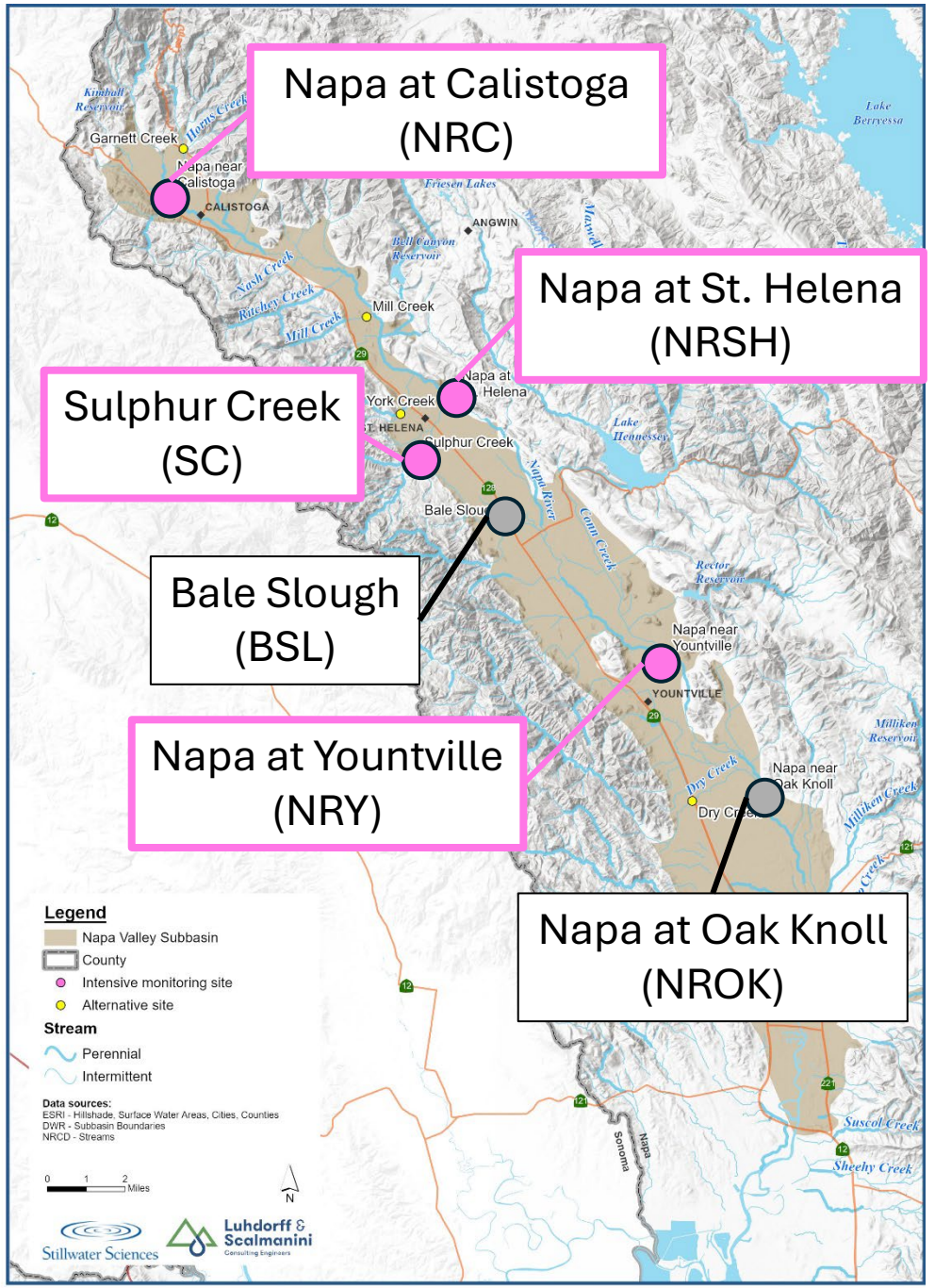
		2024	2025	2026	2027
NAPA RCD	Stream Watch				GSP Update January 2027
	Shallow Groundwater Monitoring				
	Napa RCD fish surveys				
	Remote Sensing of GDEs				

Ongoing Monitoring Schedule (continued)

		2024	2025	2026	2027
	Fish Habitat and Usage				GSP Update January 2027
	Aquatic Wildlife			Optional (Flood, Drought)	
	Vegetation Health and Rare Plants				
	Terrestrial Wildlife (Birds)				

ISW and GDEs Workplan Implementation

- Six intensive survey sites identified in the Workplan, initial surveys were conducted at 4 of the 6 sites.
- Stillwater conducted reconnaissance visit and field visit to 4 of the sites on May 2024 with the Technical Team plus TAG member Matt Kondolf.
- Napa River at Oak Knoll now approved
  - First round of surveys slated for spring 2025
- Bale Slough – access pending



2024 Monitoring

LSCE

- Stage recorders deployed at new sites, continued shallow groundwater monitoring

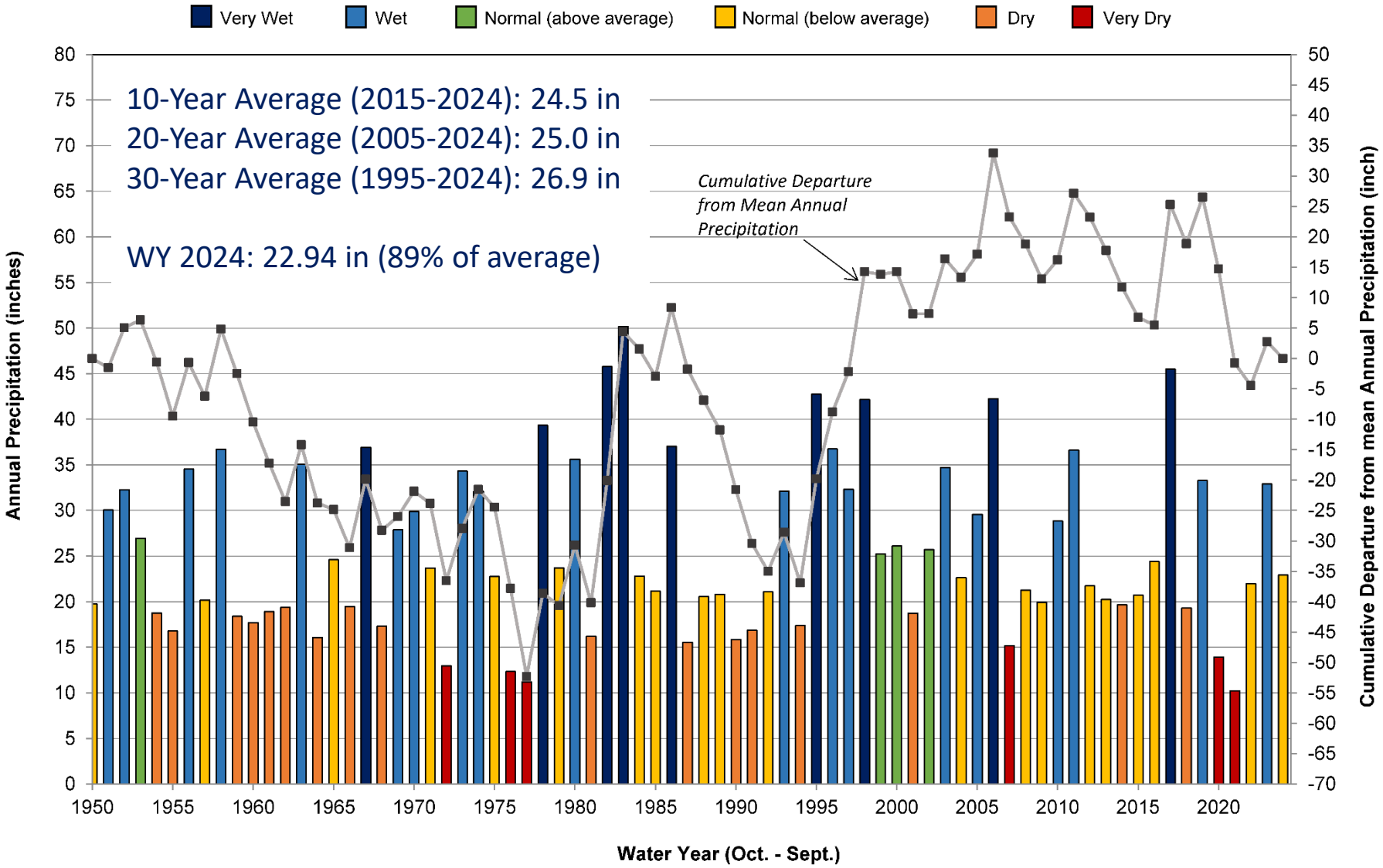
RCD summer 2024

- Dissolved oxygen and temperature monitoring
- Monthly flow connectivity (wet/dry mapping)
- Assess fish habitat
- Fish surveys

Stillwater

- Conducted amphibian surveys including eDNA
- GDE (vegetation) health surveys in late summer
- California freshwater shrimp surveys (Calistoga reach)
- Thalweg surveys

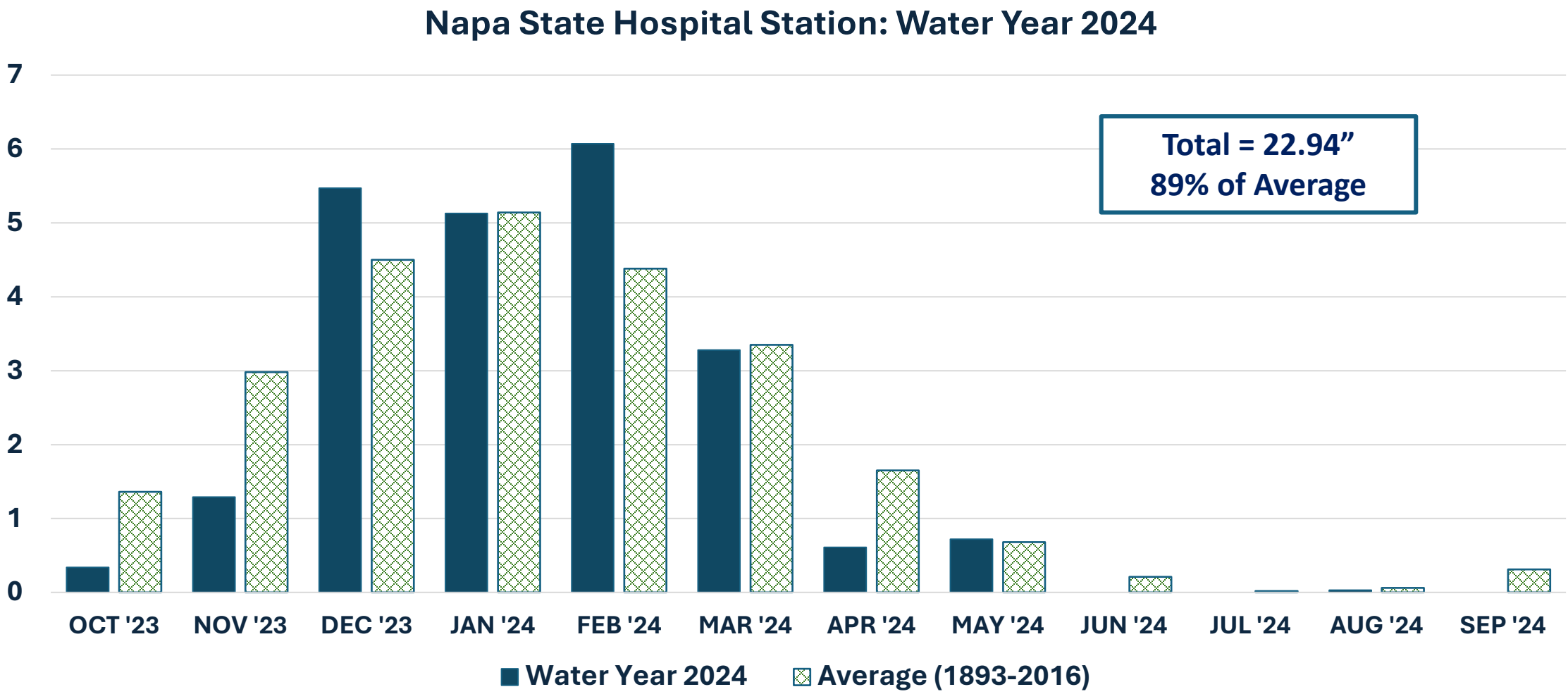
Historical Precipitation at Napa State Hospital



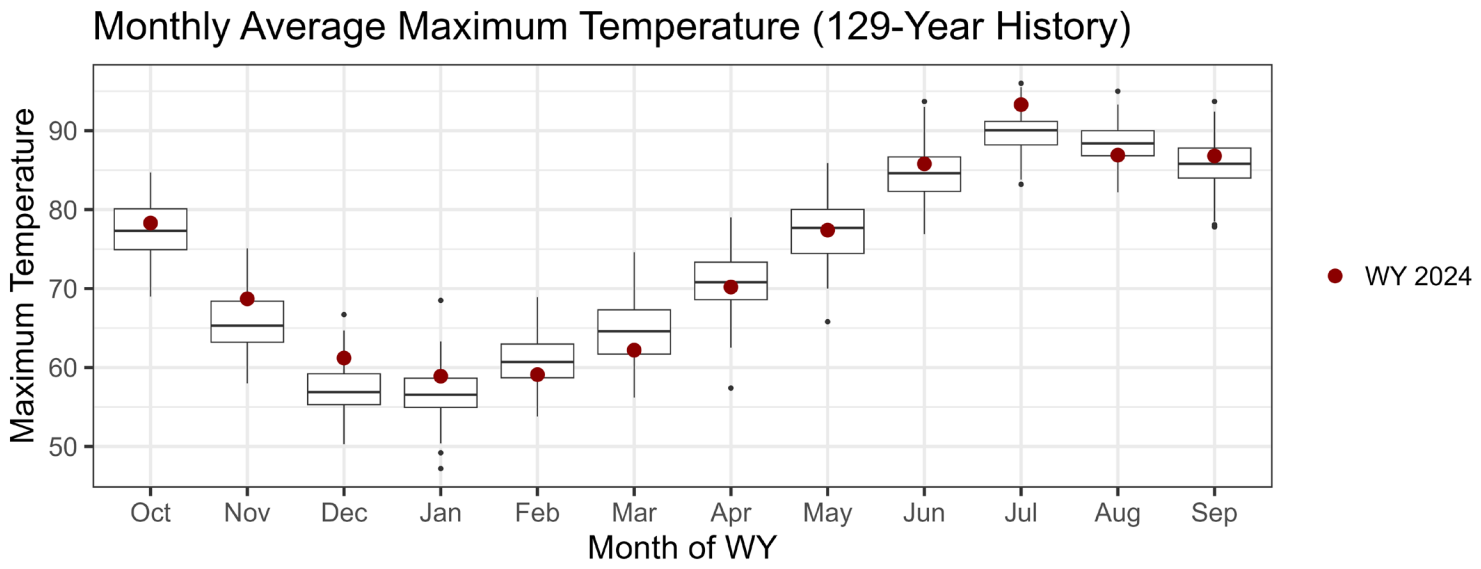
NOTE: Gaps in this data record have been reconstructed using data from the Oakville CIMIS station (77) and NOAA Saint Helena, CA station (GHCND:USC00047646).

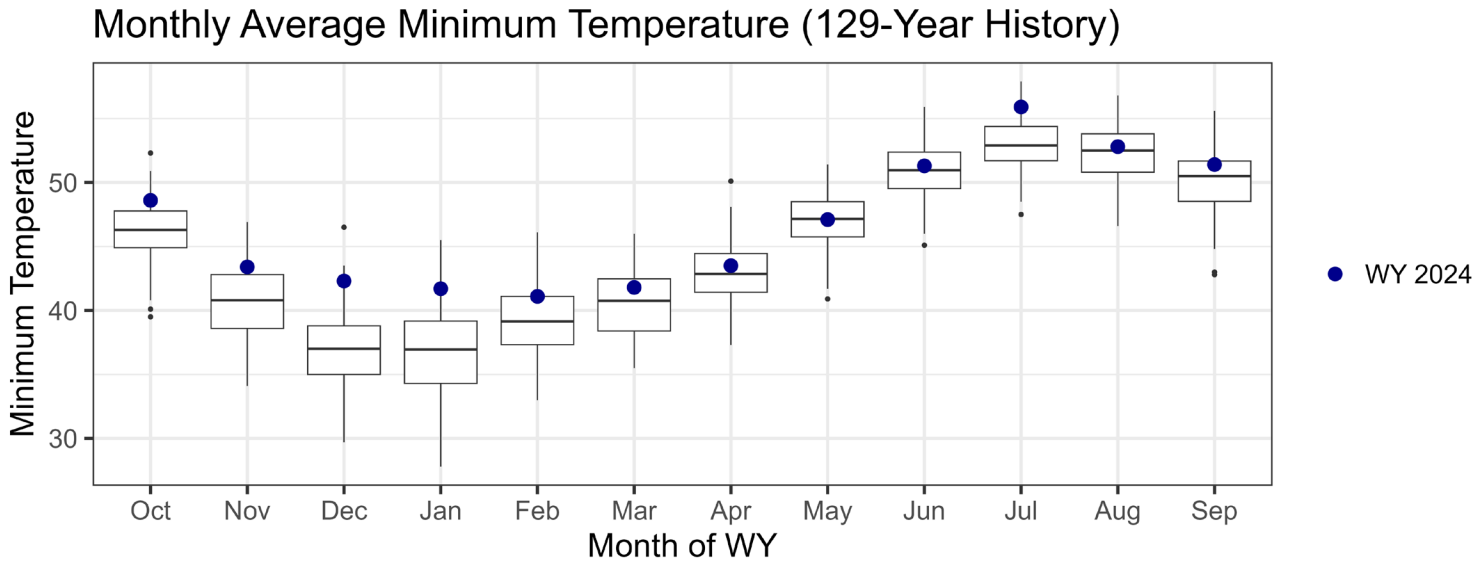
X:\2022\22-042 Napa County - Napa Valley Subbasin GSP Implementation 3-Years Technical Services\DATA\Precip\NSH_Cumulative_Dep.xlsx

Precipitation: Water Year 2024



Temperature: Water Year 2024



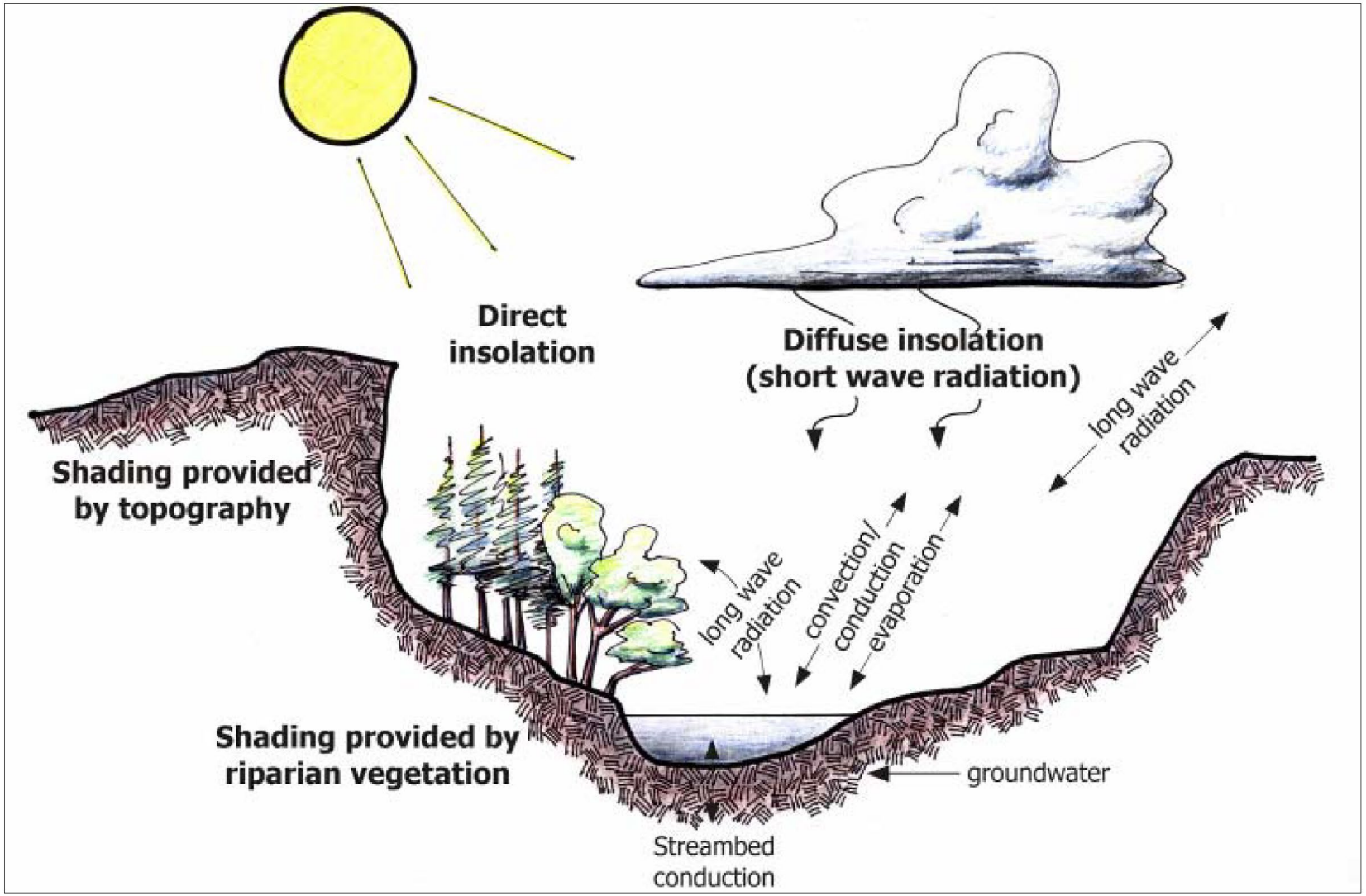


- WY 2024 characterized by a cool spring and hot summer.
- Winter saw very high minimum temperatures.
- July saw extremely high maximum temperatures.
- June through September saw above average minimum temperatures.
- Days above 100°F:

Site	2023	2024
Calistoga	16	35
St. Helena	15	35
Oakville	3	12

Influences on Stream Temperature

- Flow
- Air temperature
- Shading from vegetation and topography
- Channel width and depth (shallower wider channels warm more quickly)
- Groundwater inputs (groundwater can cool, or warm surface water)



2024 Climate summary

- 2024 had normal (below average) precipitation.
- Summer 2024 was very warm, particularly in July when minimum and maximum daily temperatures were high relative to the historical record.
- Calistoga, St. Helena, and Oakville experienced 35, 35, and 12 days above 100 degrees Fahrenheit, much higher than average.
- These conditions are likely to lead to higher stream temperature and low dissolved oxygen.

Fish and Habitat Surveys

- Completed snorkel surveys at each of the four sites
- Napa RCD mapped habitat (extent of pools, riffles, etc.)
- Napa RCD deployed dissolved oxygen and temperature sensors at four sites

Herpetology surveys

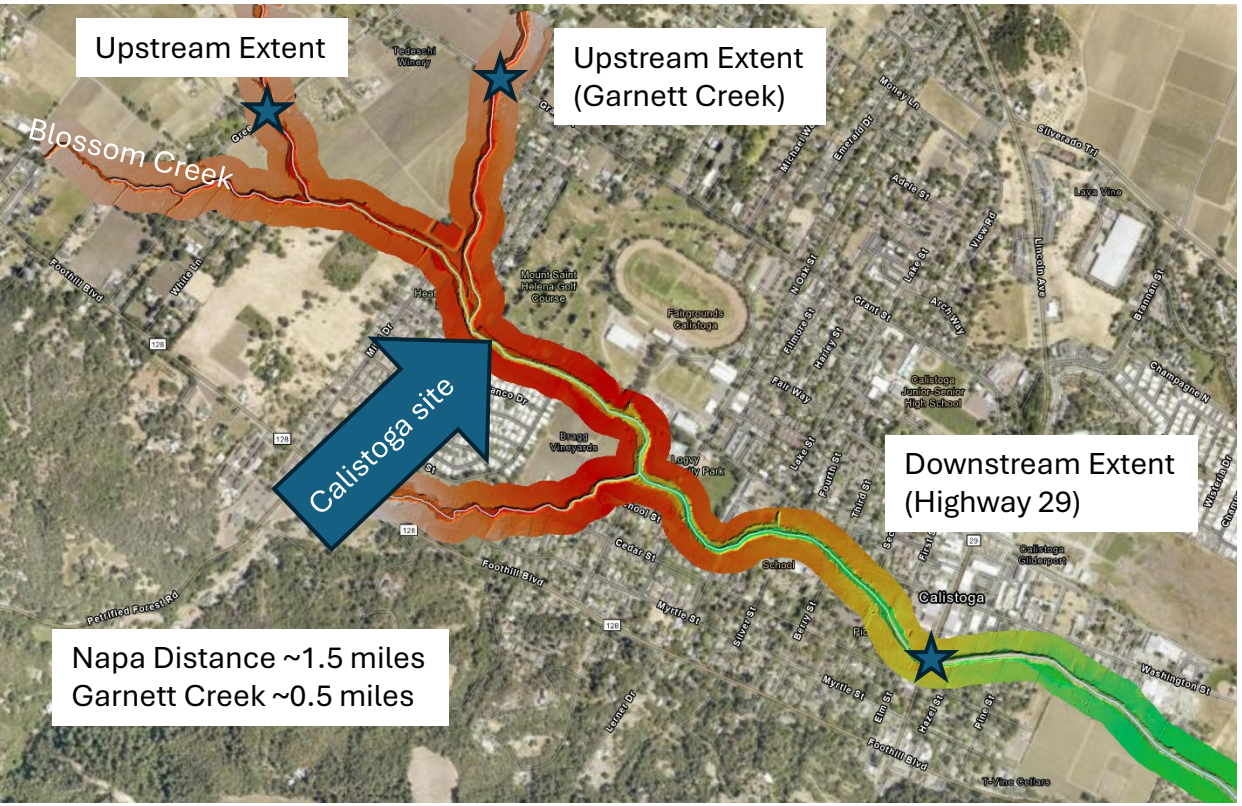
- Two visual encounter surveys and one eDNA sample for foothill yellow-legged frog and Northwestern pond turtle at Sulphur Creek, Napa River at Calistoga, Napa River at St. Helena, Napa River at Yountville.
- Other sites will be surveyed in 2025

eDNA sampling at the Napa River near Calistoga

Visual encounter surveys

California Freshwater Shrimp Surveys

- Surveyed August 2024
- Napa River at Calistoga and lower Garnett Creek



*Color scale shows relative elevation along river corridor.

Vegetation Surveys

- Mapped riparian vegetation and assessed plant vigor in September 2024
- Two transects per site
- Data still being processed


Calistoga

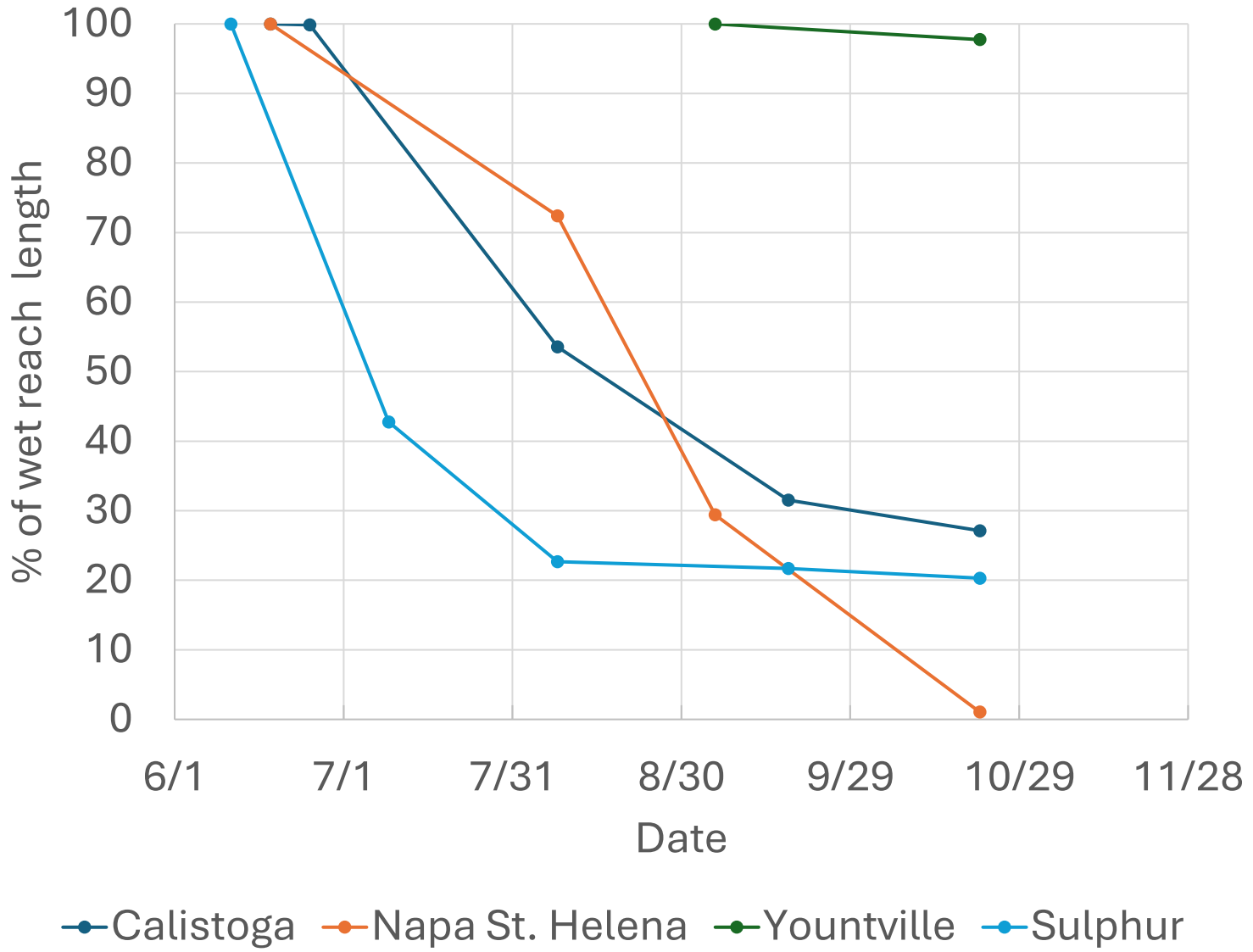

St Helena


Sulphur Creek

Wet-Dry Mapping Summary

- Mapped approximately monthly
- The USGS gage at Oak Knoll went dry on September 10
- The USGS gage at St. Helena went dry on August 8

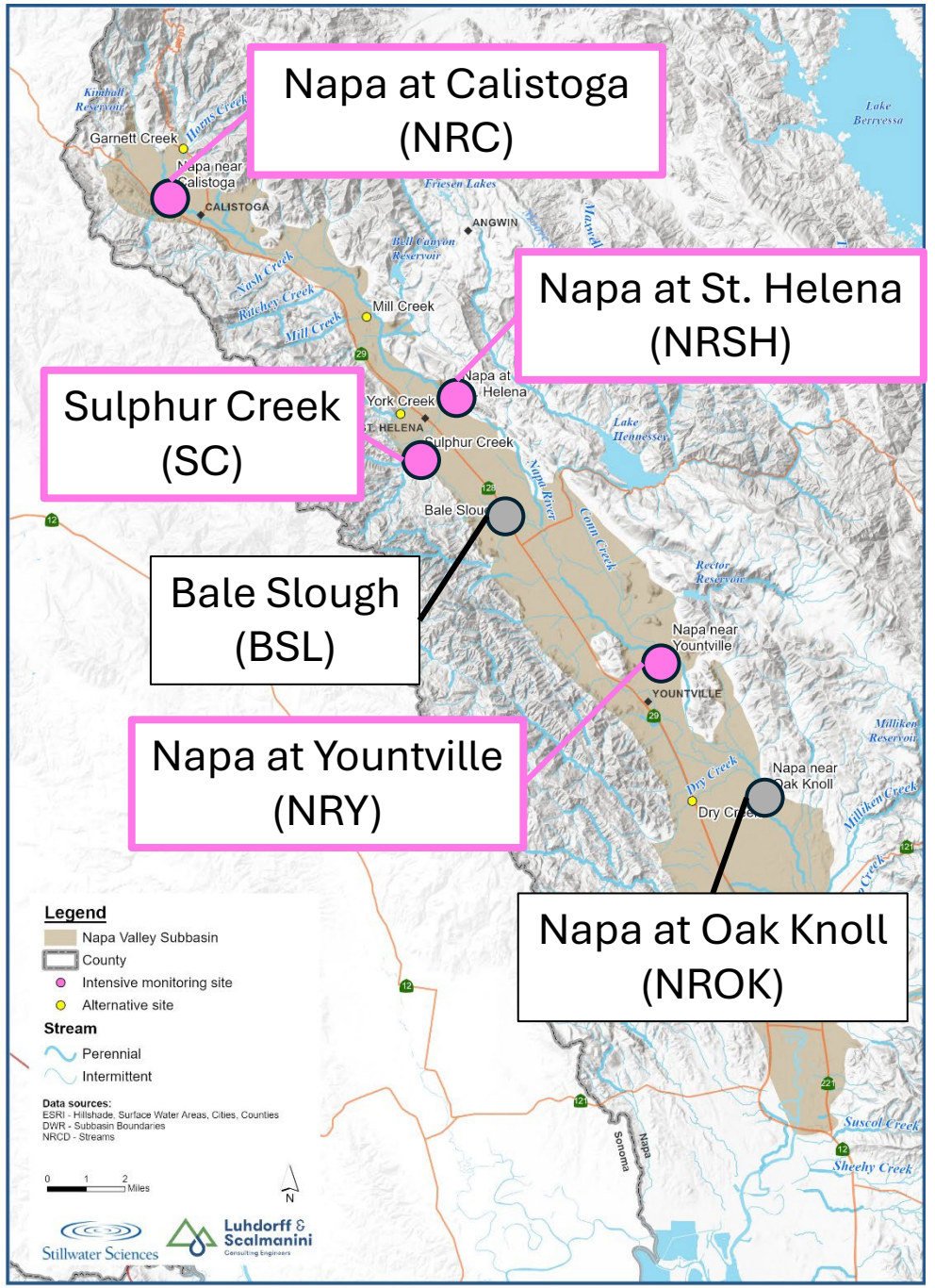
Reach	Length (miles)
Napa at Calistoga	1.2
Napa at St. Helena	1.3
Napa at Yountville	1.1
Sulphur Creek	1.0



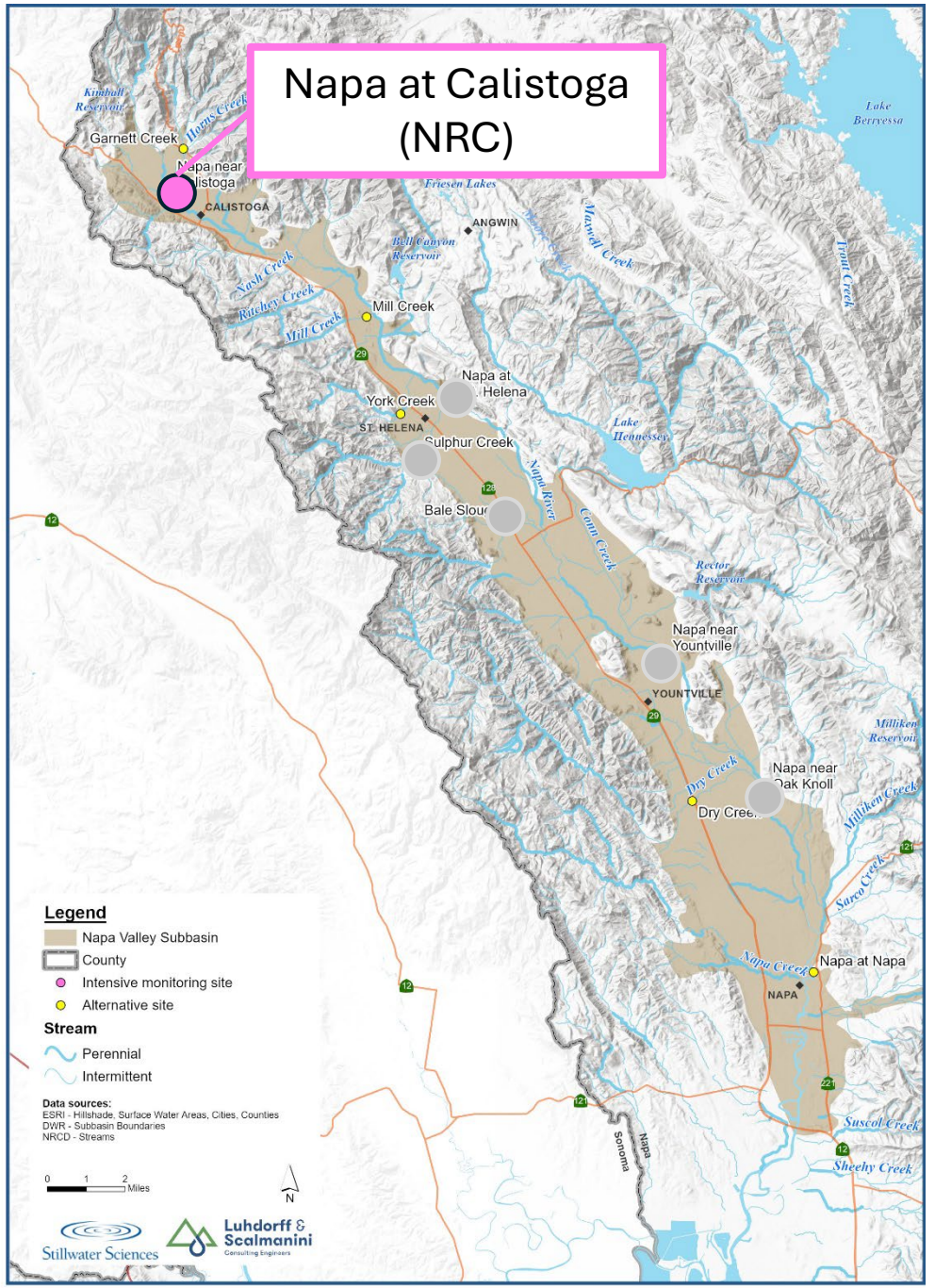
Longitudinal Profile surveys

- Thalweg profiles were surveyed at the four accessible sites in October 2024
- Surveys were conducted by RTK GPS and total station
- Some gaps will be filled in November 2024 and the data will be processed and finalized
- Surveys include the streambed and water elevation (where present)
- Surveys were 1000-2000 ft long at each site

Surveys by Site

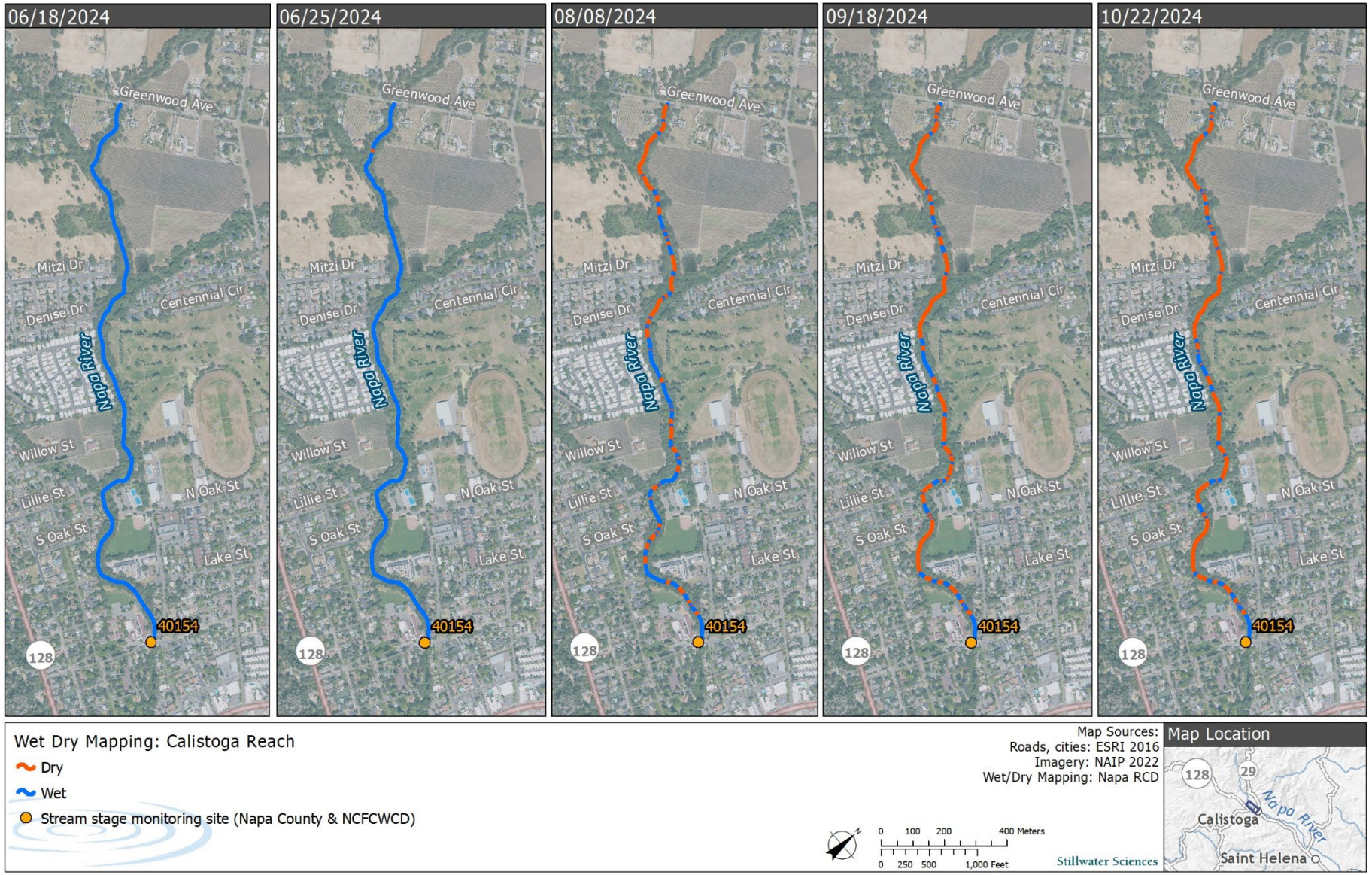


Napa River at Calistoga



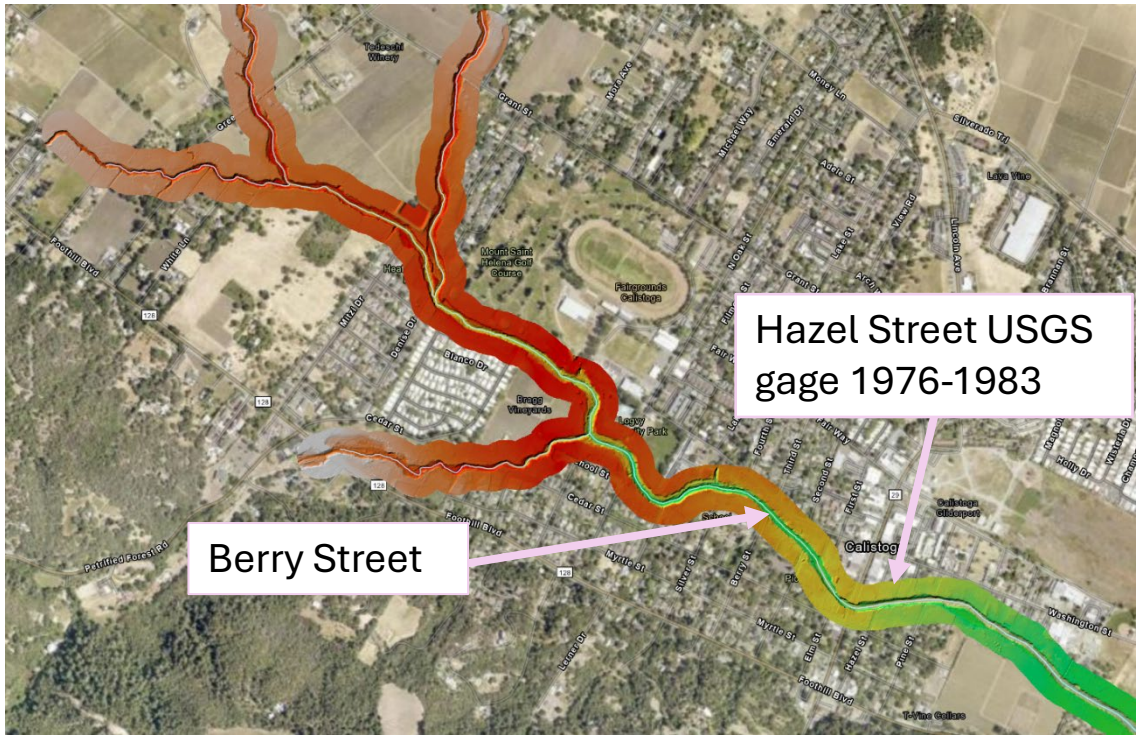
Napa River at Calistoga – Wet/Dry Mapping

- Transition to isolated pools separated by dry glides and riffles in August
- 27% of the reach was wet on 10/22/2024

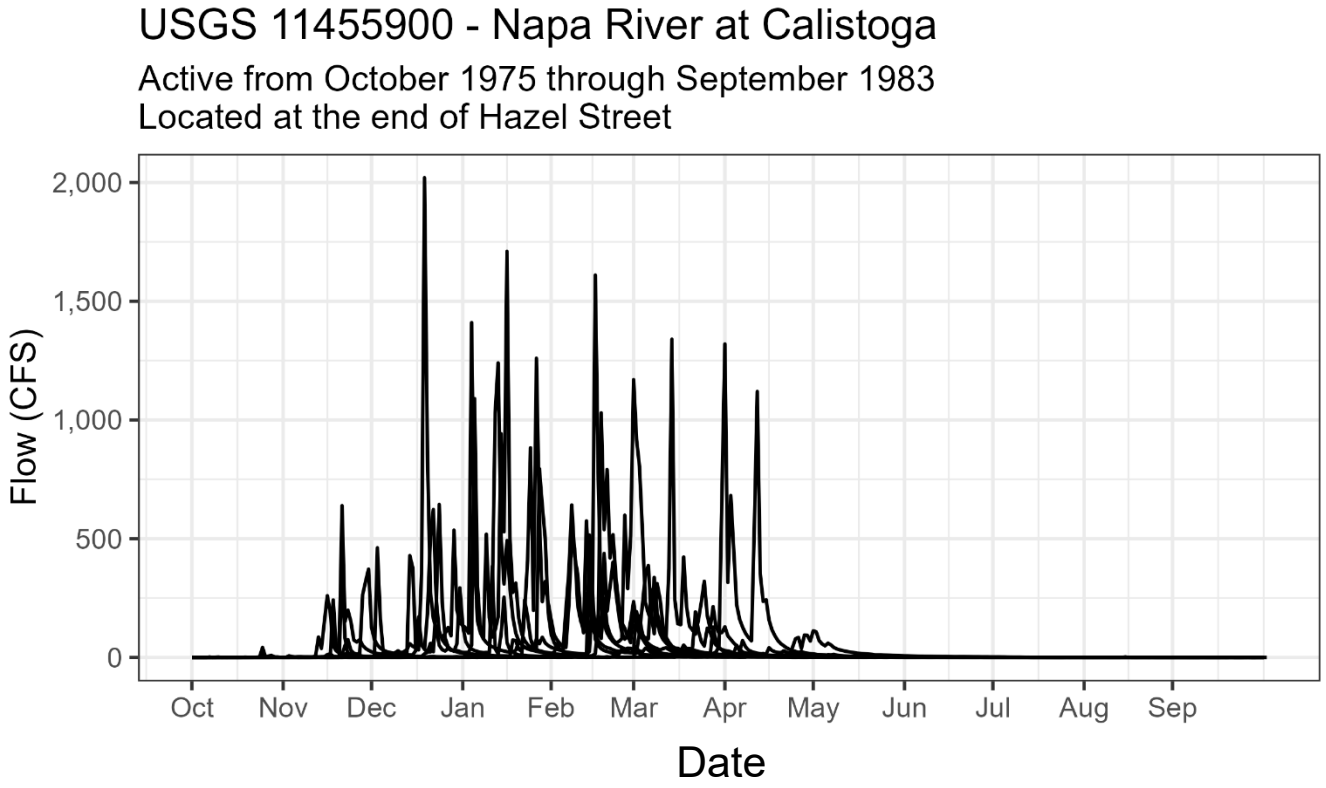


Napa River at Calistoga – Historical Flow

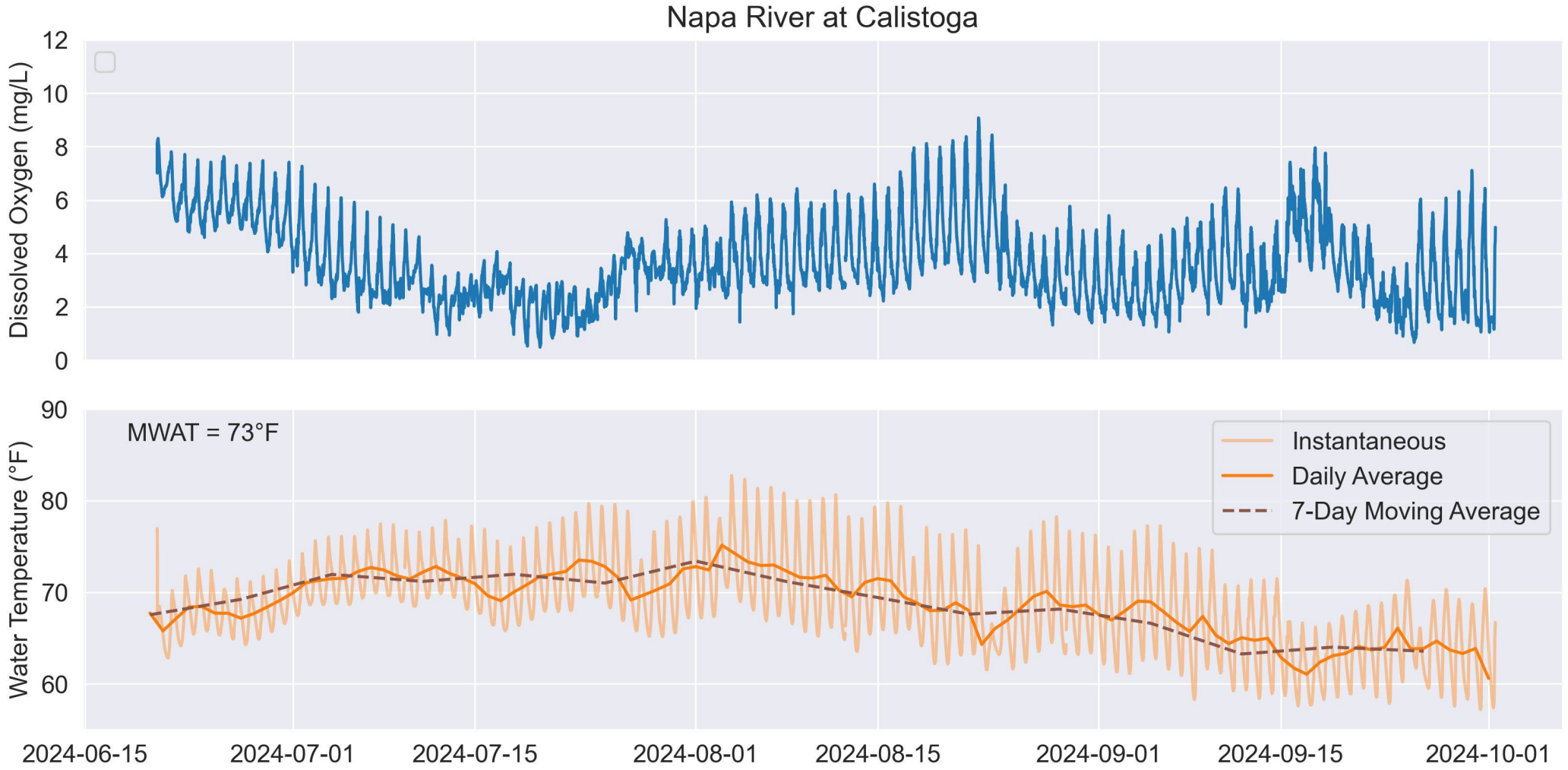
- Stream Watch: Napa River at Berry Street continuously flowing from 11/2018-1/2022 (since retired)
- Stream Watch site located approximately 1,300 ft upstream of historical USGS Gage



*Color scale shows relative elevation along river corridor.



Temperature and Dissolved Oxygen Napa River at Calistoga



*Conditions reflect high summer temperatures.

2024 Napa River at Calistoga – Observation Summary

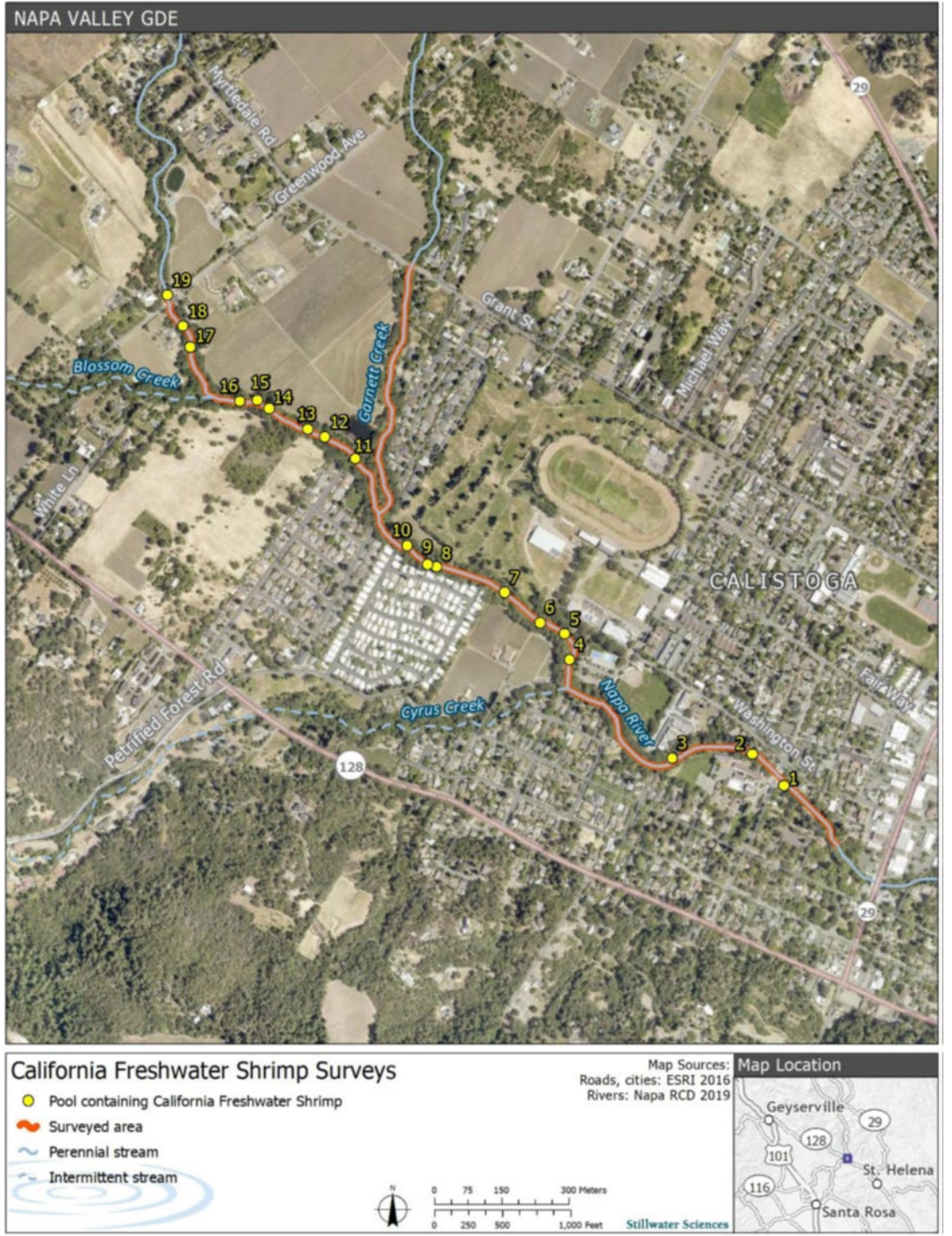
Survey	May	Jun	Jul	Aug	Sep	Oct
Flow Connectivity	Flowing (site visit)	Flowing	Isolated pools	Isolated pools	Isolated pools	Isolated pools
Water Quality		DO and Temperature stressful	Low DO, high temperature	Low DO, high temperature	Low DO	Low DO
Fish surveys		Steelhead fry (118), steelhead parr				
Herps	Absent		No , eDNA negative			
California freshwater shrimp				105 individuals		

Key

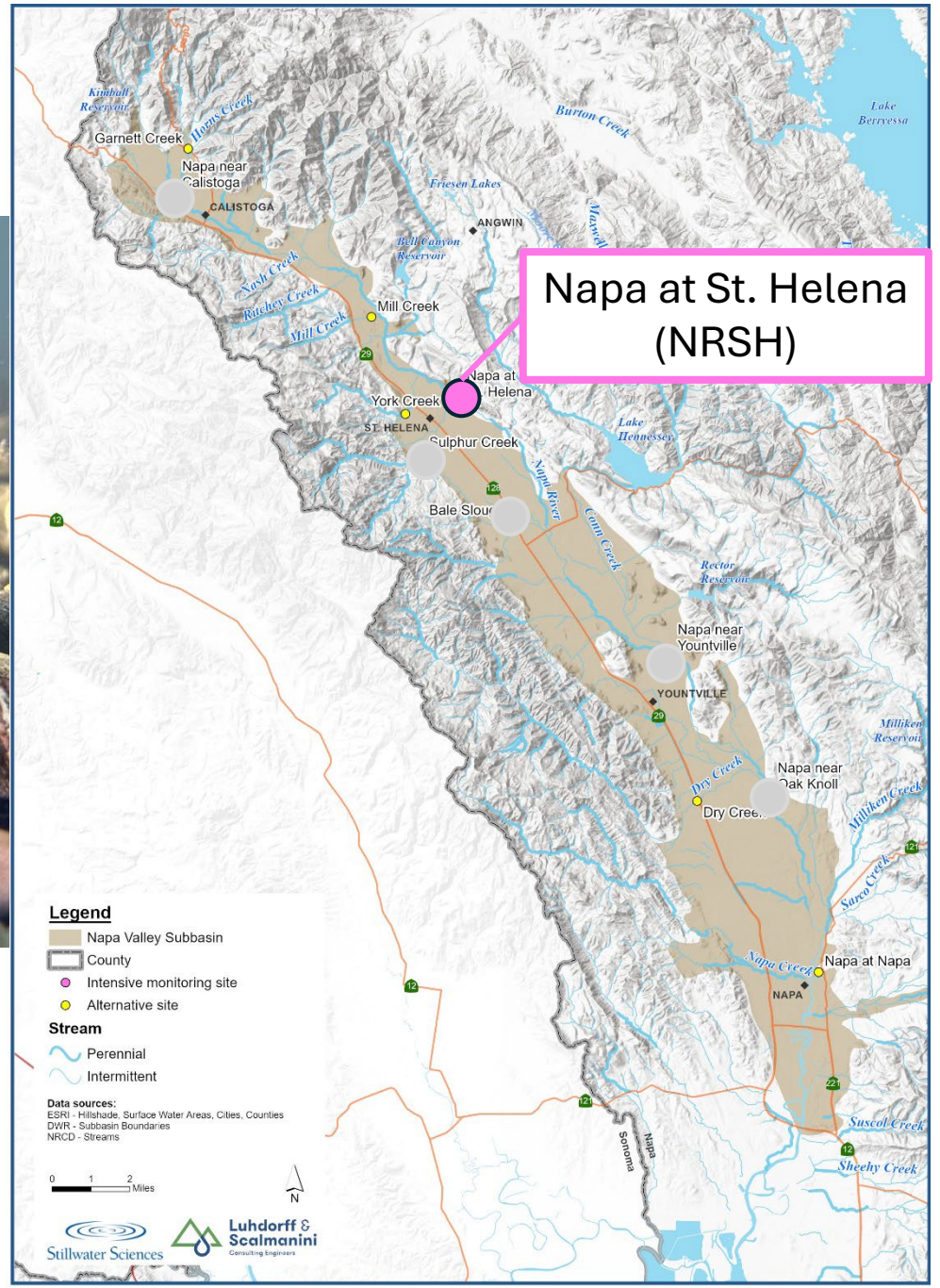
	Species observed, Suitable DO/T, flowing
	Small number of individuals present, Intermediate DO/T, isolated pools
	Species absent, poor DO/T, Mostly dry
	No monitoring

California Freshwater Shrimp (Calistoga)

- 105 shrimp observed in isolated pools
- 41 males, 19 females, 45 juveniles
- Found throughout the reach
- Most of the pools were still wetted in October, but a couple of the pools dried out

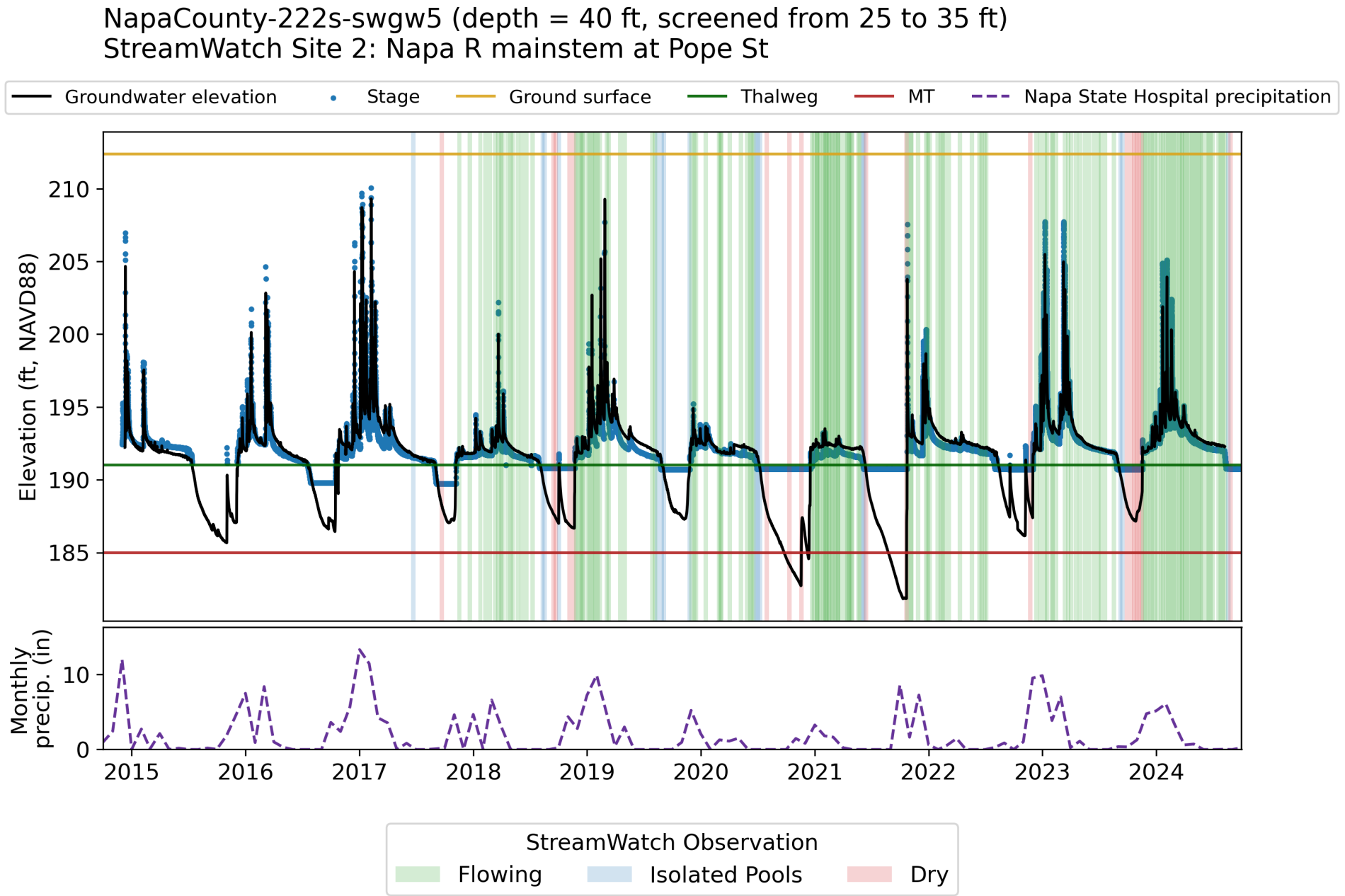


Napa River at St. Helena

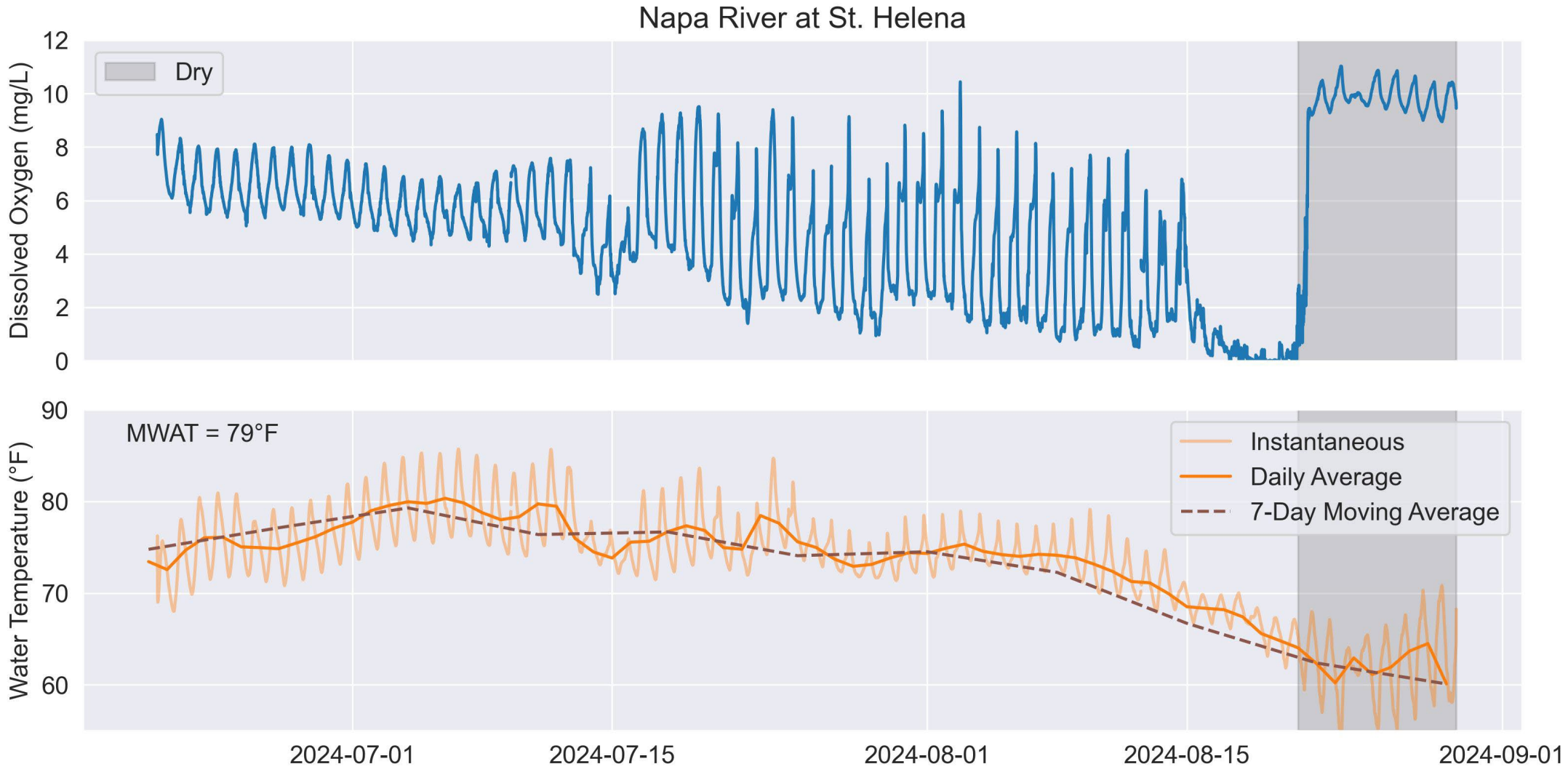


Napa River at St. Helena – Wet/Dry Mapping

- Upstream section of channel stayed wet through early August
- Surface flow observed at Pope Street on 8/9, isolated pools by 8/16
- Middle section dried out in early August


NapaCounty-222s-swgw5 (depth = 40 ft, screened from 25 to 35 ft)
StreamWatch Site 2: Napa R mainstem at Pope St
Groundwater elevation
Stage
Ground surface
Thalweg
MT
Napa State Hospital precipitation
Elevation (ft, NAVD88)
210
205
200
195
190
185
Monthly precip. (in)
10
0
2015
2016
2017
2018
2019
2020
2021
2022
2023
2024
StreamWatch Observation
Flowing
Isolated Pools
Dry

Temperature and Dissolved Oxygen
Napa River at St. Helena



*Conditions reflect high summer temperatures.

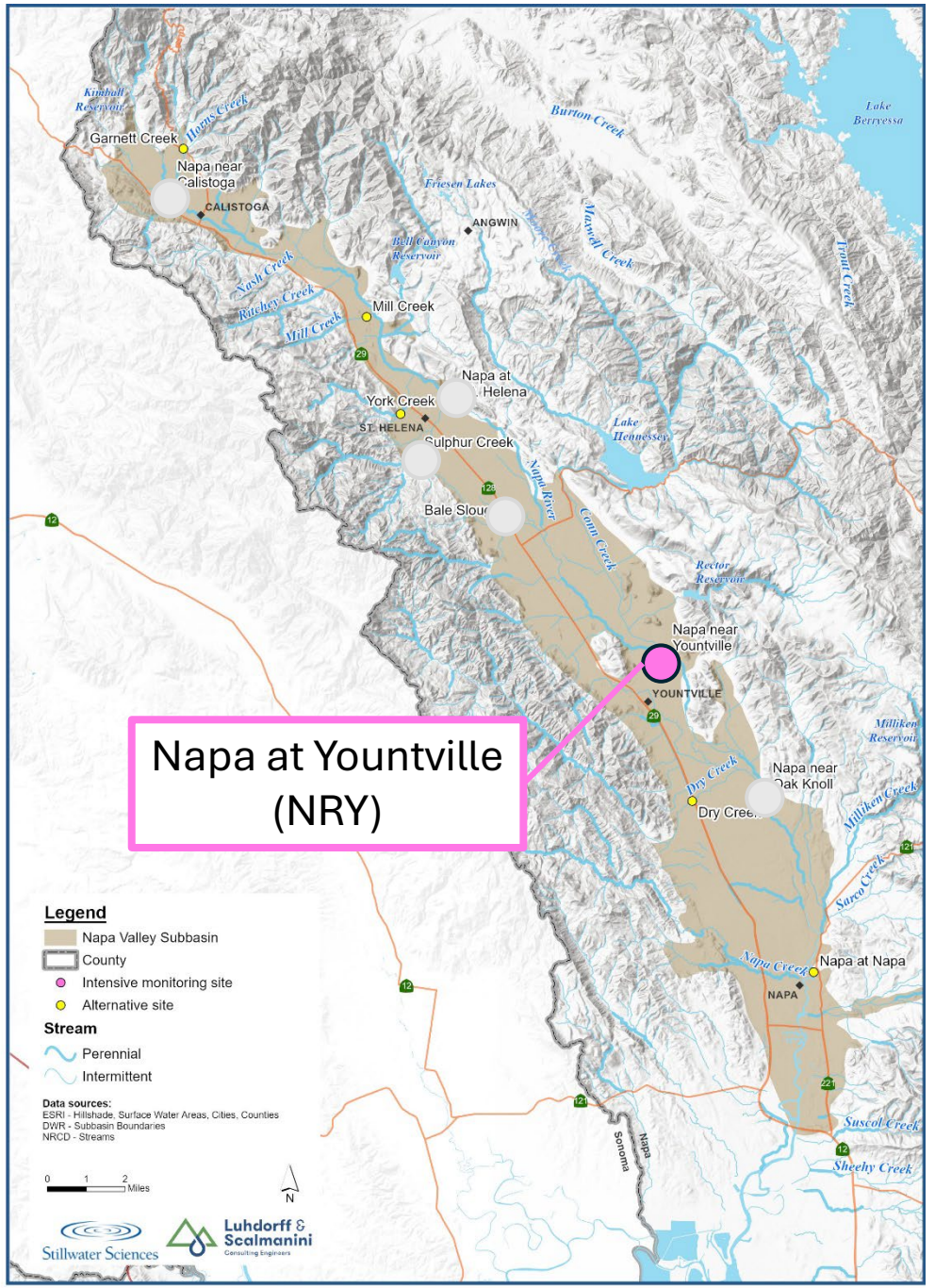
2024 Napa River at St. Helena

Survey	May	Jun	Jul	Aug	Sep	Oct
Flow Connectivity	*Flowing (stream watch)*	flowing	flowing	Long dry reach	Dry	Dry
Water Quality		Moderate DO and temp	Low DO, high temp	Low DO, high temp		
Fish surveys		Steelhead fry (2)				
Herps	VES: Foothill yellow legged frog eggs, northwestern pond turtle adult		eDNA: Foothill yellow legged frog			

Key

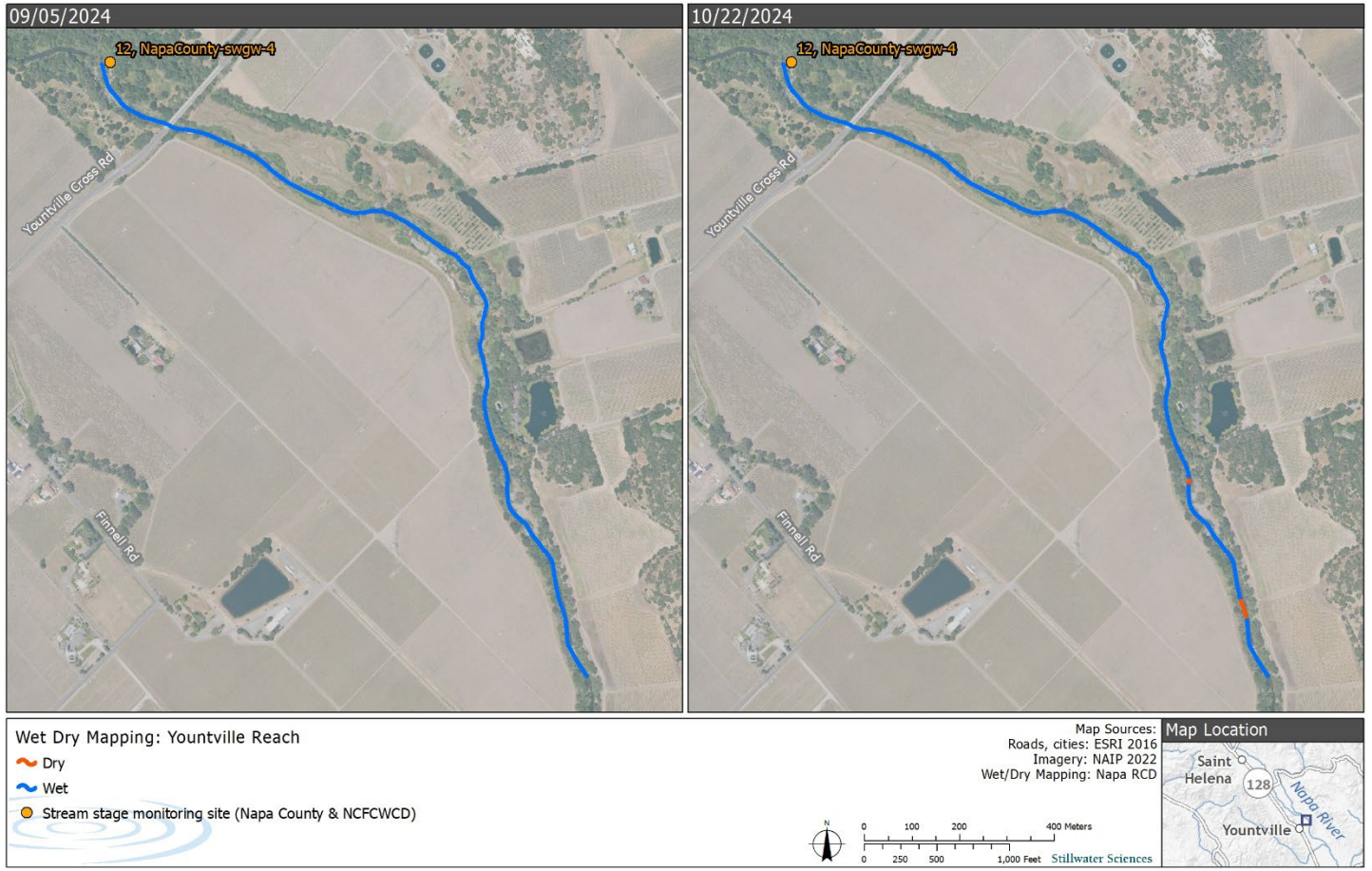
	Species observed, Suitable DO/T, flowing
	Small number of individuals present, Intermediate DO/T, isolated pools
	Species absent, poor DO/T, Mostly dry
	No monitoring

Napa River at Yountville

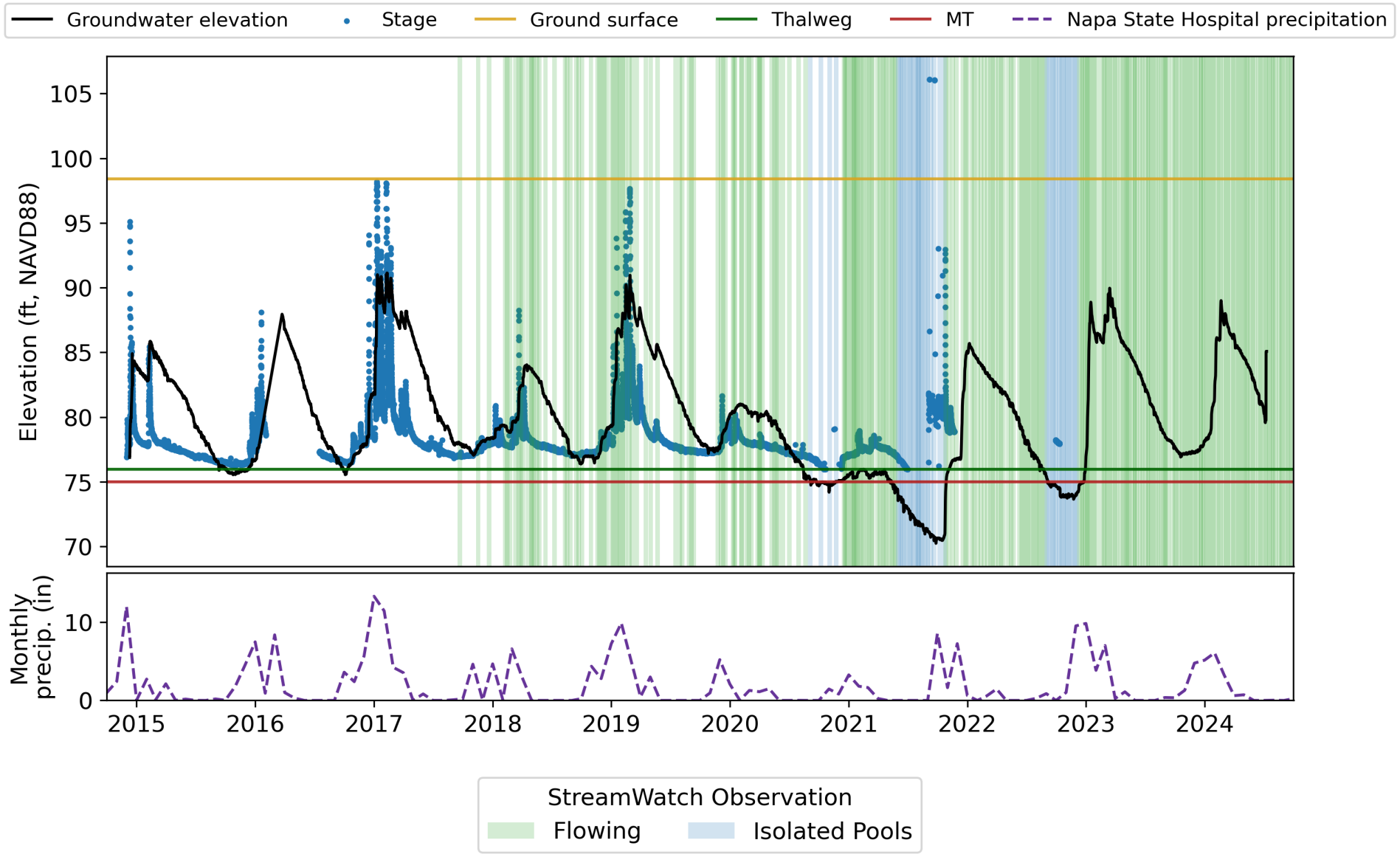


Napa River at Yountville – Wet/Dry Mapping

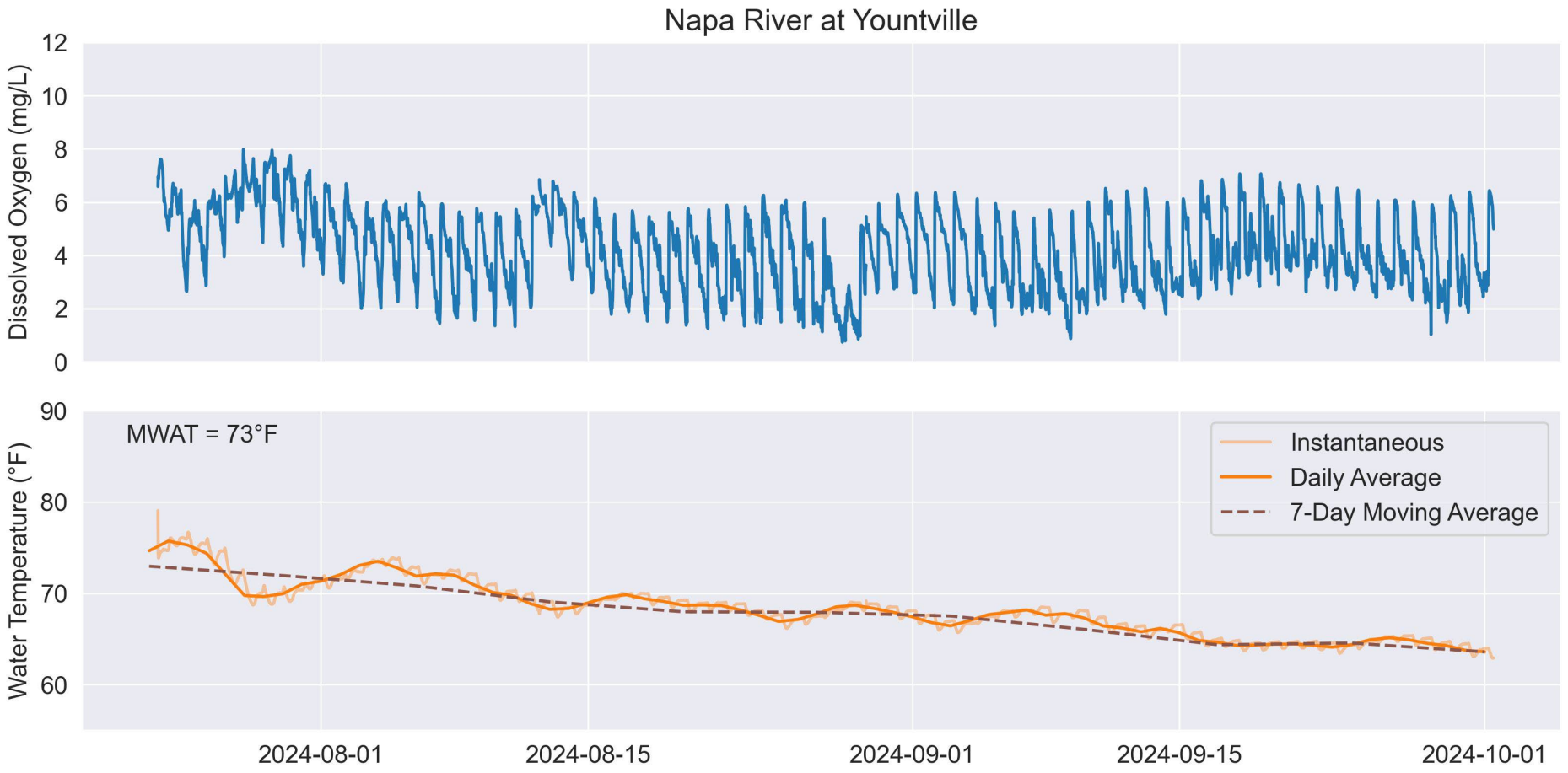
- Almost entirely wetted, even in October (98% wetted)
- Poor dissolved oxygen conditions, mapped dry conditions in upstream reaches



NapaCounty-220s-swgw4 (depth = 45 ft, screened from 25 to 40 ft)
StreamWatch Site 1: Napa R mainstem at Yountville EcoReserve



Temperature and Dissolved Oxygen
Napa River at Yountville



*Conditions reflect high summer temperatures.

2024 Napa River at Yountville

Survey	May	Jun	Jul	Aug	Sep	Oct
Flow Connectivity	*Flowing (stream watch*	*Flowing (stream watch)*	*Flowing (stream watch)*	*Flowing (stream watch)*	Flowing	Mostly flowing
Water Quality				Low DO, stressful temperature	Low DO	
Fish surveys		Steelhead fry (2)				
Herps	north-western pond turtle		eDNA: north-western pond turtle			

Key

	Species observed, Suitable DO/T, flowing
	Small number of individuals present, Intermediate DO/T, isolated pools
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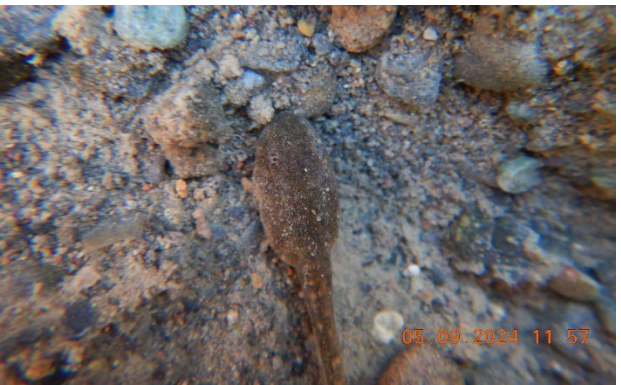
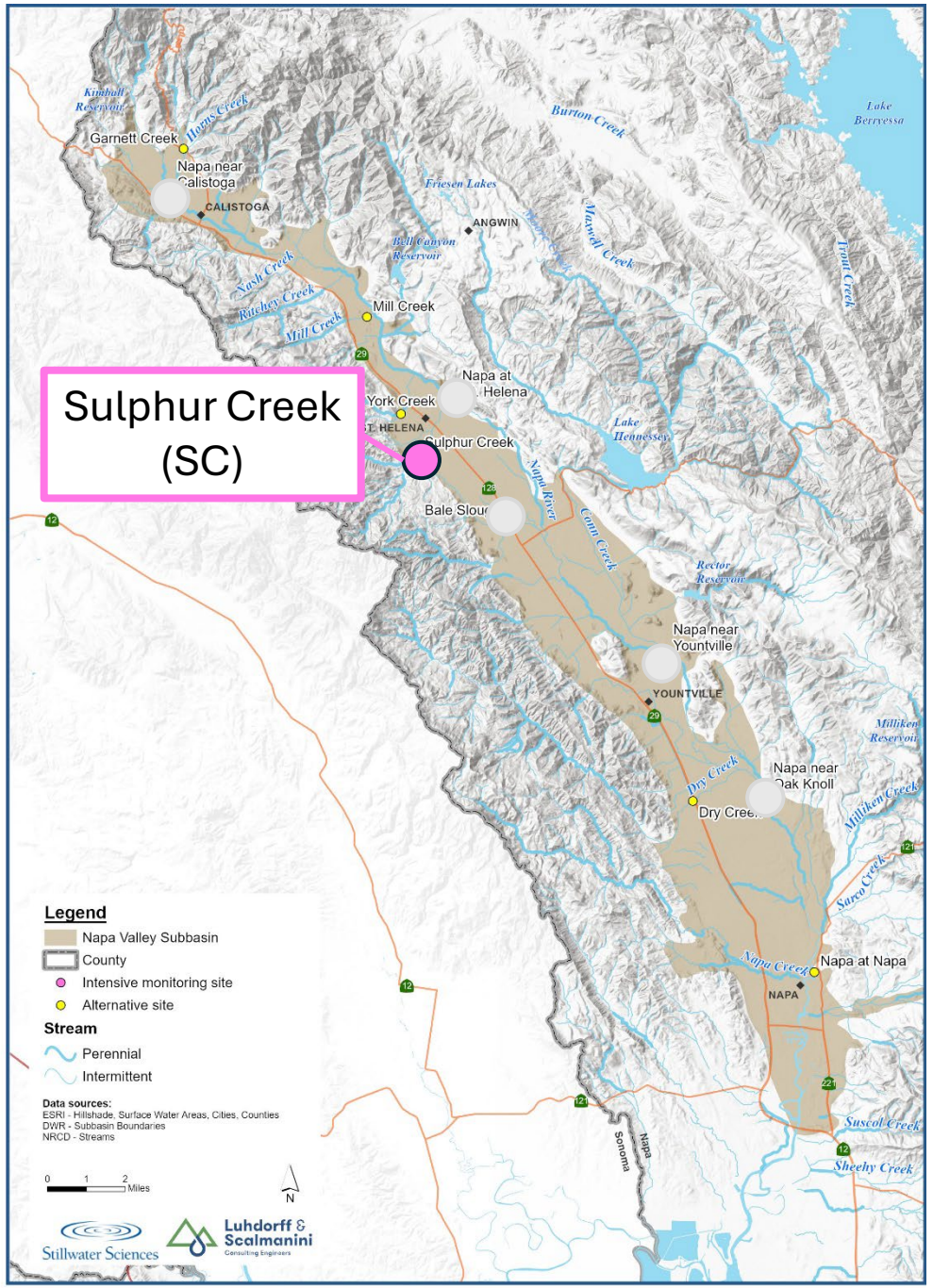
	No monitoring

Sulphur Creek

- Foothill yellow-legged frog tadpole and adult
- *O. Mykiss* observed at upstream end of reach (perennial)

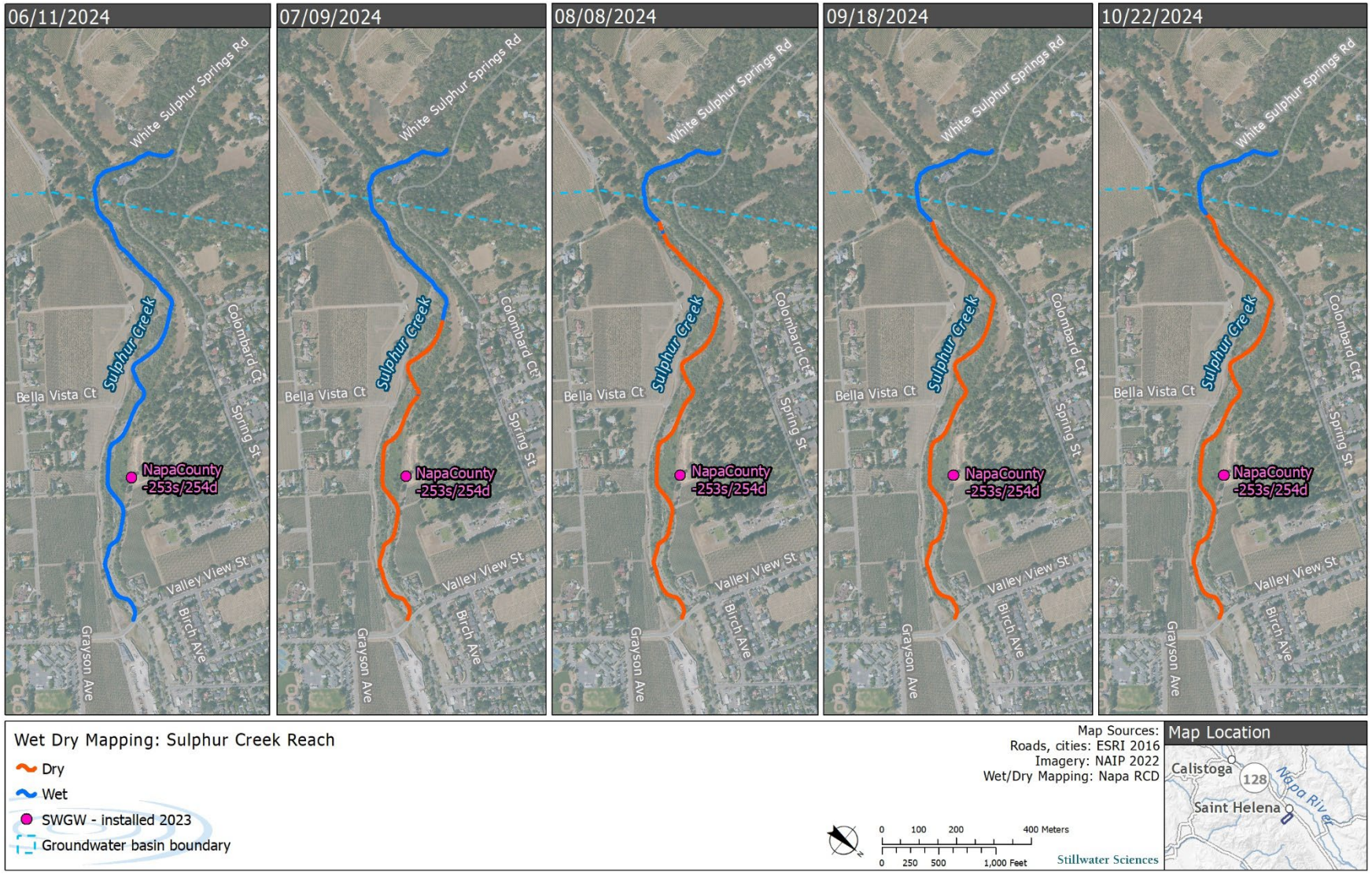




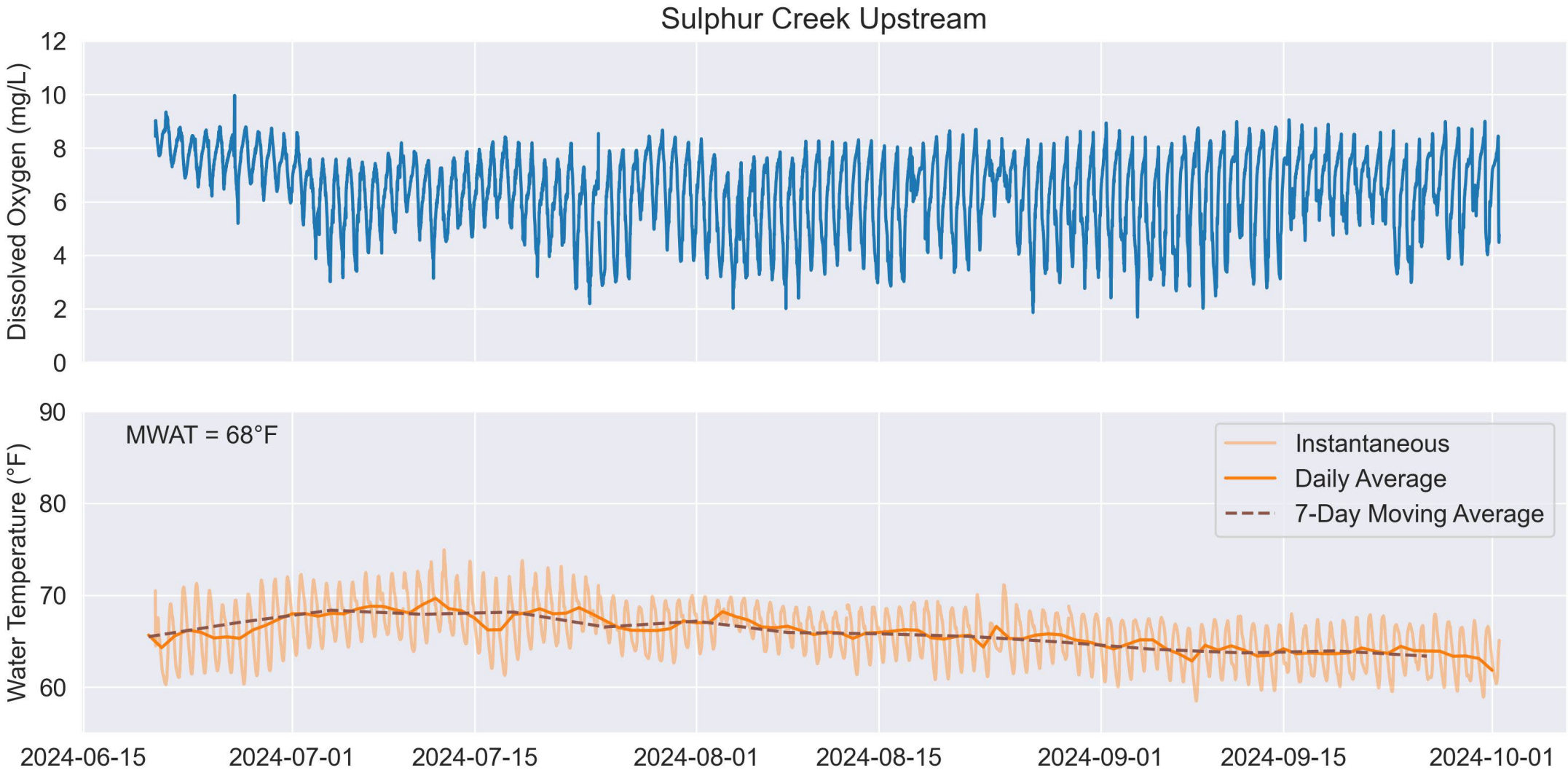

NapaCounty-253s
StreamWatch Site 9: Sulphur Cr at Valley View St
Groundwater elevation
Napa State Hospital precipitation
Elevation (ft, NAVD88)
265
260
255
250
245
240
Monthly precip. (in)
10
0
2015
2016
2017
2018
2019
2020
2021
2022
2023
2024
StreamWatch Observation
Flowing
Isolated Pools
Dry

Sulphur Creek

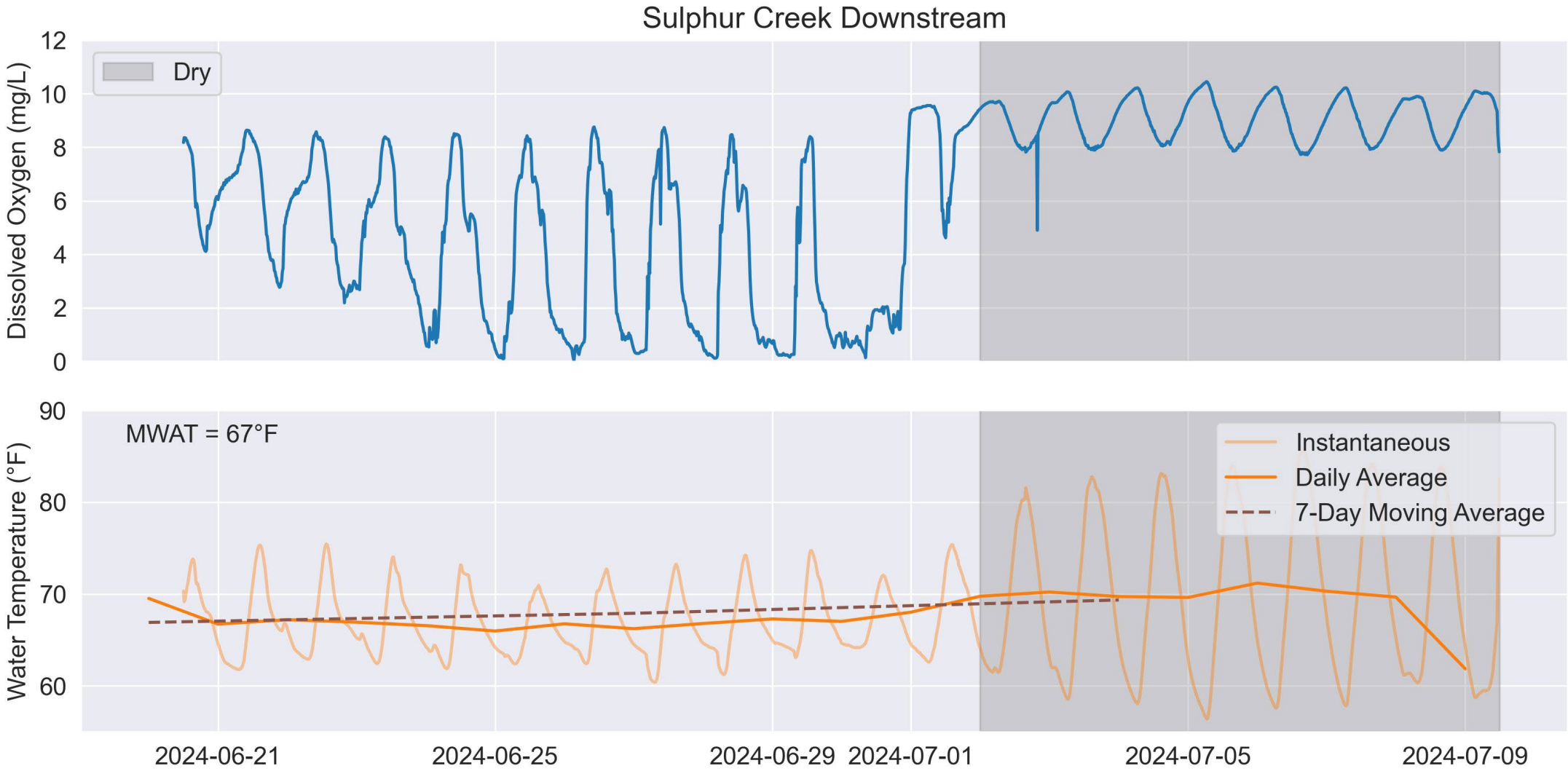
- Upstream section of channel stayed wet, most of which is outside the groundwater Subbasin
- Downstream section of channel dried out in June
- Water quality monitored upstream (at confluence of tributaries) and downstream.



Temperature and Dissolved Oxygen Sulphur Creek Upstream at Heath Creek



Temperature and Dissolved Oxygen Sulphur Creek Downstream



2024 Sulphur Creek

Survey	May	Jun	Jul	Aug	Sep	Oct
Flow Connectivity		Flowing	Dry downstream, flowing upstream	Dry downstream, flowing upstream	Dry downstream, flowing upstream	Dry downstream, flowing upstream
Water Quality (downstream)		Poor DO				
Water Quality (upstream)		Good temp, impaired DO	Good temp, impaired DO	Good temp, impaired DO	Good temp, impaired DO	
Fish surveys		Steelhead fry (26), steelhead parr (8), steelhead adult (3)*				
Herps	Foothill yellow legged frog tadpoles and adult		Foothill yellow legged frog juveniles			

* Fish found in upstream, perennial reach

Key

	Species observed, Suitable DO/T, flowing
	Small number of individuals present, Intermediate DO/T, isolated pools
	Species absent, poor DO/T, Mostly dry
	No monitoring

Next steps

- **Continue data analysis**
- **Summarize 2024 results in a technical memorandum for inclusion in the 2024 Annual Report**
- **CEFF analysis**

Stillwater

- Special status plants (spring 2025)
- Vegetation surveys (summer 2025)
- Birds (spring 2025)
- Amphibian surveys (spring/summer 2025)
- Shrimp surveys (summer 2025)
- CEFF analysis (starting fall 2024 through 2025)

2025 Planned Surveys

RCD

- Redeploy dissolved oxygen and temperature sensors next spring/summer
- Continue habitat connectivity surveys (wet/dry mapping)

Stillwater

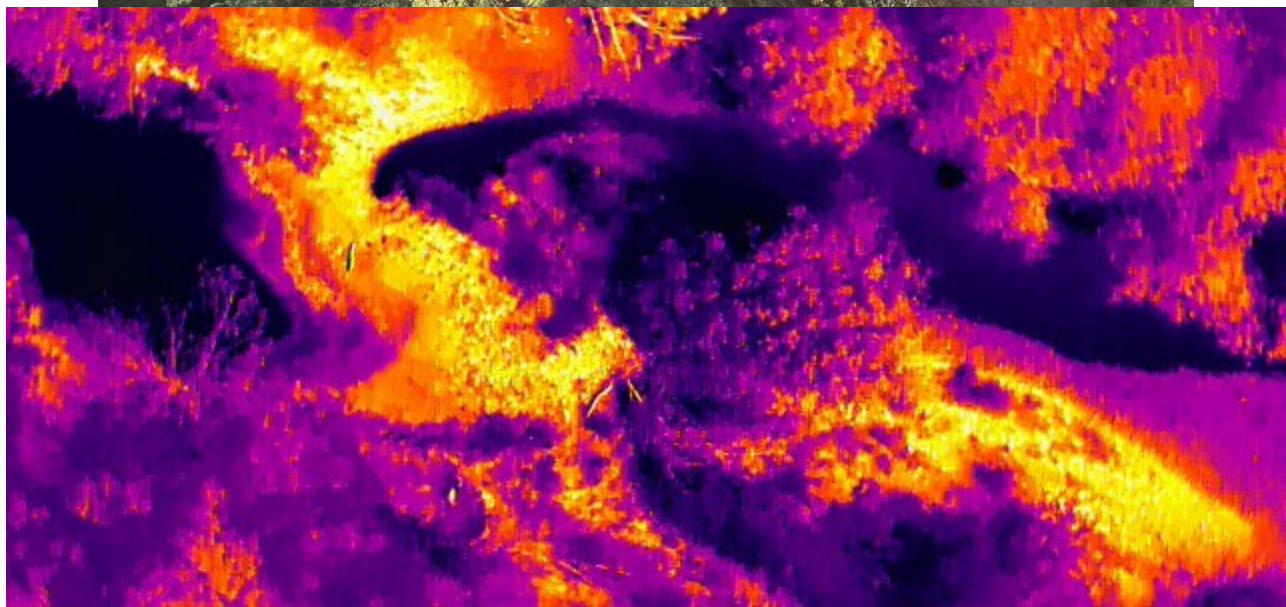
- Special status plants (spring 2025)
- Vegetation surveys (summer 2025)
- Birds (spring 2025)
- Amphibian surveys (spring/summer 2025)
- Shrimp surveys (summer 2025)

Refinements to the 2025 Surveys – Preliminary

- Install water quality monitoring earlier in the season
- Monitor fish in May
- Survey Herps in late spring and early summer
- Potentially add a second fish survey later in the season to track changes
- Investigating use of thermal imagery

Aerial Imagery

- Drone imagery, using both visual and thermal bands, was flown in October 2024.
- Thermal mapping allows for easier identification of wet/dry conditions.
- Currently investigating uses of thermal data in understanding ISW conditions.



ISW and GDE Workplan Goal:
...better understand the conditions required to protect and enhance healthy terrestrial and aquatic GDEs

Current Conditions:

- Napa Calistoga: Juvenile steelhead, California freshwater shrimp, riparian vegetation
- Napa St. Helena: Foothill yellow-legged frog eggs and tadpoles, riparian vegetation
- Napa Yountville: Riparian vegetation and Northwestern pond turtle
- Sulphur Creek: Foothill yellow-legged frog eggs and tadpoles, juvenile fish at the upstream end of the site

ISW and GDE Workplan Goal:
...better understand the conditions required to protect and enhance healthy terrestrial and aquatic GDEs

In 2025:

- Discuss ecological goals
- Investigate ecological-flow relationships
- Scenario analysis with NVIHM

Questions and Discussion

Thank You

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