Napa Valley Subbasin

Groundwater Conditions Update – Water Year 2023 & Start of Water Year 2024

Watershed Information & Conservation Council

August 21, 2024

Luhdorff & Scalmanini
Consulting Engineers

NAPA COUNTY
CALIFORNIA

Outline

Napa Valley Subbasin Annual Report: WY 2023

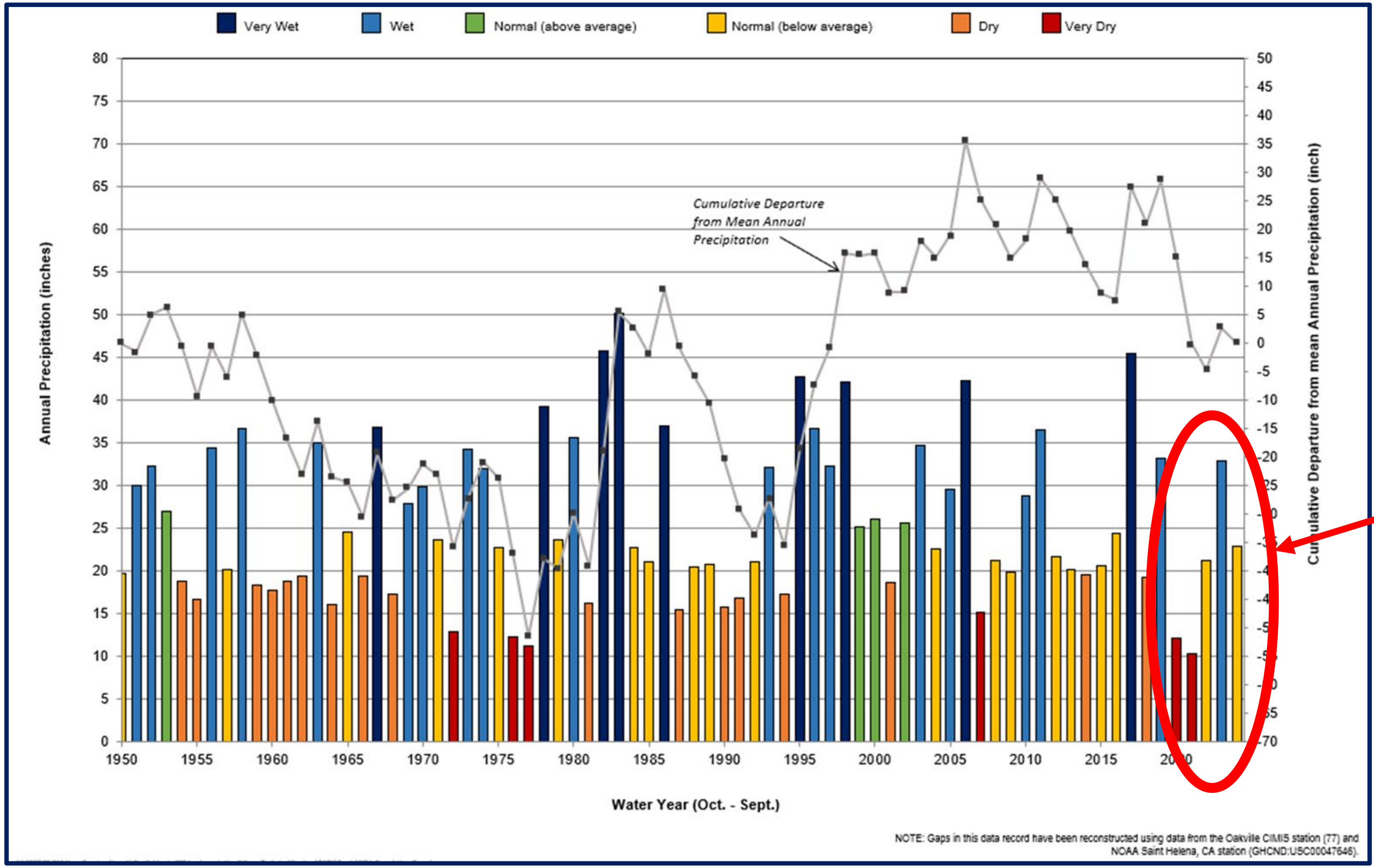
Sustainability Indicators & Metrics

Start of WY 2024 - Spring Conditions & Beyond

Questions and Discussion

Annual Report 2023 – Conditions and Sustainable Management Criteria

Historical Precipitation at Napa State Hospital

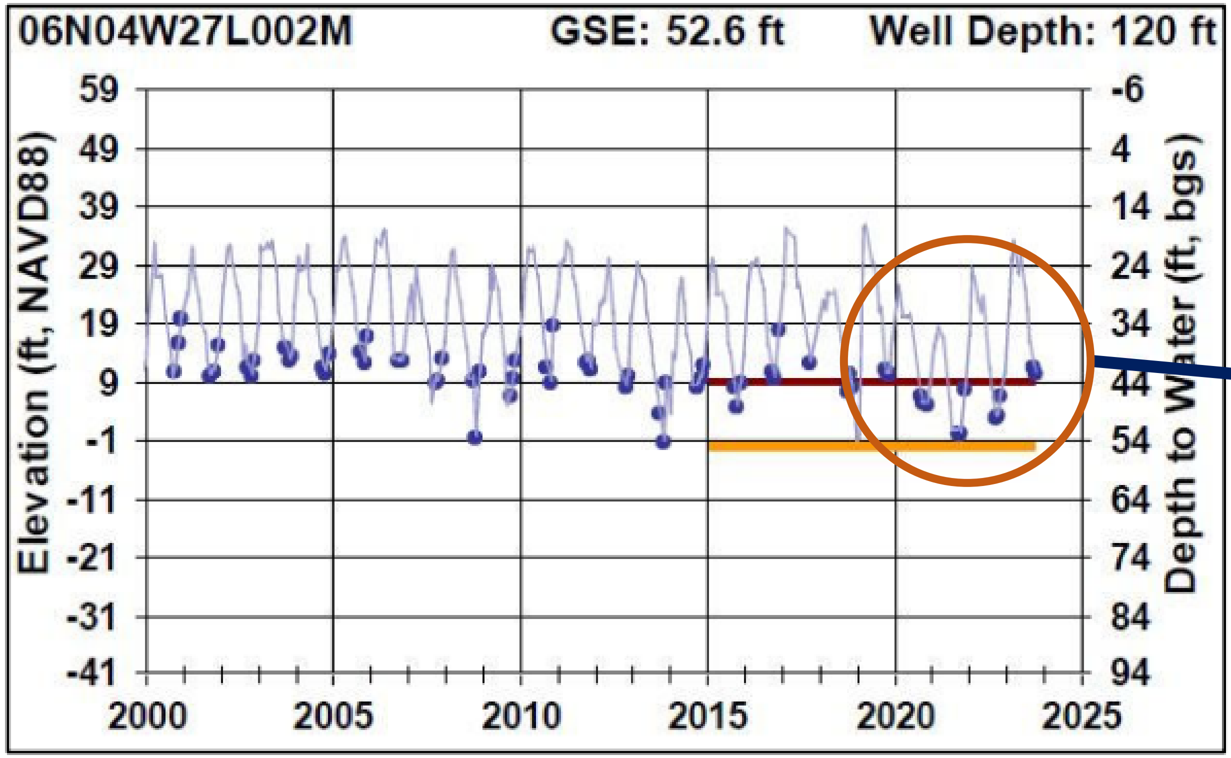


California's Climate Change Projections – warmer temperatures, "thirstier atmosphere", flashier runoff and streamflow – overall uncertainty about the timing, duration, and magnitude of precipitation.

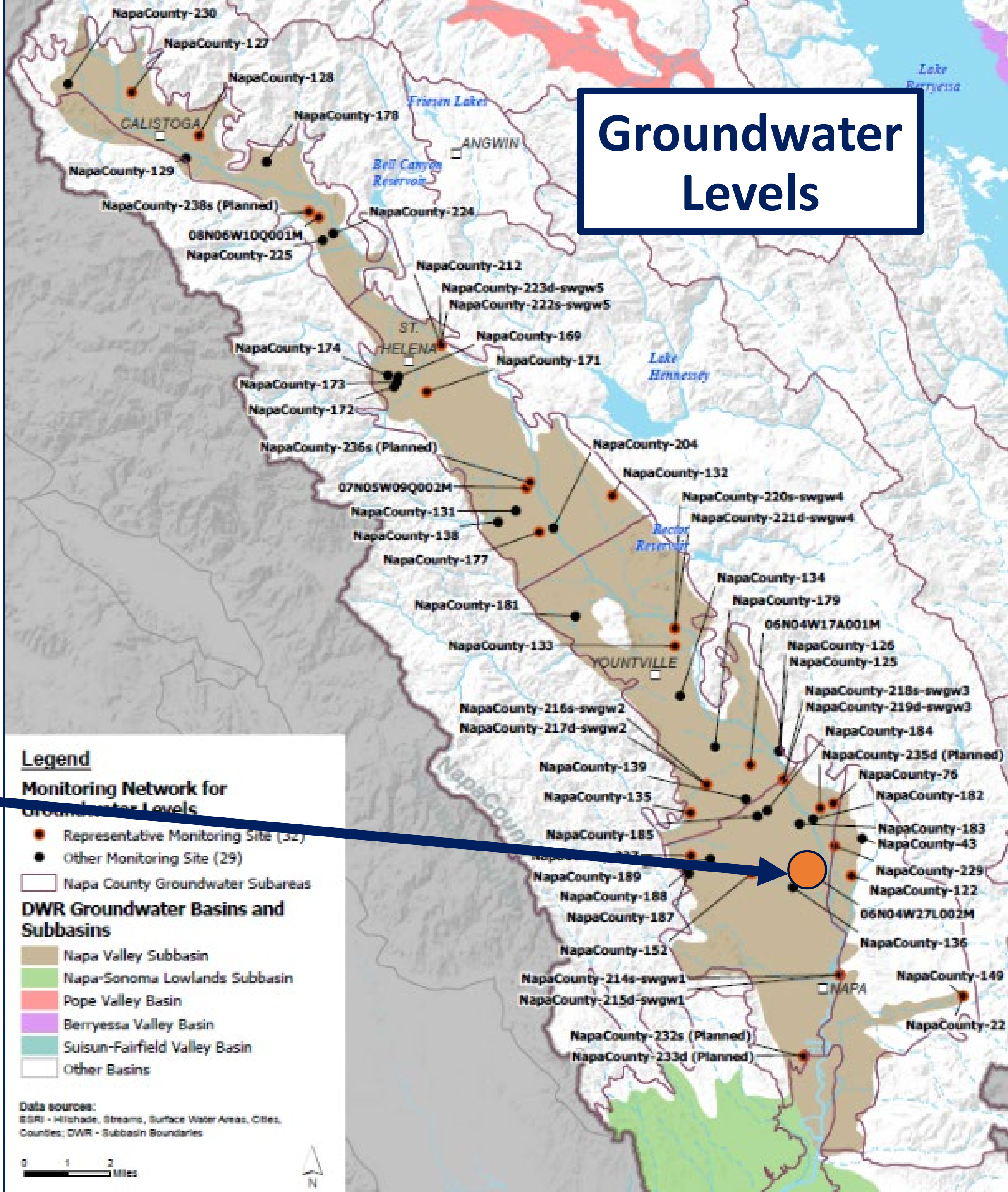
WYs 2020/2021 Very Dry;
WY 2022 Normal (below average);
WY 2023 Wet;
WY 2024 Normal (below average)

Napa Valley Subbasin Hydrograph

Recent Drought Effects,
Overall Groundwater Level Recovery,
Responsive Aquifer System



RMS Wells: Emphasis on Fall GW Levels



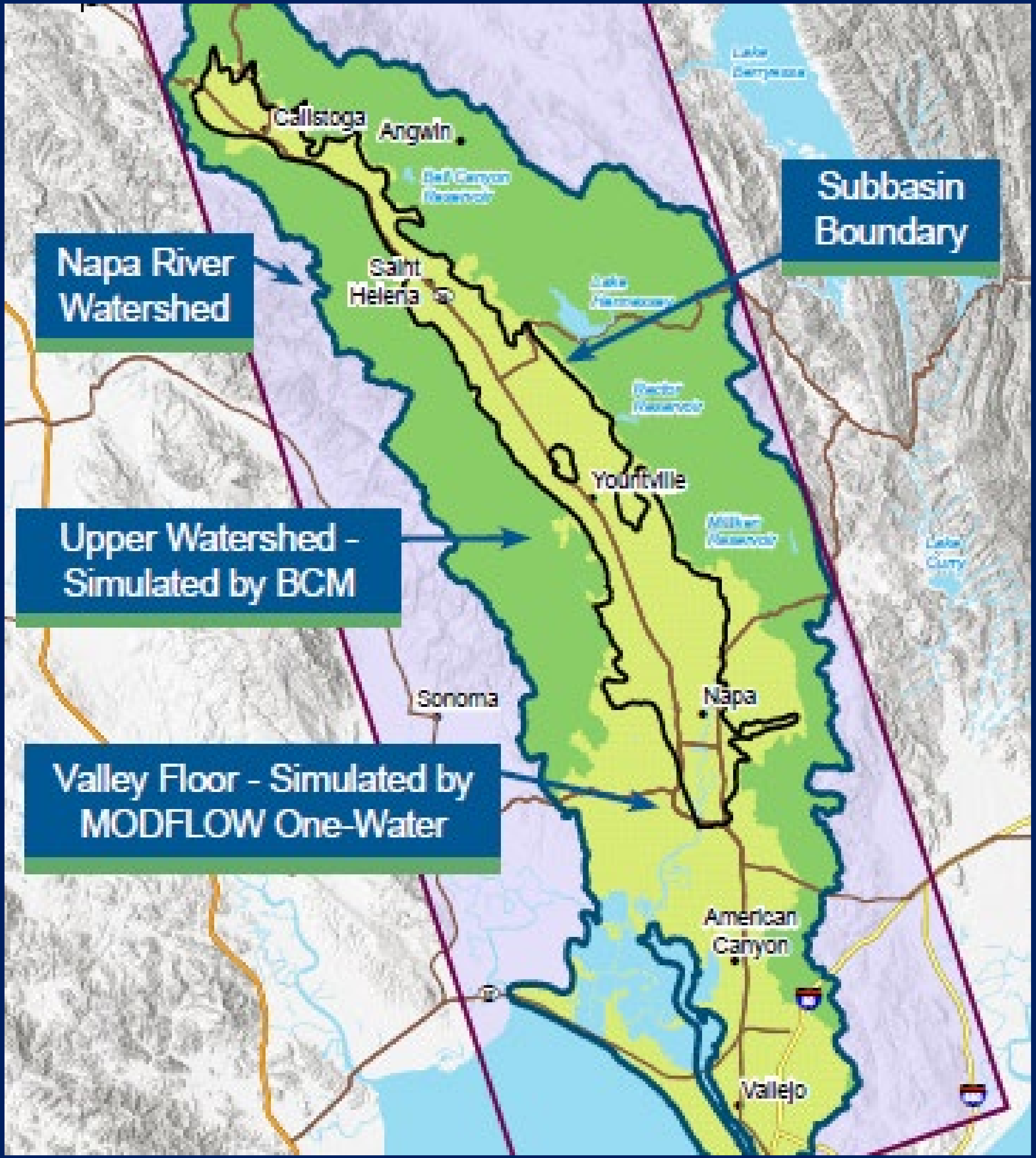
Monitoring Networks	Measurement Type	Total			GSP-Specific	
		County	Napa Valley Subbasin	RMS	Supplemental	Planned
Groundwater Level	GW Levels	**116**	81	33	40	--
Groundwater Storage	GW Levels	--	27	--	27	--
	NVIHM Model	--	1	1	--	--
Land Subsidence	GW Levels	--	15	15	--	--
	Benchmark Monitoring	--	8	5	3	--
	InSAR	--	1	--	--	--
Stream Stage and Stream Discharge	Stream Stage and Stream Discharge	--	5	--	**13**	**--**
	Stream Watch	39	32	--	--	Yes
	Flood Control	28	16	--	16	--
Interconnected Surface Water – Groundwater	GW Levels	--	**32**	8	24	--
	NVIHM Model	--	2	2	--	--
GDE Monitoring	GW Level	--	**33**	--	33	--
	Stream Habitat	--	1	--	**4**	**2**
	Remote Sensing	--	10	--	10	--
Groundwater Quality	GW Quality	1,532[1]	37	21	16	--
Seawater Intrusion	Chloride testing	--	18	11	7	--
Surface Water Quality	SW Quality	--	6	--	6	--

[1]- *Value is from GAMA database accessed through waterboards server: https://gispublic.waterboards.ca.gov/portalserver/services*

9 Monitoring Networks

- Significant increase in total number of wells based on outreach, volunteer wells, and installation of new wells.
- Installed stream stage monitoring sites (8) are be co-located with dual-completion monitoring wells.
- **ISW and GDE monitoring increased with completion of 8 sites/16 shallow monitoring wells.**
- Stream habitat as part of the ISW and GDEs Workplan Implementation.

Napa Valley Integrated Hydrologic Flow Model (NVIHM)



During GSP Development

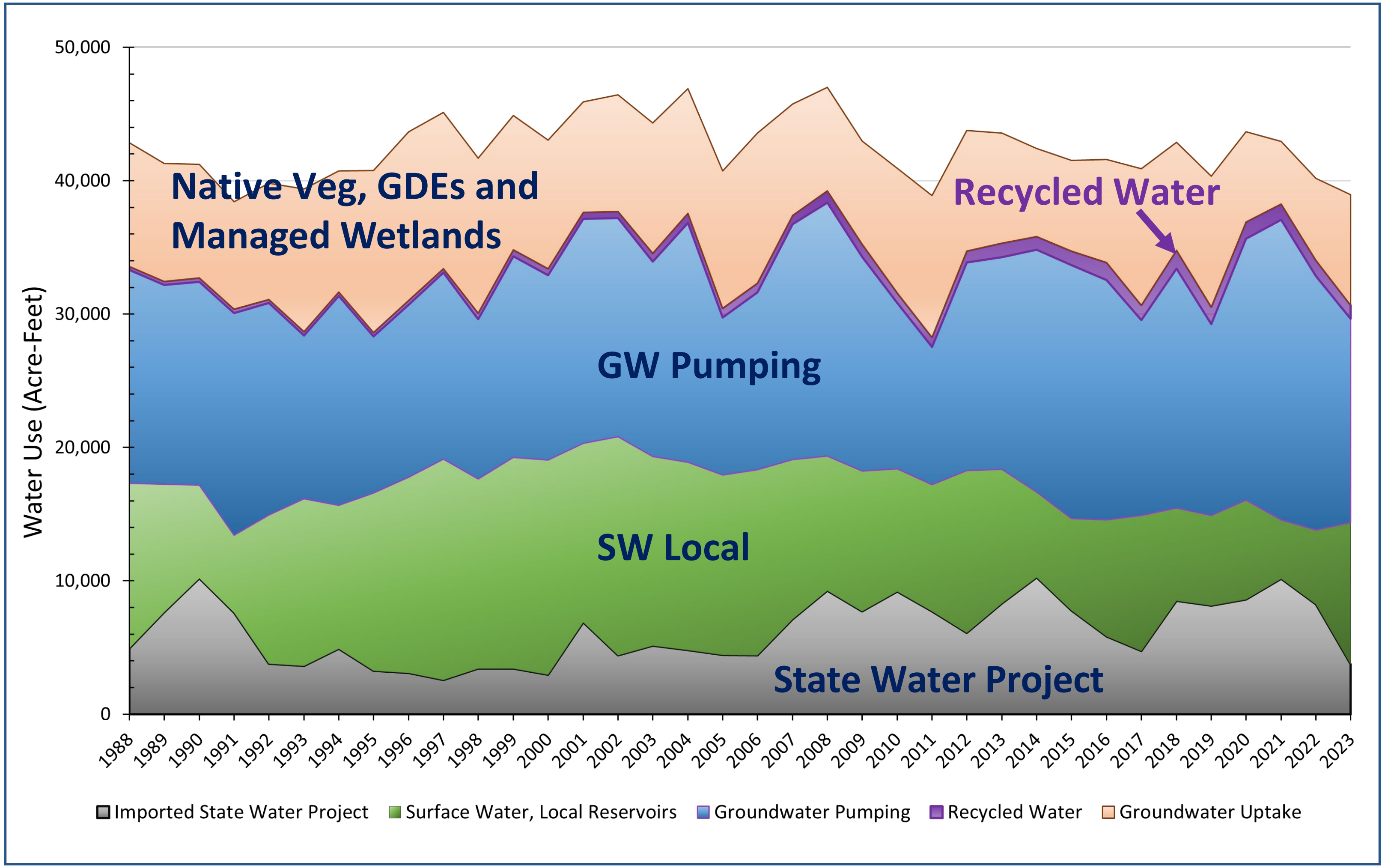
- Develop water budgets: historical, current and projected (50-Year)
- Simulate response to climate change and future land use
- Evaluate projects and management actions to maintain sustainability

Updates WY 2023 Annual Report

- Basin Characterization Model (BCM): Climate WY 2023
- MODFLOW: Land use (2019) and water budget components through WY 2023

Water Use: Water Year 2023 (acre-feet)

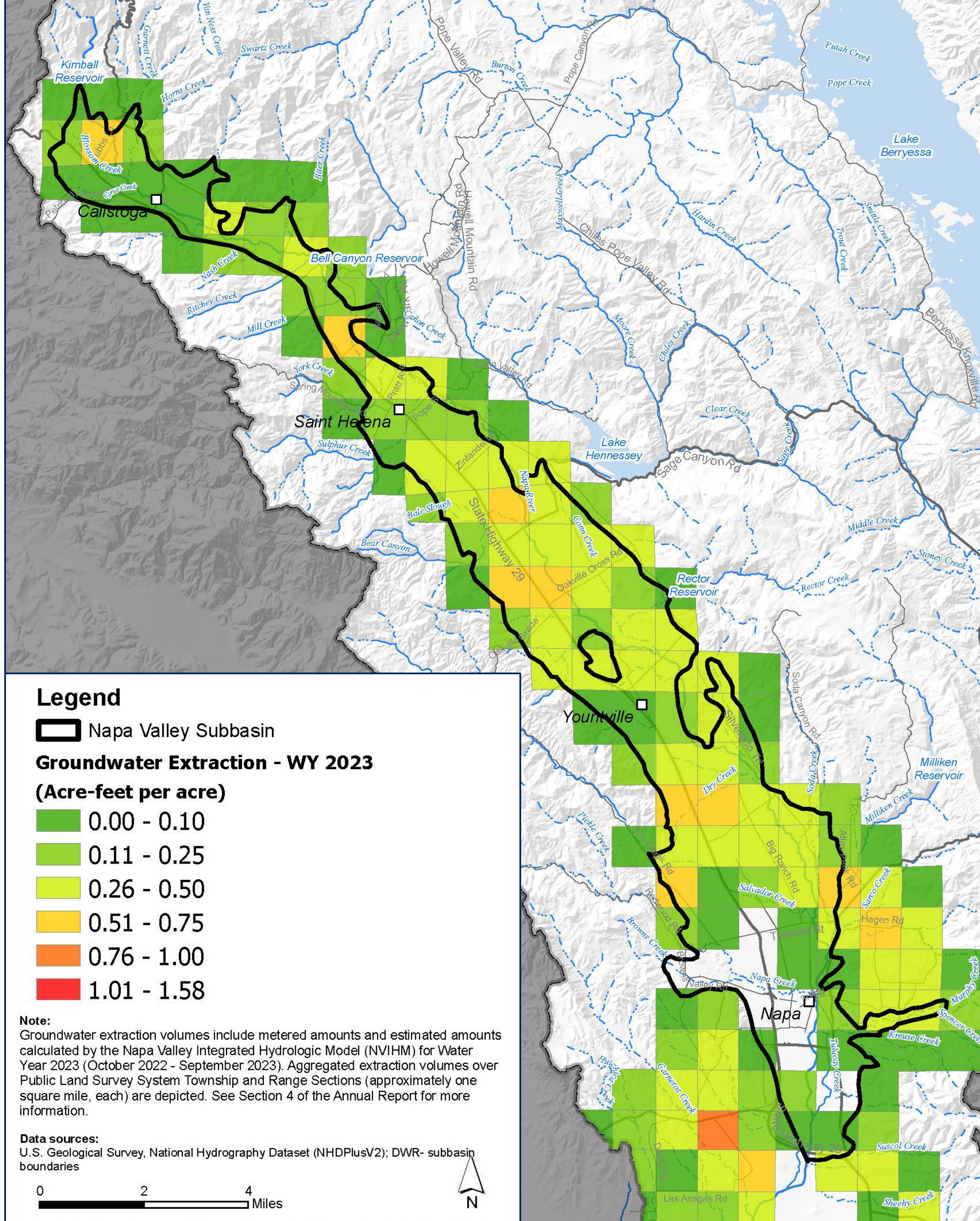
Water Use	2022	2023
Groundwater Pumping (all users)	18,790	15,270
Native Veg, GDEs & Managed Wetlands	6,440	8,290
Recycled Water Use	1,220	1,020
Local Surface Water Use (including reservoirs, diversions, etc.)	5,562	10,627
State Water Project Use	8,290	3,740
TOTAL	**40,302**	**38,947**



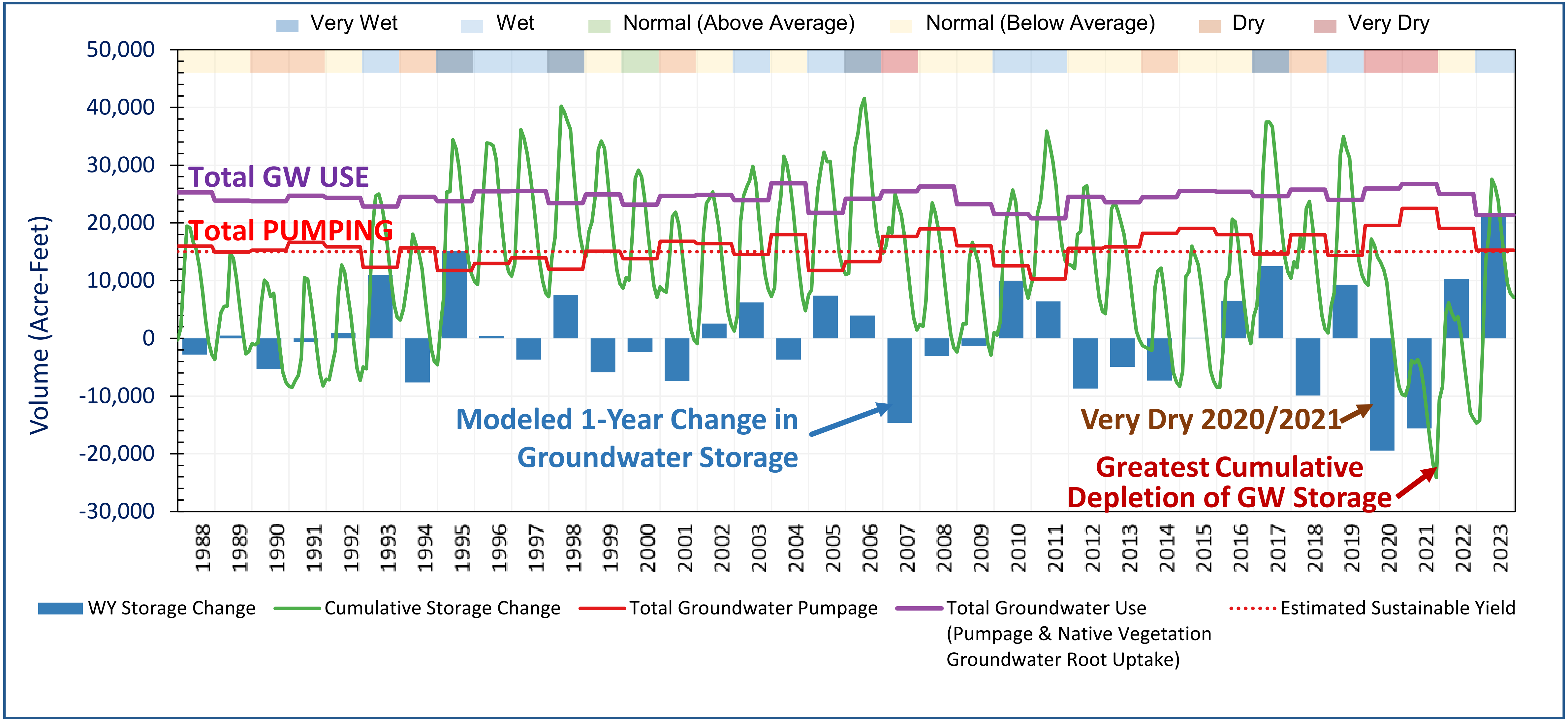
Groundwater Pumping, 2023 (Acre-feet)

Groundwater Pumping	Acre-feet	Percent Use*
Ag (i.e., vines)	11,330	74%
Municipal	330	2%
Self-Supplied Users Domestic (2,294 AF for outdoor use)	2,540	17%
Small Public Water Systems	1,070	7%
*Percentages comparable to historical averages.		

TOTAL = 15,270 Acre-feet



GW Pumping, Total Use, and GW Storage Change and Cumulative Change (NIVHM; 1988-2023)



Sustainability Indicators & Metrics (WY 2023)

Groundwater Sustainability Indicators

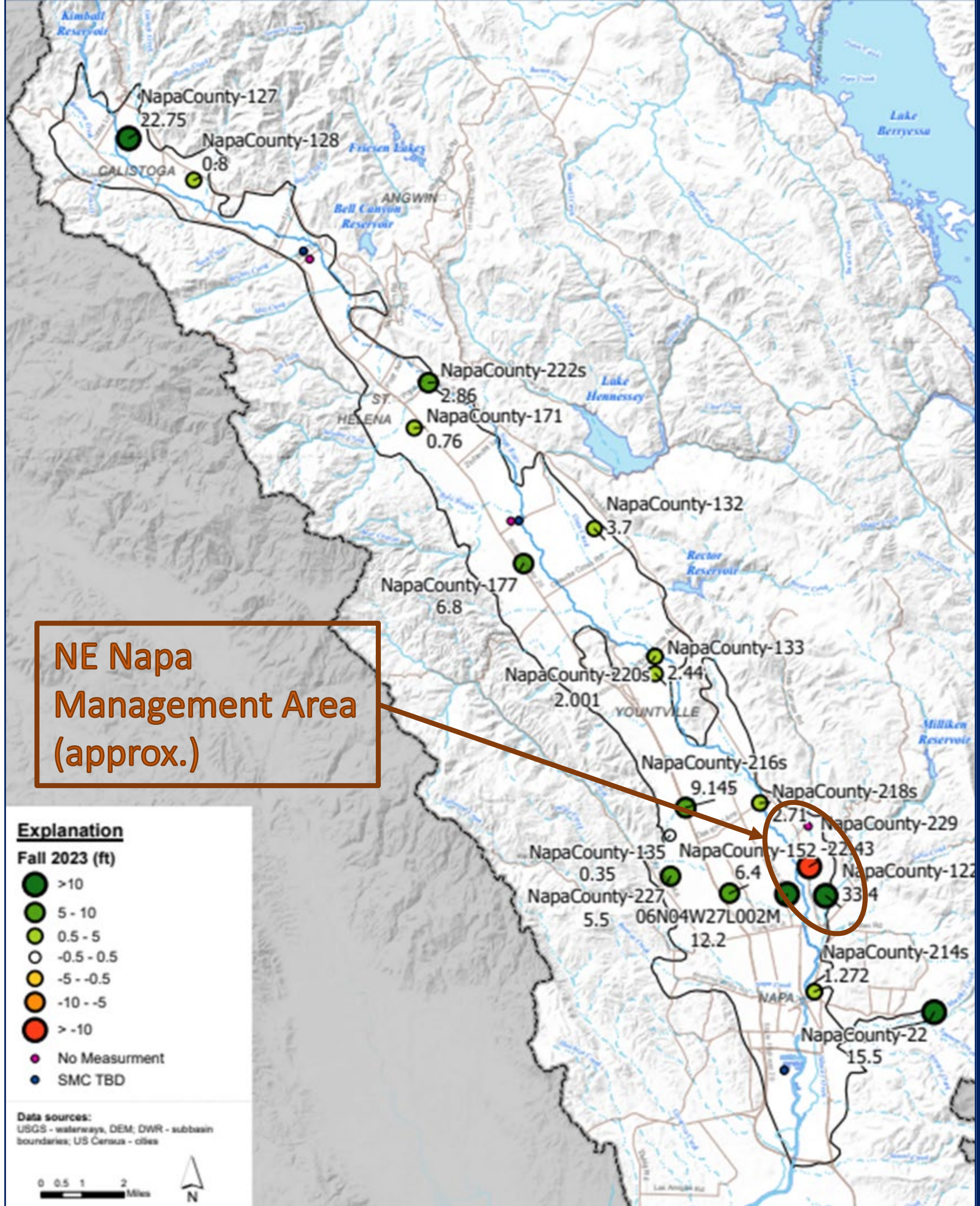
Not Causing Undesirable Results:
Means Avoiding Significant and Unreasonable …

Lowering of GW Levels	Reduction of GW Storage	Seawater Intrusion
Water Quality Degradation	Land Subsidence	Depletion of Surface Water

Napa Valley Hydrogeologically Sensitive to this Indicator

Groundwater Levels for Fall 2023: Subbasin Representative Monitoring Sites

- Climate in WY 2023 was wetter and cooler, leading to significant recharge and increased groundwater levels.
- Groundwater levels:
  - **1** of 23 wells exceeded their MT
    - NE Napa Management Area
- Sustainability Indicator for Depletion of Interconnected Surface Water (ISW): groundwater measurements
  - **0** of 5 wells exceeded their MT



Reduction of Groundwater Storage

Minimum Threshold

Net GW extraction by pumping exceeding the sustainable yield for the Subbasin, where net GW extraction is the volume extracted less any volume of augmented recharge achieved by projects implemented in the Subbasin.

Undesirable Result

Seven (7) year average annual net GW extraction in the Subbasin exceeds the sustainable yield.

- ➢ UR occurred since 7-year average exceeds the sustainable yield for the Subbasin.

Sustainable Yield (Est.) = ~15,000 AFY

Year	Total Groundwater Extraction (AF)
2017	14,630
2018	17,950
2019	14,340
2020	19,560
2021	22,510
2022	19,050
2023	15,280
7 Year Avg.	**17,620**

SMC for Depletion of Interconnected Surface Water: Depletion Volume

Interim Minimum Threshold

- Summer/early Fall (June to October) streamflow depletion volumes exceeding the second highest seasonal volume of streamflow depletion that occurred from 2005-2014 at 2 RMS on Napa River at Pope St. and Oak Knoll Ave. Based on modelled input and output.

Interim Undesirable Result

- Exceedance of MT for volume of streamflow depletion occurring 3 consecutive years at either of above stations. Based on modelled results.

Trigger

- Occurs when there is an exceedance of the MT in the Fall for Streamflow Depletion Volume in a single year.

Interconnected Surface Water and Model Results

Recent Seasonal (June to October) Streamflow Depletion Volume
Estimated with NVIHM at RMS USGS Stream Sites

Stream Gage Location	Representative Site		Seasonal Depletion (AF)			WY 2023 MT Exceedance	Three Consecutive WY MT Exceedances
	Minimum Threshold (AF)	Measurable Objective (AF)	WY 2021	WY 2022	WY 2023		
Napa River at Oak Knoll	**3,190**	2,370	3,376	1,351	3,700	Yes	No
Napa River at Pope Street	**1,400**	1,120	995	815	1,389	No	-

- Seasonal streamflow depletion volume conditions **did not meet** the interim definition for an undesirable result.
- Greater streamflow in WY 2023 allowed additional surface water to be depleted due to prior dry and below average water years.

RMS Groundwater Levels: Response Action Required

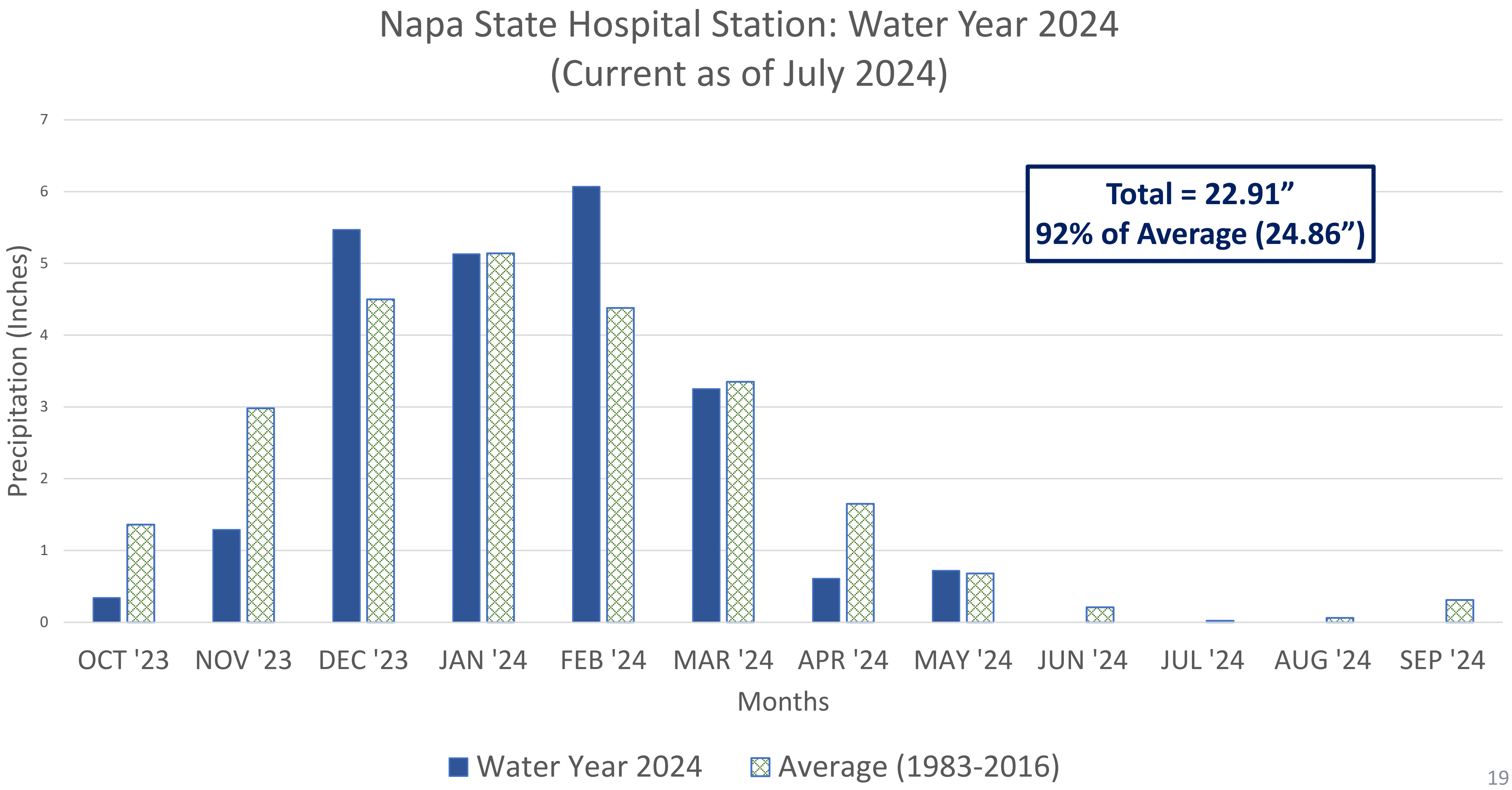
- 1 RMS/Chronic GW Level Lowering wells has three consecutive Fall MT exceedances
  - **No UR for Chronic GWL lowering since only 1 well has had three consecutive years**
- Avg. GW pumping over 7-year period exceeds Sustainable Yield
  - **UR has occurred for Reduction in Groundwater Storage since WY 2021**

Sustainability Indicator	WY 2021	WY 2022	WY 2023
	UR: Yes or No	UR: Yes or No	UR: Yes or No
Chronic GWL Lowering (CGWL)	No	No	No
Depletion of Interconnected Surface Water (ISW)	No	Yes	No
GW Quality Degradation	No	No	No
Reduction of GW Storage	Yes	Yes	Yes
Land Subsidence	No	No	No
Seawater Intrusion	No	No*	No*

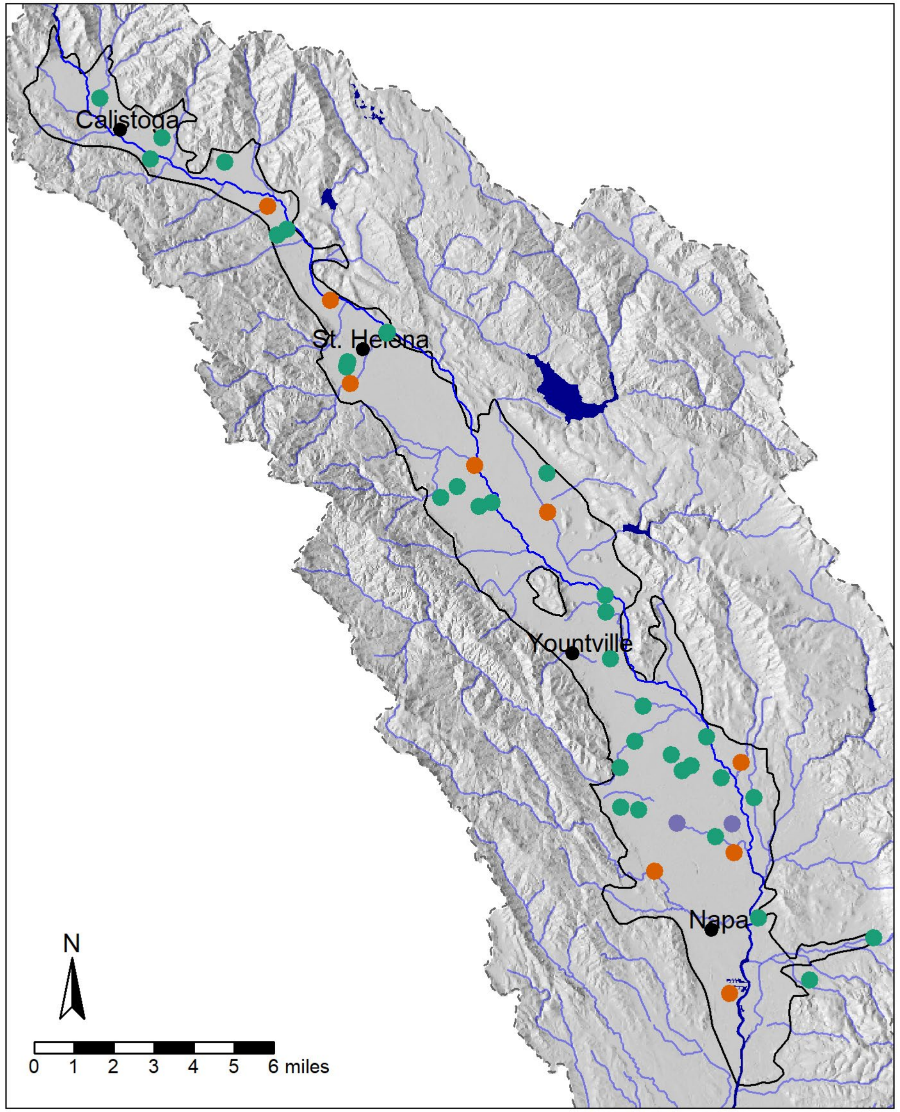
*New RMS wells are being evaluated for this SI.

Start of WY 2024 - Spring Conditions & Beyond

Precipitation: Water Year 2024



Changes in Quaternary Alluvium (Qa) Monitoring Sites

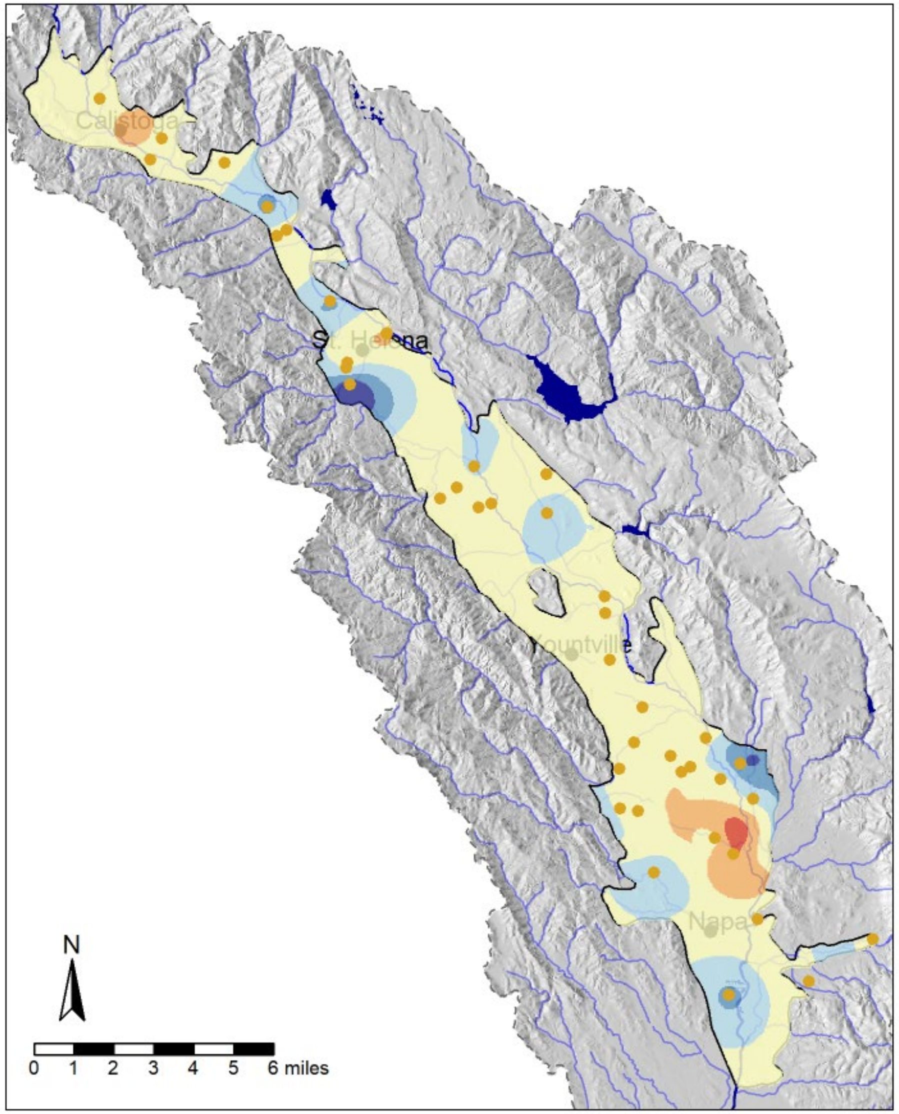


- Generally shallow wells screened within the alluvium are used to assess water table conditions.
- Total of 44 wells uses to assess storage in 2023/2024.
- Two wells were only measured in 2023.
- Nine wells only measured in 2024 (including the eight new ISW wells).

Wells in 23/24

- Continuous
- Not Measured 2023
- Not Measured 2024

Change in Saturated Thickness from Spring 2023 to 2024



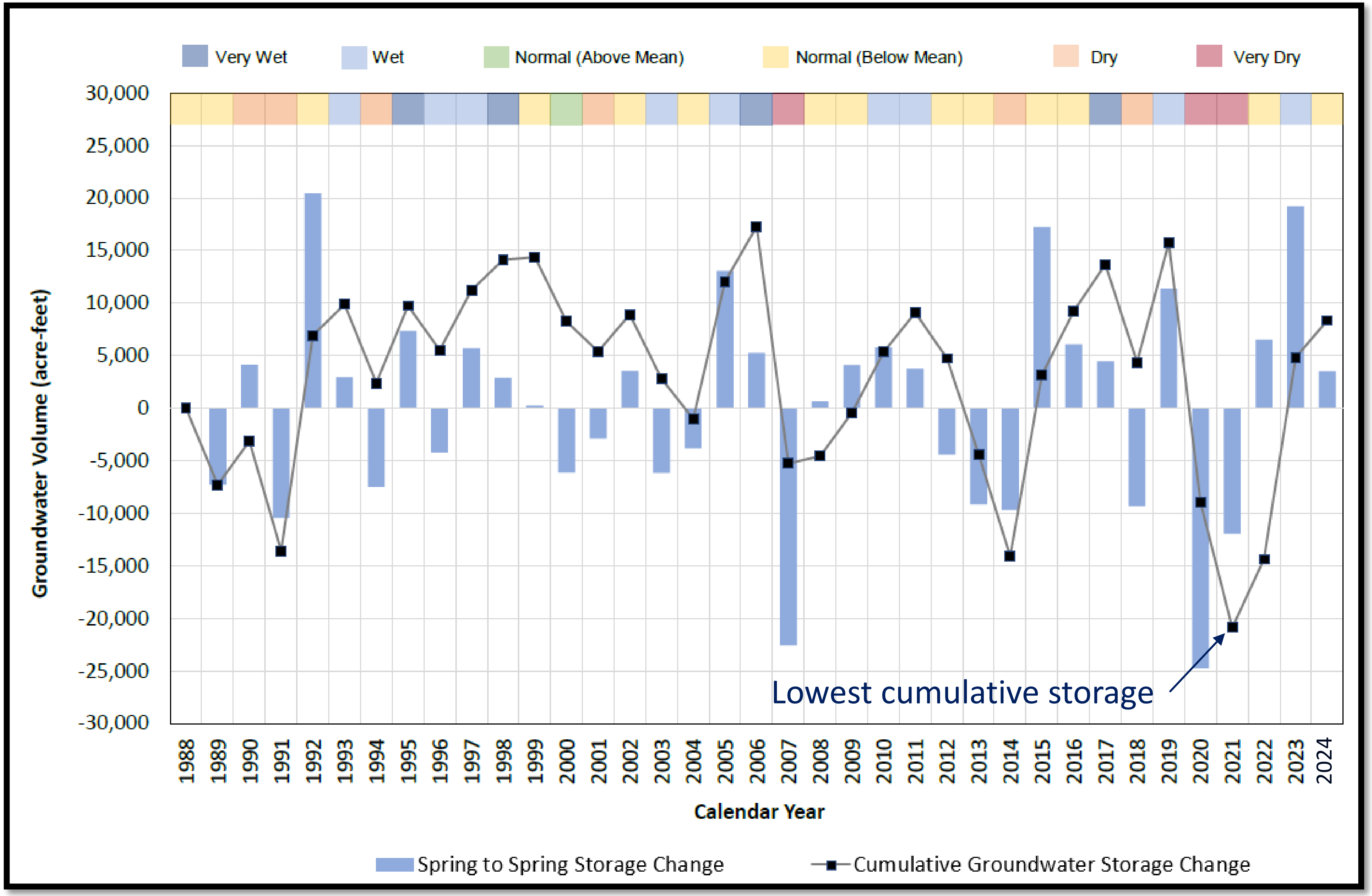
- For wells measured in both 2023 and 2024, year-to-year changes ranged from -7.9 decline to 8.2 increase (feet).
- Total estimated increase in groundwater storage of **<u>3,500 acre-feet</u>**.

Groundwater Elevation Change (2023 to 2024)

- -25 to -15 (ft; lower in 2024)
- -15 to -5
- -5 to 5
- 5 to 15
- 15 to 25
- 25 to 35 (ft; higher in 2024)

Groundwater Well (Qa)

Subbasin Estimated Storage Change: Spring to Spring Groundwater Levels



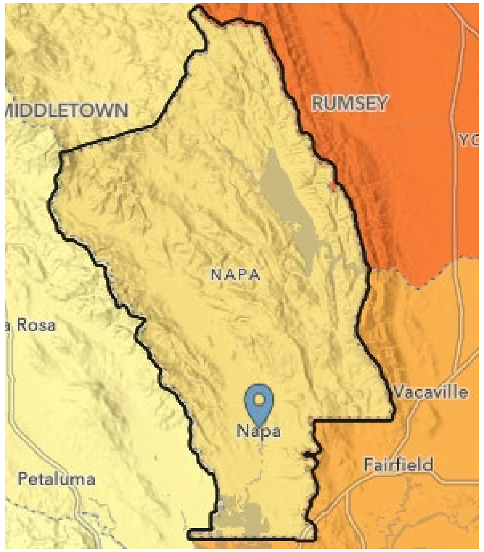
- Spring to Spring does not use the NVIHM and is solely evaluated on groundwater data.
- Spring 2024 marks the third year of increased groundwater storage.
- Average start to WY 2024 further increased storage across the Subbasin.

Climate Change and Potential Impacts From Fifth National Climate Assessment

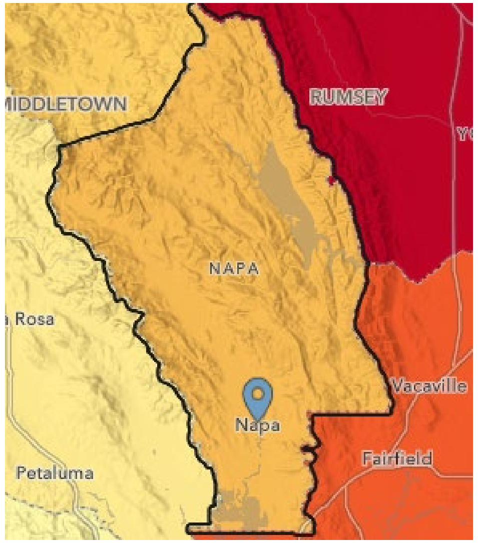
- The Fifth National Climate Assessment (NCA5) was published in 2023 and provides tools for the entire country to assist decision makers in understanding climate impacts.
- Impacts to multiple sectors are detailed including water, energy, forest, ecosystems, agriculture, transportation, etc…
- County level impacts were assessed based on four climate scenarios, 1.5°C (2.7°F), 2°C (3.6°F), 3°C (5.4°F), and 4°C (7.2°F).
- Summary for Napa: hotter temperatures, additional precipitation, higher intensity storms.

Jay, A.K., A.R. Crimmins, C.W. Avery, T.A. Dahl, R.S. Dodder, B.D. Hamlington, A. Lustig, K. Marvel, P.A. Méndez-Lazaro, M.S. Osler, A. Terando, E.S. Weeks, and A. Zycherman, 2023: Ch. 1. Overview: Understanding risks, impacts, and responses. In: *Fifth National Climate Assessment*. Crimmins, A.R., C.W. Avery, D.R. Easterling, K.E. Kunkel, B.C. Stewart, and T.K. Maycock, Eds. U.S. Global Change Research Program, Washington, DC, USA.

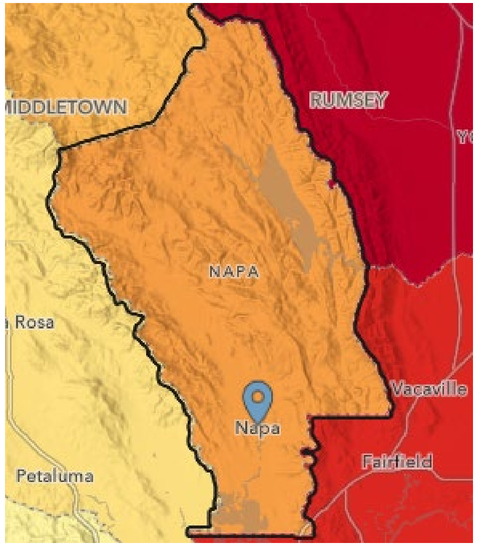
Napa Climate Projections: Drought, Annual Days >100 °F



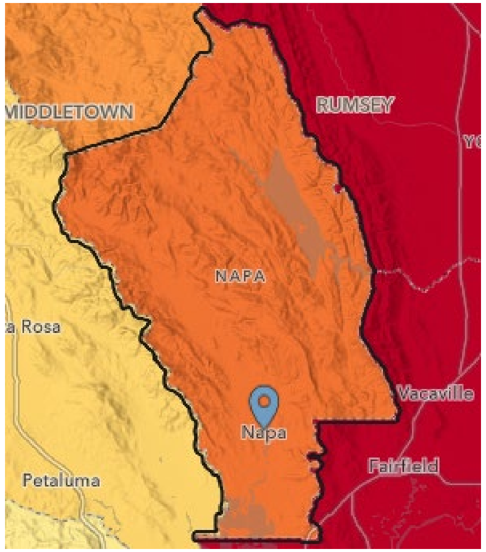
Modeled History
1976-2005
4.8 days



Early Century
2015-2044
10.0 days



Mid Century
2035-2064
13.8 days



Late Century
2070-2099
18.6 days

Future Projection: Nearly 4X More Annual Days >100 °F

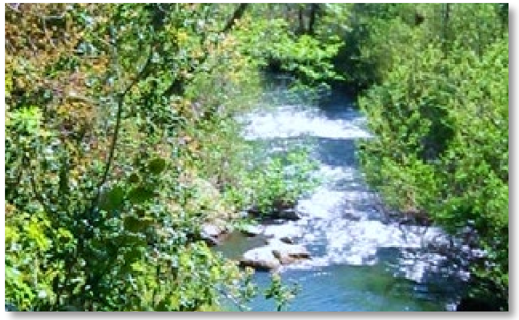
(5th National Climate Assessment, 2023)

Adapting to Climate Change by Building Resiliency

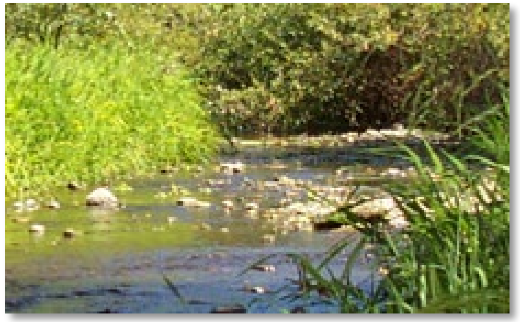

BMPs to Recharge Groundwater


Maintain/Improve Groundwater Discharge to Streams


Maintain/Improve Functional Flows


Capture/Store Surplus Stormwater to Buffer Drought Effects

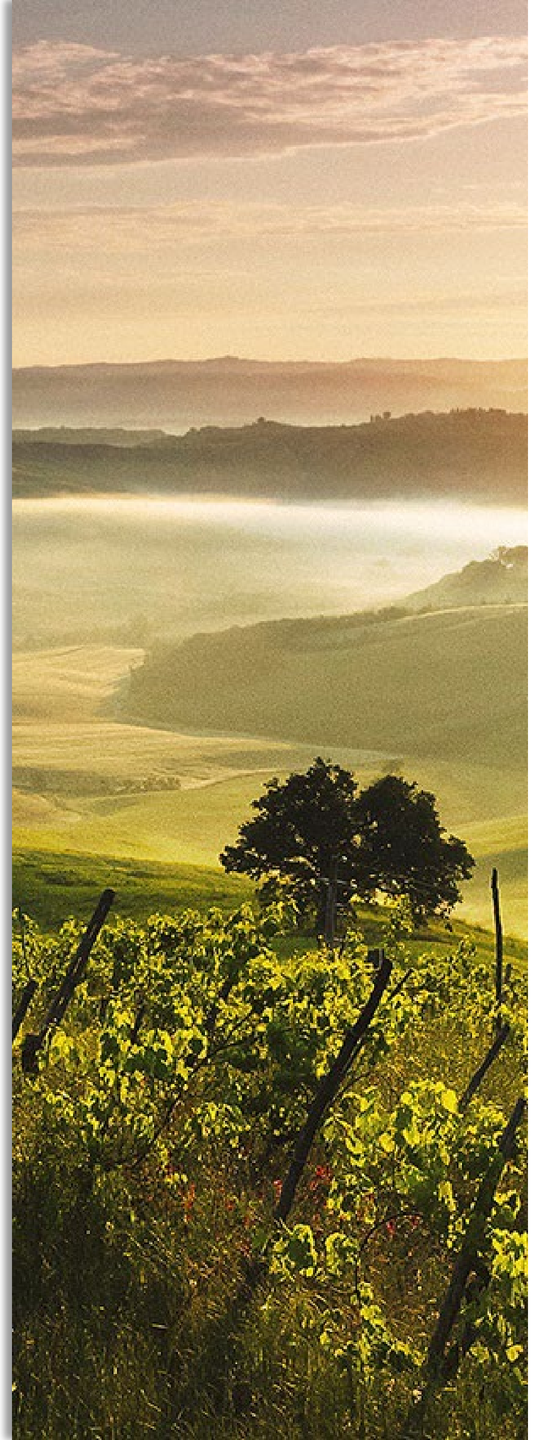
Enhance Soil Moisture Profile


Reduce GDE Drought Effects

Drought or Deluge:
Conservation as a Napa Way of Life

- California is experiencing hotter/drier conditions, including uncertain climate with more extreme events.
- Approaches are needed to adapt to climate change, build resiliency, and better protect interconnected surface water.
- Napa Valley vineyards and wineries are widely recognized for their resource stewardship and conservation practices.
- These uncertain times and changing climate call for ***Conservation as a Napa Way of Life***.

4Rs: Retain – Replenish – Resilience – Reserves



Thank You

Cab Esposito, ***Senior Hydrogeologist***
Luhdorff & Scalmanini, Consulting Engineers

Napa County Groundwater Sustainability Agency

Jamison Crosby, ***Natural Resources Conservation Manager***
Planning, Building, and Environmental
Services Department
1195 Third Street
Suite 210
Napa, CA 94559
jamison.crosby@countyofnapa.org

Ryan Alsop, ***Executive Officer***
Napa County Groundwater
Sustainability Agency
1195 Third Street
Napa, CA 94559

Brian Bordona, ***Director***
Planning, Building, and
Environmental Services Department
1195 Third Street
Napa, CA 94559