

Napa County Groundwater Sustainability Agency

Technical Advisory Group

*Annual Report
Water Year 2023*

March 14, 2024



**Luhdorff &
Scalmanini**
Consulting Engineers





Outline

Napa Valley Subbasin Water Budget

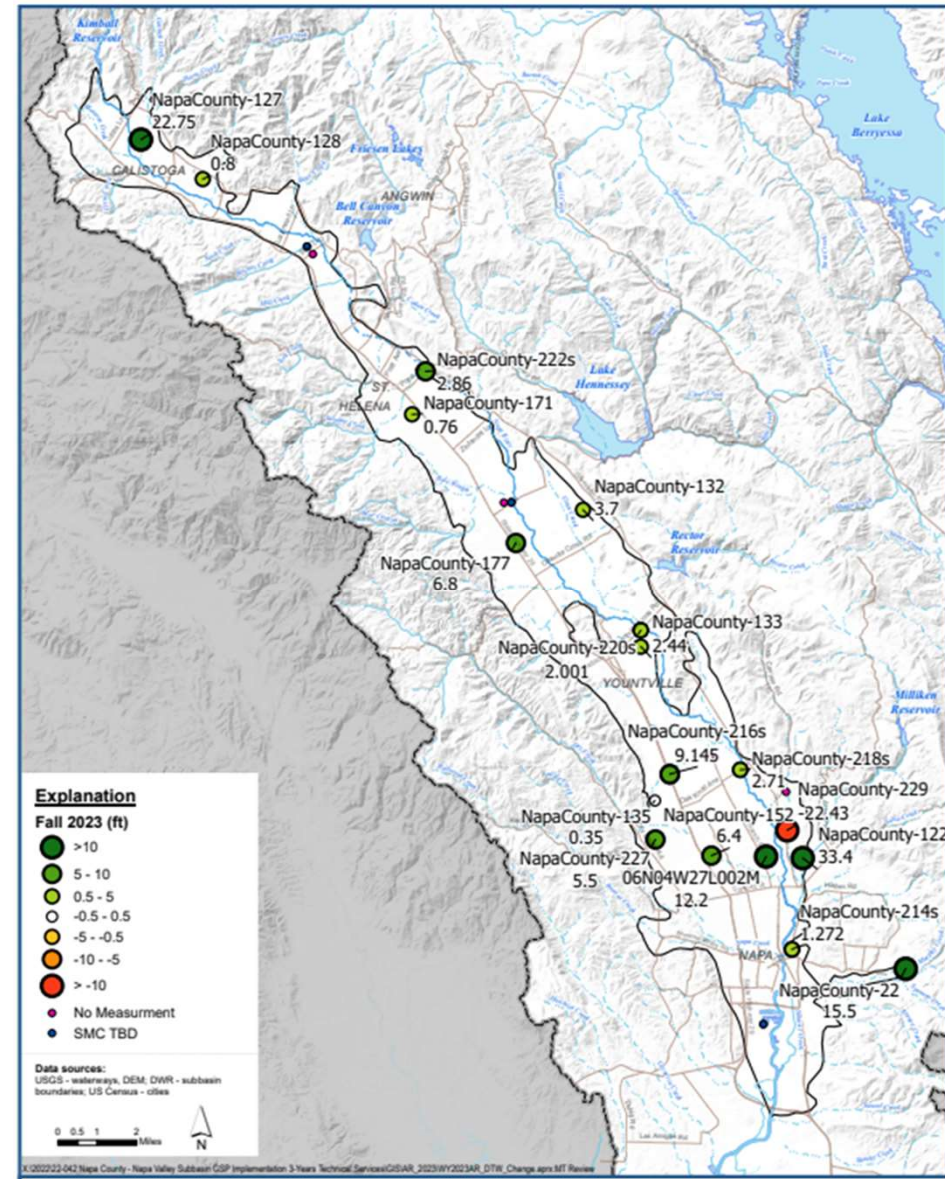
Sustainability Indicators & Metrics

NVIHM Information and Scenarios

Response Actions & GSP
Implementation

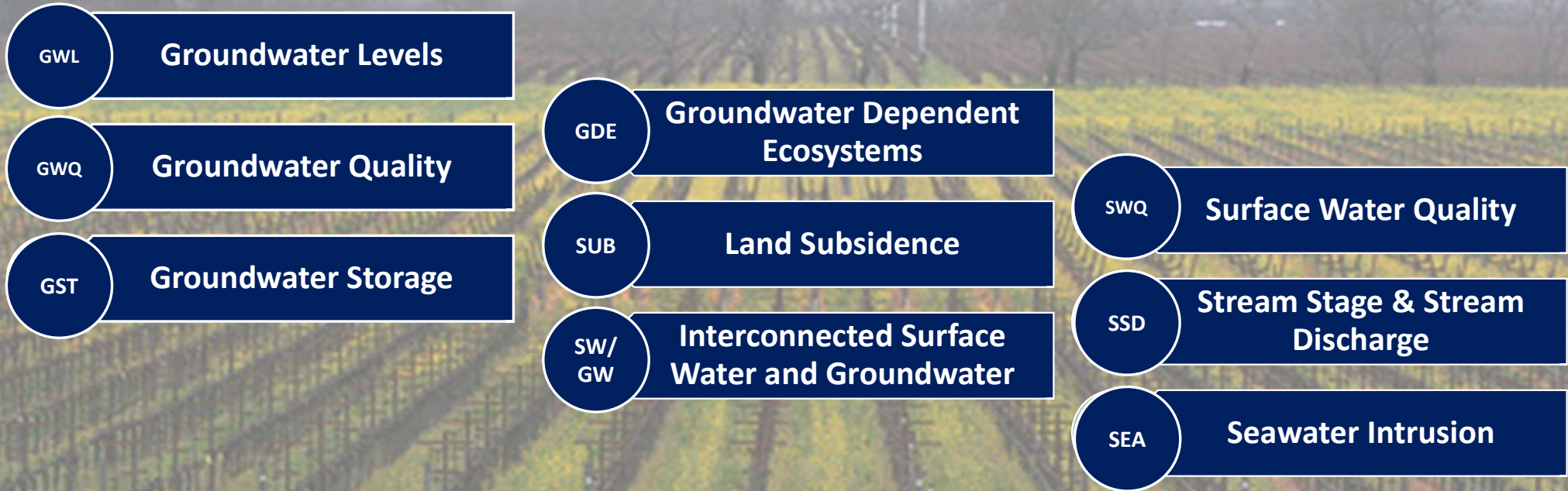
Groundwater Levels for Fall 2023

- Climate in WY 2023 was wetter and cooler, leading to significant recharge.
- Groundwater SMC:
 - 1 of 23 wells exceeded the MT
 - 9 of 23 met their MO
- Depletion of ISW groundwater measurements:
 - 0 of 5 wells exceeded their MT
 - 2 of 5 wells met their MO





9 GSP Monitoring Networks



Increased monitoring with additional well recruiting, new ISW dual-completion wells, and water quality sampling.



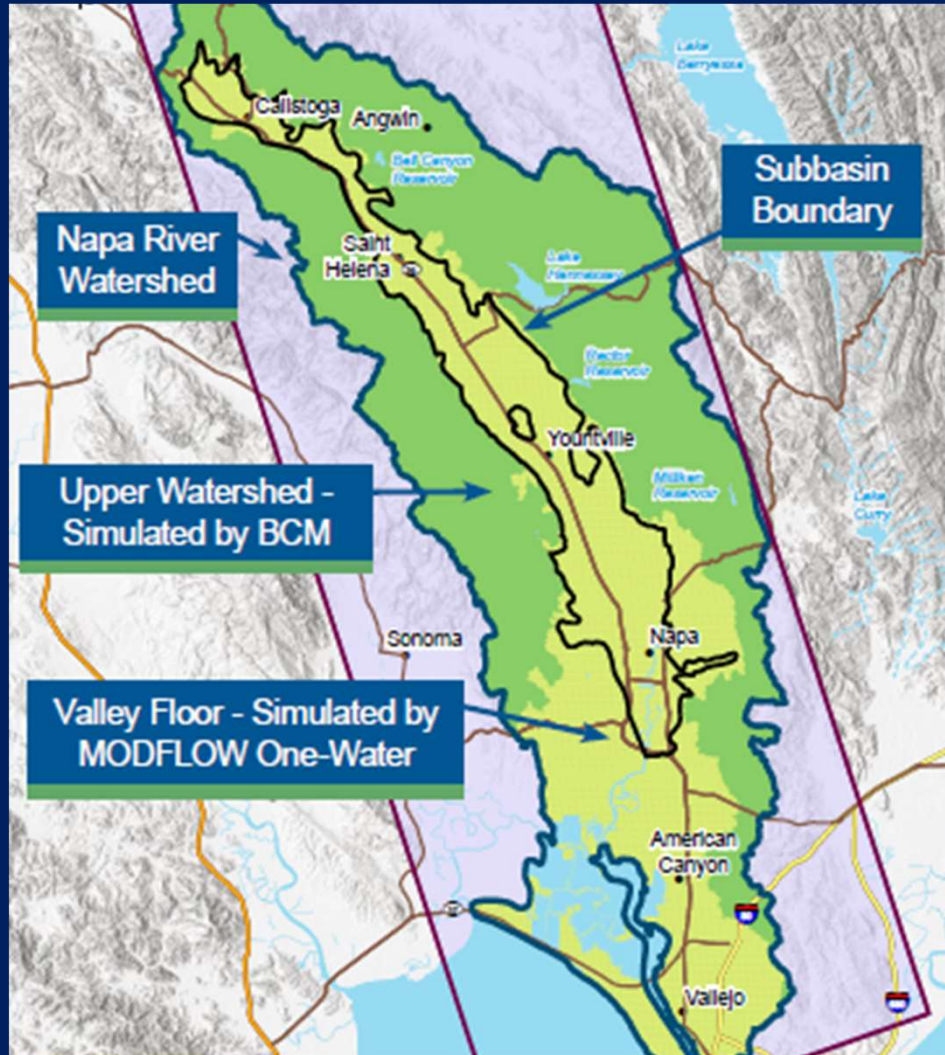
Monitoring Network	Measurement Type	Total			GSP-Specific	
		County	Napa Valley Subbasin	RMS	Supplemental	Planned
Groundwater Level	GW Levels	116	81	33	40	--
Groundwater Storage	GW Levels	--	27	--	27	--
	NVIHM Model	--	1	1	--	--
Land Subsidence	GW Levels	--	15	15	--	--
	Benchmark Monitoring	--	8	5	3	--
	InSAR	--	1	--	--	--
Stream Stage and Stream Discharge	Stream Stage and Stream Discharge	--	5	--	5	8
	Stream Watch	39	32	--	--	Yes
	Flood Control	--	18	--	18	--
Interconnected Surface Water – Groundwater	GW Levels	--	32	11	21	--
	NVIHM Model	--	2	2	--	--
GDE Monitoring	GW Level	--	31	--	31	--
	Stream Habitat	--	1	--	--	6
	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	--

- Significant increase in total number of wells based on outreach, volunteer wells, and installation of new wells.
- Eight future stream stage monitoring sites will be co-located with dual-completion monitoring wells.
- ISW and GDE monitoring increased with completion of shallow monitoring wells.
- Stream habitat planned as part of the ISW and GDE Workplan Implementation.

¹- Value is from GAMA database accessed through waterboards server: <https://gispublic.waterboards.ca.gov/portals/server/services>



Napa Valley Subbasin Water Budget WY 2023



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



NVIHM – Updates and Data Sources

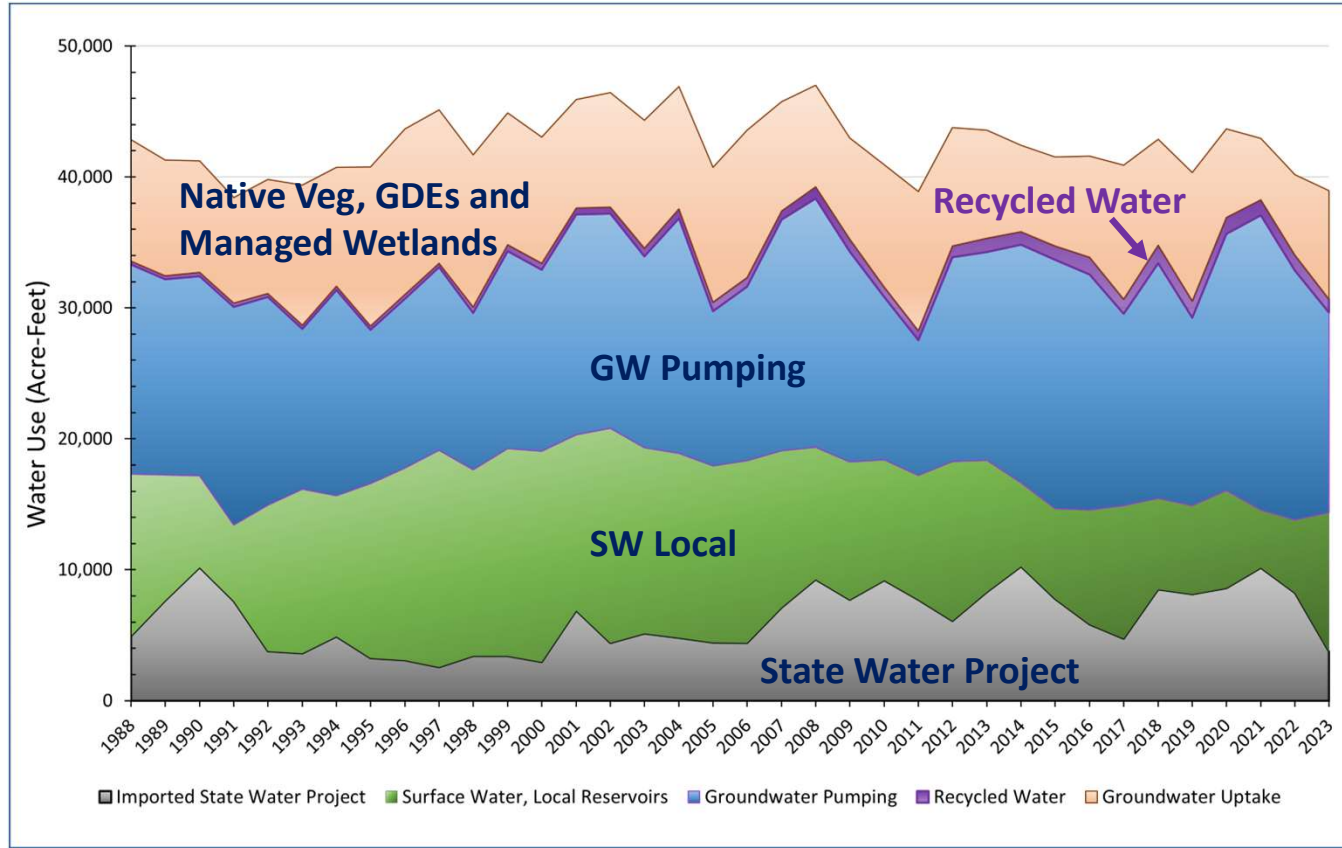


- The NVIHM is updated every year to evaluate SMC within the Napa Subbasin.
- Model updates are conducted in January and go through the preceding October.
- Best available data is collected and inputted in the model, but revised data and data availability changes.
- Surface water diversions and dam releases for WY 2021 and WY 2022 were updated and incorporated in the Annual Report 2023 NVIHM model run.

Water Use: WY 2023 (acre-feet)



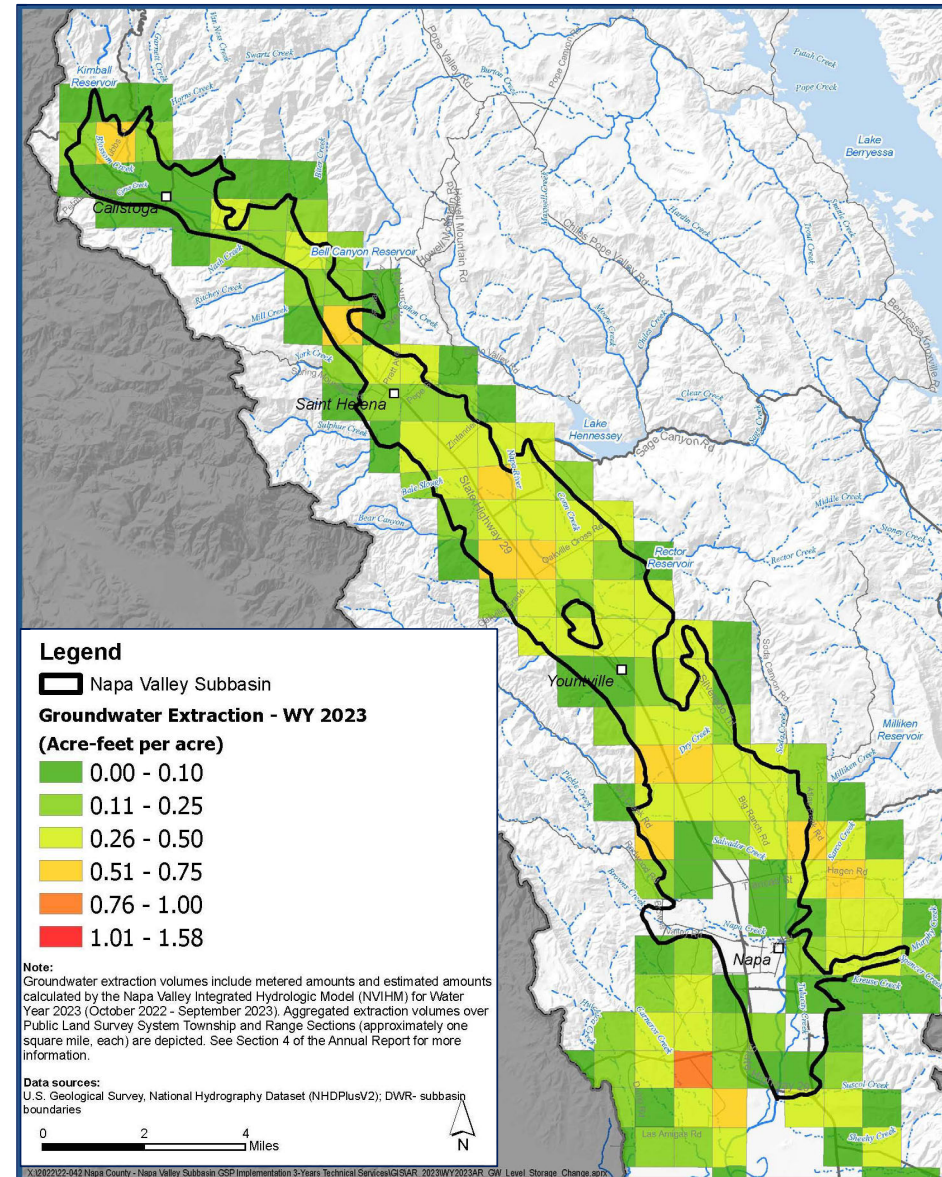
Water Use	2022	2023
Groundwater Pumping	18,790	15,270
Native Veg, GDEs & Managed Wetlands	6,440	8,290
Recycled Water Use	1,220	1,020
Local Surface Water Use (including reservoirs, diversions, etc.)	5,562	10,627
State Water Project Use	8,290	3,740
TOTAL	40,302	38,947



Groundwater Pumping, 2023 (Acre-feet)

Groundwater Pumping	Acre-feet	Percent Use
Ag (vines and other)	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%

TOTAL = 15,270 Acre-feet



Recycled Water Use: WY 2023

Recycled Water Use

Acre-feet

Ag (vines and other)

250

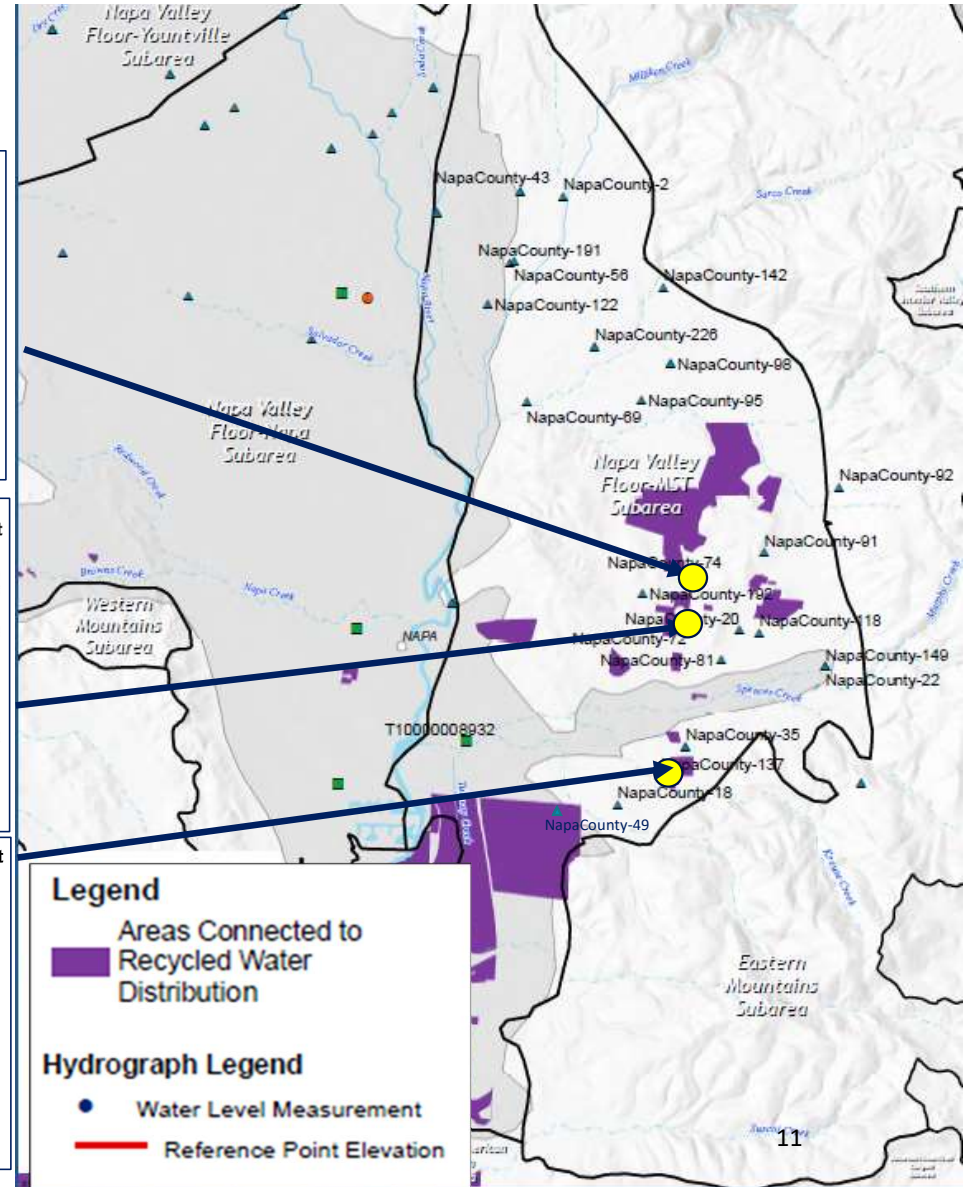
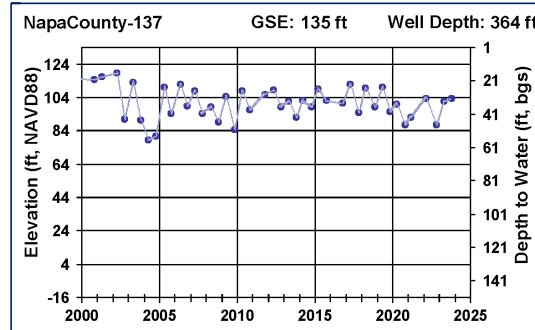
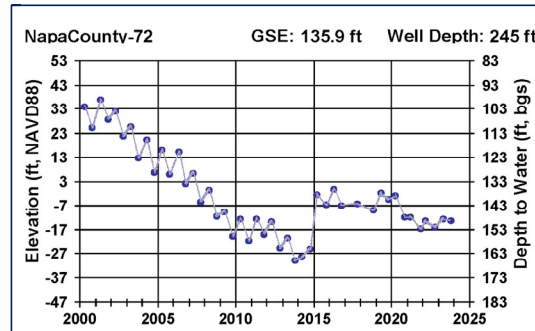
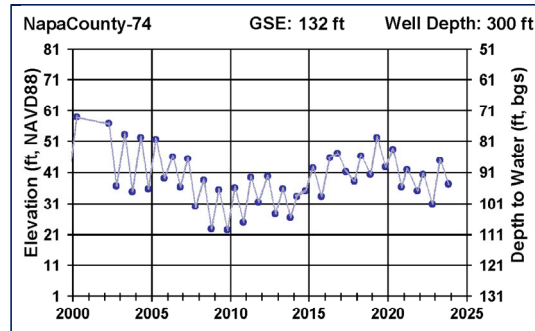
Municipal

690

Small Public Water Systems

80

TOTAL=
1,020 Acre-feet



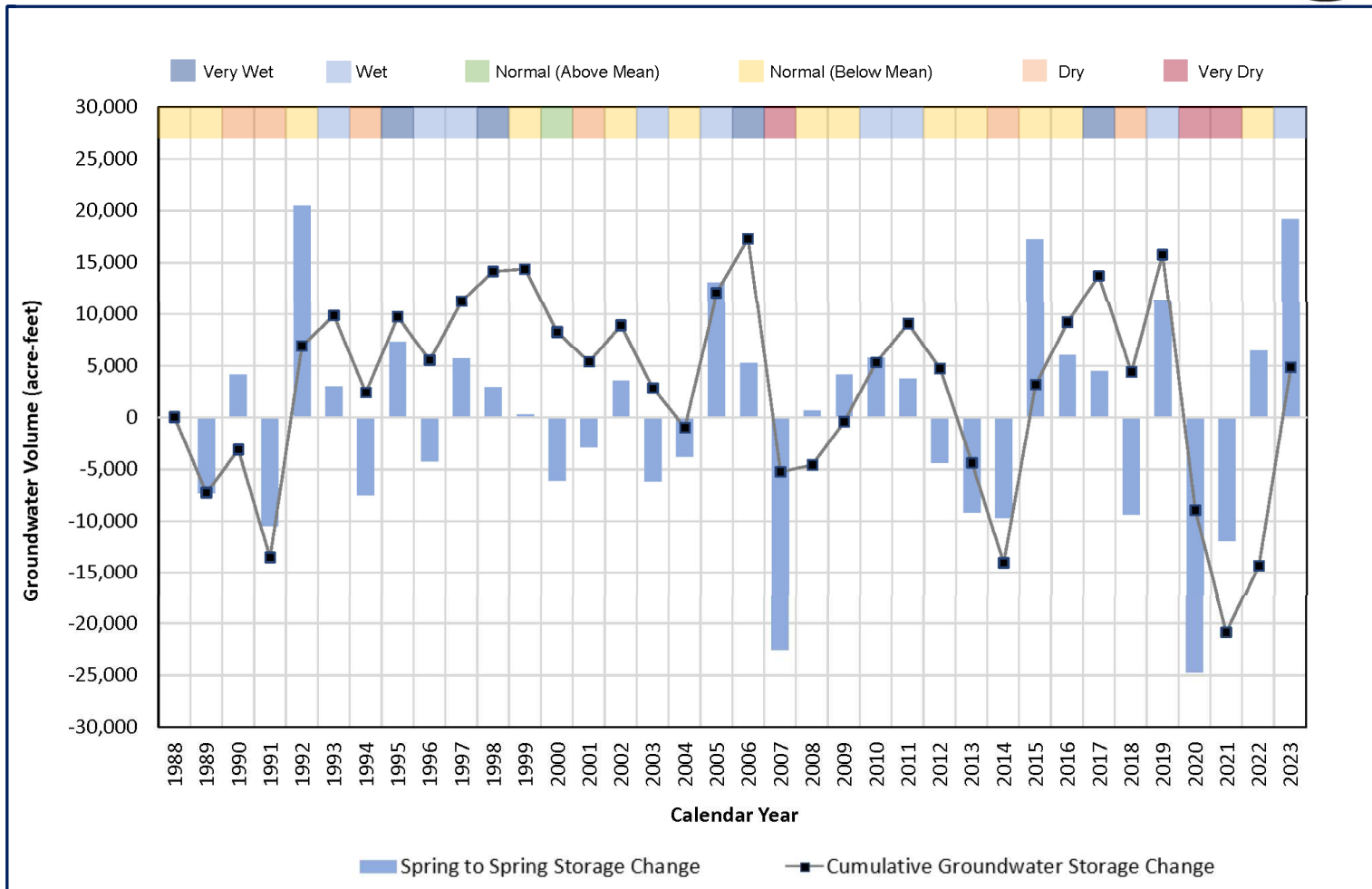
-
- A photograph of a small waterfall in a lush, green forest. The water flows over a series of rocks into a calm pool below, which reflects the surrounding trees and foliage. The forest is dense with various shades of green, and the scene is captured in a slightly soft, artistic style.

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Change in Groundwater Storage: Spring 2022 to Spring 2023

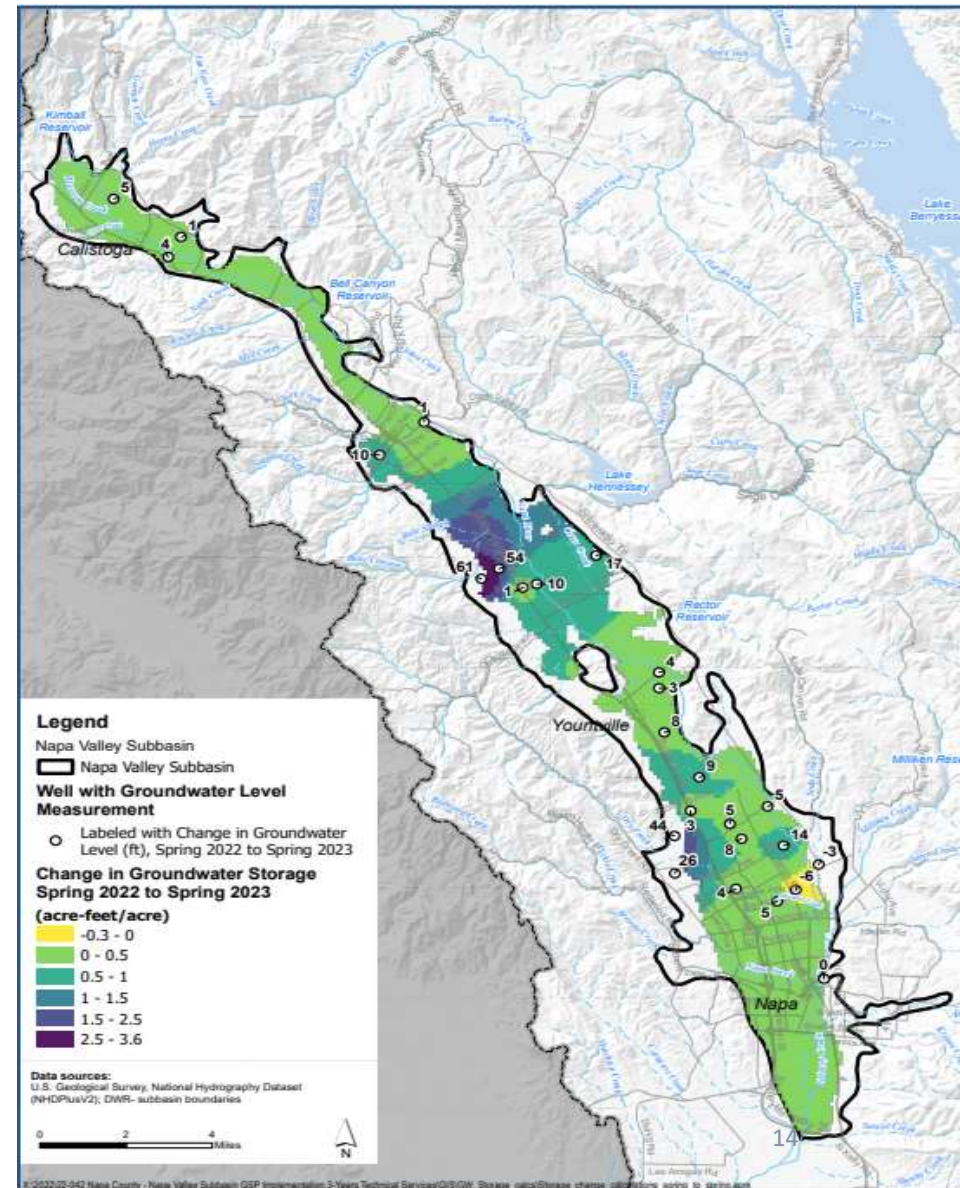


- Change in groundwater storage influenced by water year, pumping and recharge.
- Substantial increase in storage in WY 2023.
- From 1988 to 2023, cumulative storage changes show increase of supply.

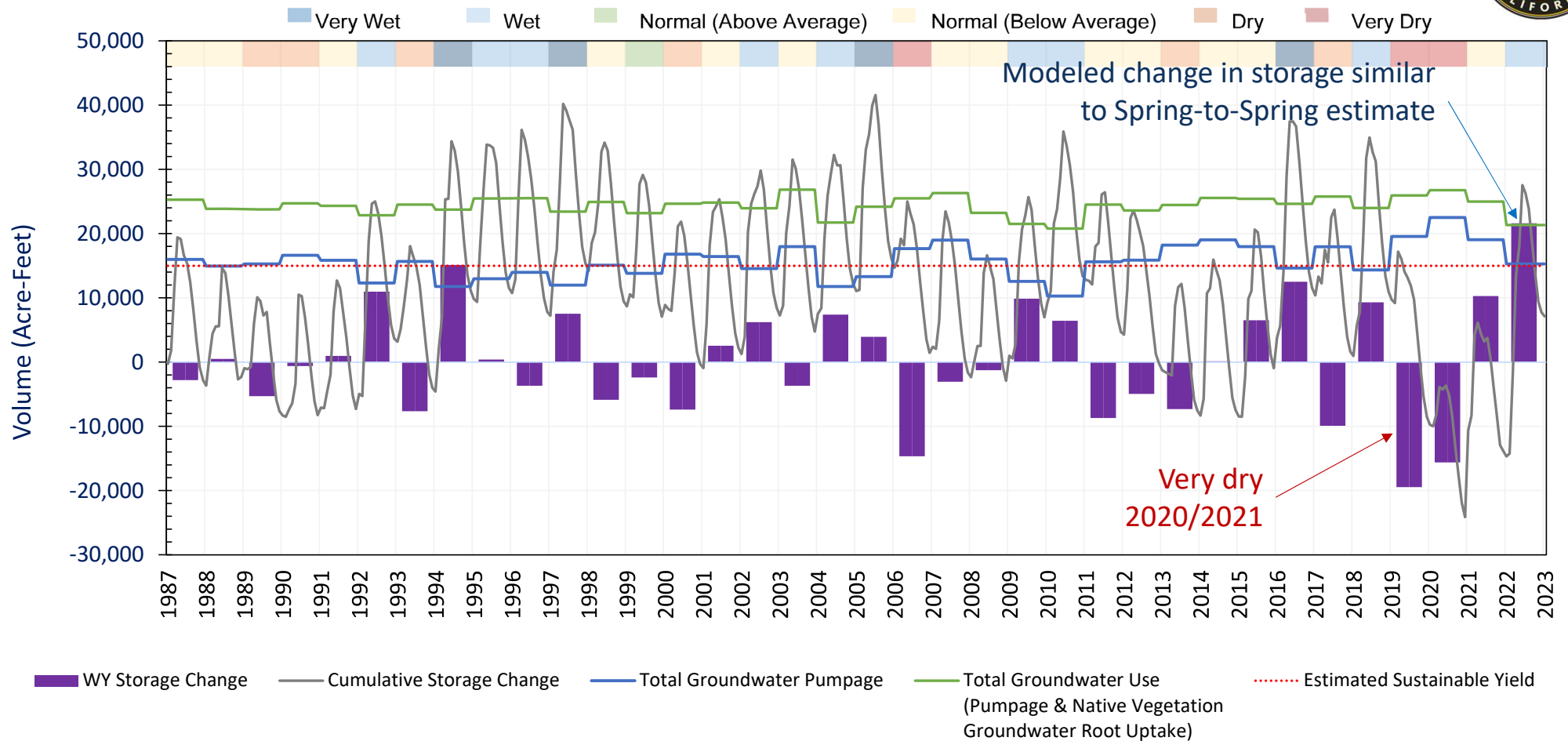


Principal Aquifer Change in Storage: Spring 2022 to Spring 2023

- Change in GW storage computed using Spring GW level measurements
- Total estimated GW storage change for Spring 2022 to Spring 2023 = +19,214 AF

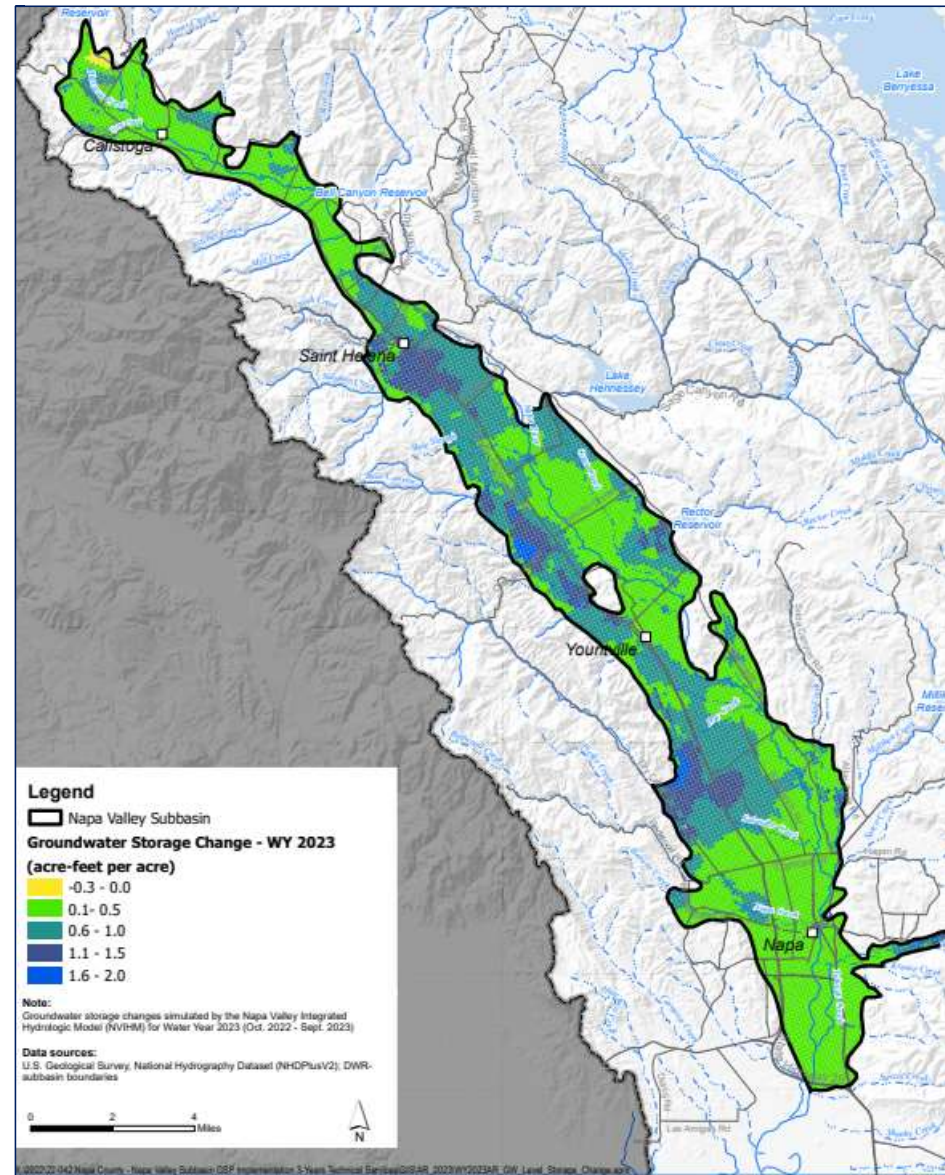


GW Pumping, Total Use, and GW Storage Change and Cumulative Change (1988-2023)



GW Storage Change Simulated NVIHM 10/2022-09/2023

- Increase in GW storage in WY 2023 across most of the Subbasin
- Increase in GW storage based on NVIHM (Oct. 2022 to Sept. 2023) = +21,600 AF





Sustainability Indicators & Metrics



Groundwater Sustainability Indicators

Lowering of
GW Levels

Reduction of
GW Storage

Seawater
Intrusion

Water Quality
Degradation

Land
Subsidence

Depletion of
Surface Water



Land Subsidence

Minimum Threshold

Land subsidence induced by groundwater pumping has not been observed in the Subbasin.

Site	Elev. 2020 (ft)	Elev. 2022 (ft)	Elev. 2023 (ft)	Annual Rate of Elev. Change (ft/yr)
DR5677	198.7	Destroyed		
JT9565	NA	NA	150.28	-0.028
DR5674	94.3	94.172	94.34	0.179
JT0442	103.3	102.923	102.97	-0.050
DR5673	74.8	74.576	74.54	-0.038

Undesirable Result

Inelastic subsidence rate of greater than 0.2 feet per year.



Groundwater Sustainability Indicators

Lowering of
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GW Storage

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Depletion of
Surface Water



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



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**



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

Well ID	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		
11458000 (Napa River at Oak Knoll Avenue, Napa) ¹	3,190	2,370	3,376	1,351	3,700	Yes	No
11456000 (Napa River at Pope Street, St. Helena) ¹	1,400	1,120	995	815	1,389	No	-

1. Site name represents the location of a U.S. Geological Survey stream site where the NCGSA monitors stream depletion, calculated by the NVIHM.

- Seasonal streamflow depletion volume conditions **did not meet** the interim definition for an undesirable result.
- In WY 2023, groundwater elevations **did not** meet the definition for an undesirable result (see January 2023 TAG presentation).



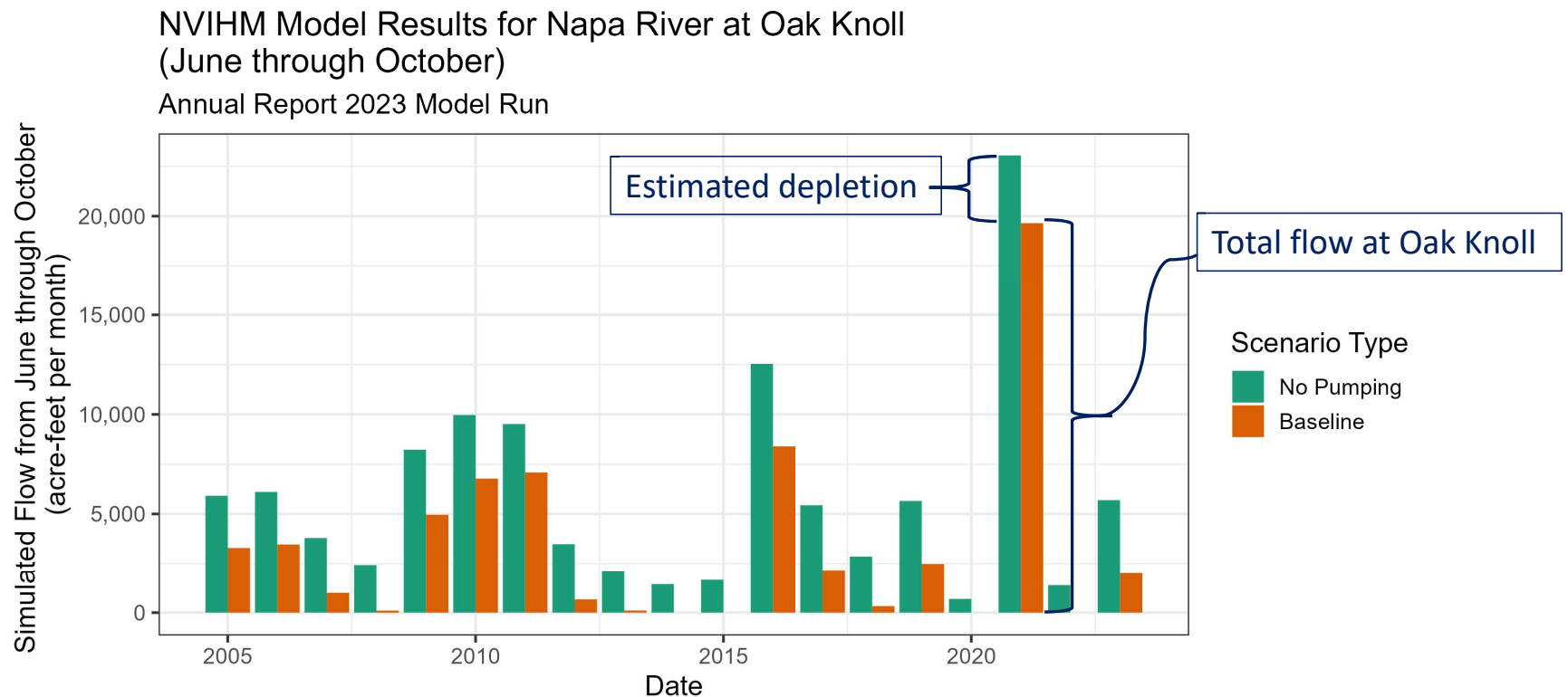
Why did the seasonal depletion of the river system exceed the MT in 2023?

- Wet winter and recovery led to higher streamflow throughout the summer than previous years.
- The timing of streamflow depletion was different than previous years.
- Additional streamflow depletion occurred due to cumulative impact of 2020-2022 dry climate signal.

Interconnected Surface Water and Model Results



NVIHM is run with all agricultural pumping removed, compared against model run developed for water budget (“Baseline”).

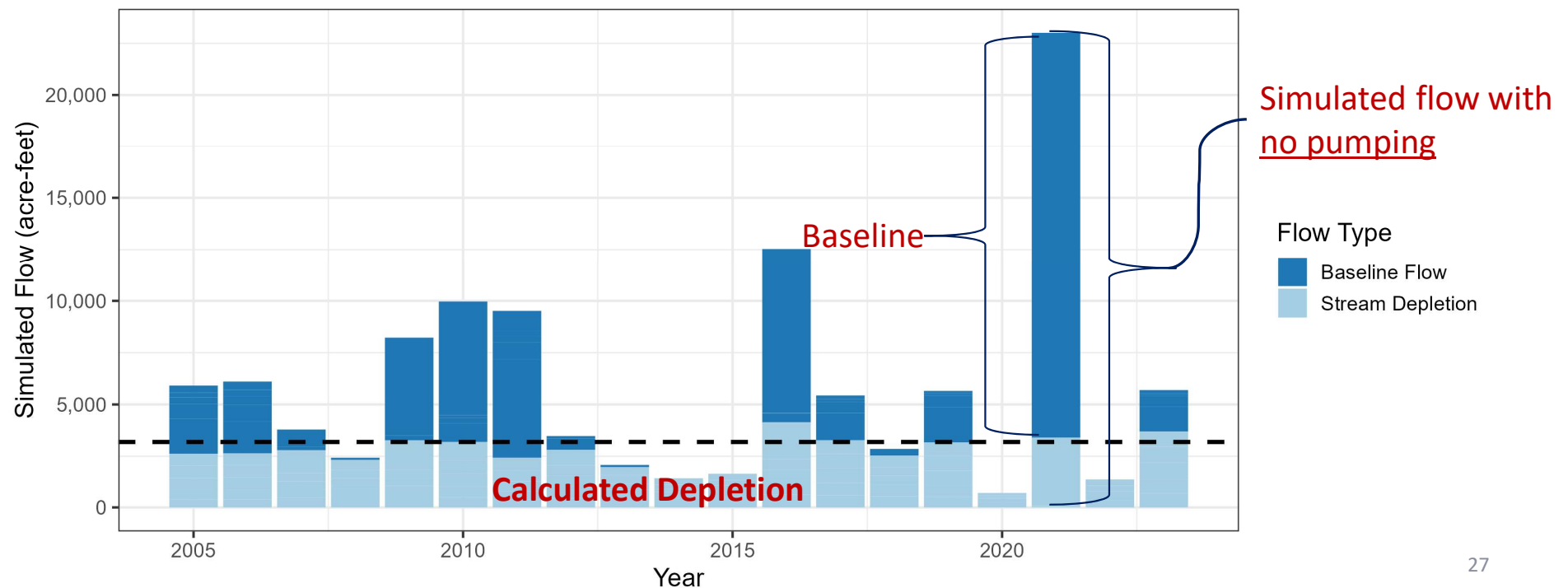


Interconnected Surface Water and Model Results



Simulated streamflow volumes are examined in the June through October timeframe to evaluate the SMC.

Napa River at Oak Knoll Simulated Stream Flow (June - Oct)
Annual Report 2023 Model Run

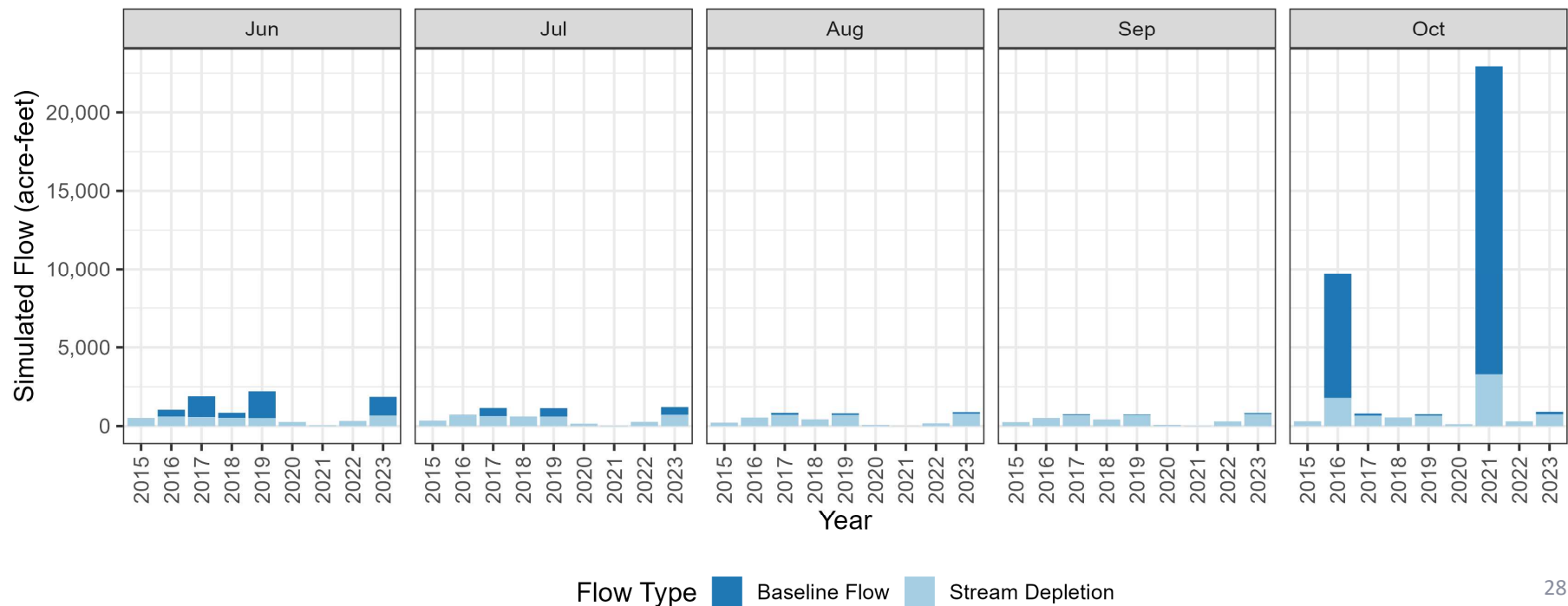


Interconnected Surface Water and Model Results



Simulated streamflow volumes are examined in the June through October timeframe to evaluate the SMC.

Napa River at Oak Knoll Simulated Stream Flow (June - Oct)
Annual Report 2023 Model Run



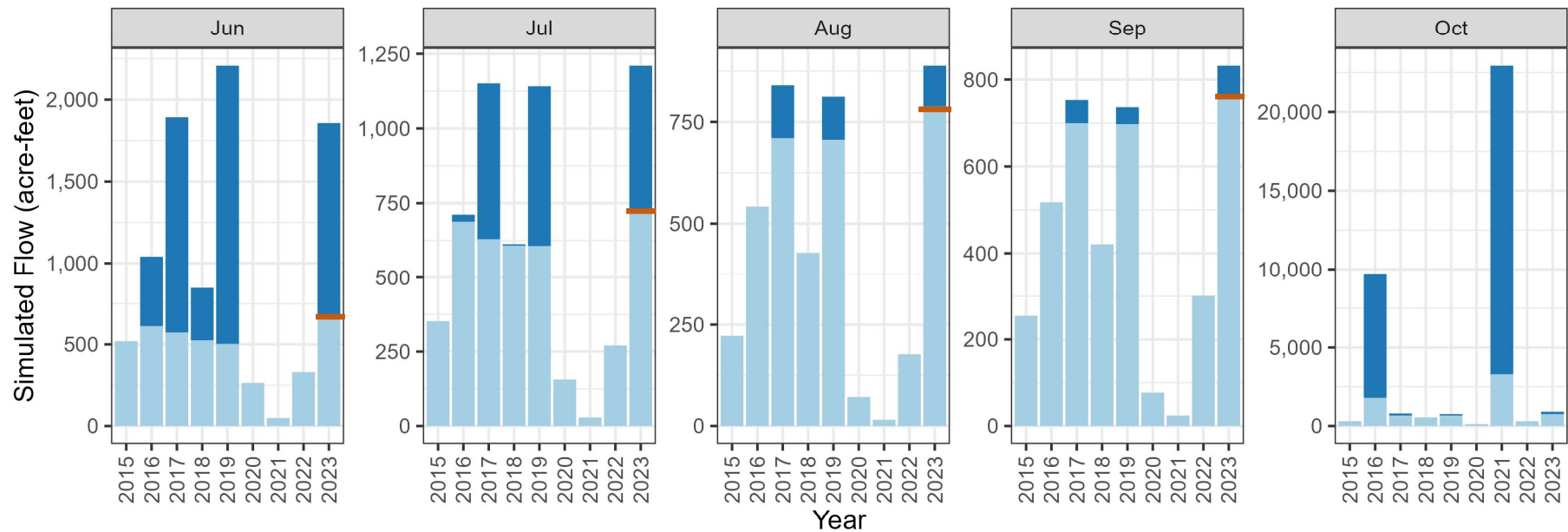
Interconnected Surface Water and Model Results



Highest percent of streamflow depletion in July – September
(50% to 100%)

Napa River at Oak Knoll Simulated Stream Flow (June - Oct)
Annual Report 2023 Model Run

October flow/depletion
largely based on fall
storms occurring



Large proportion of
flow going to depletion
in 2023

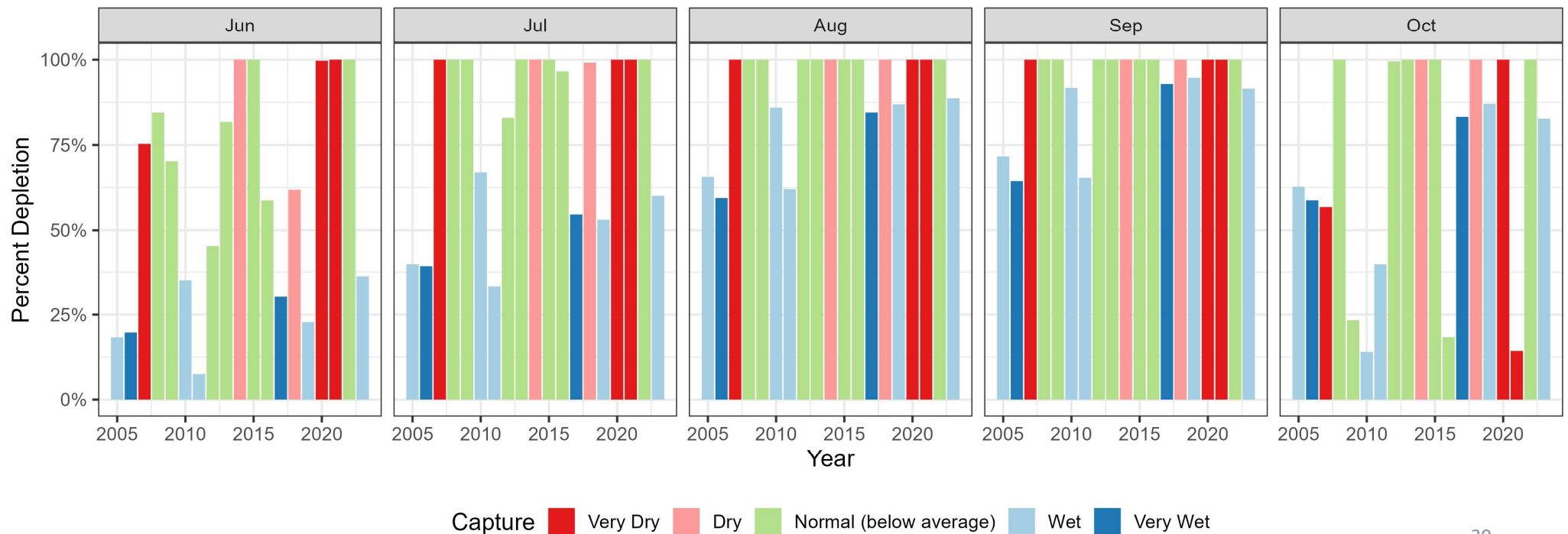
Flow Type ■ Baseline Flow ■ Stream Depletion

Interconnected Surface Water and Model Results



The percent of stream depletion in WY 2023 was much lower than dry years in, but higher than other Wet or Very Wet years.

Napa River at Oak Knoll Simluated Percent Depletion (June - Oct)
Annual Report 2023 Model Run

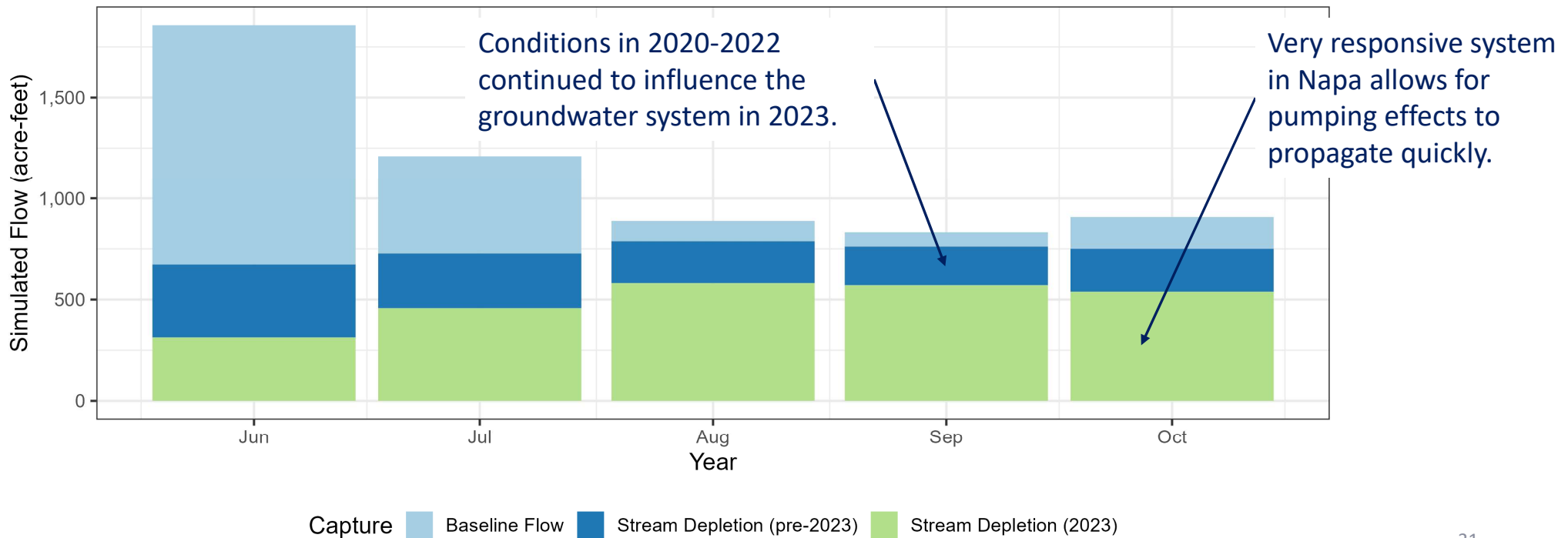


Interconnected Surface Water and Model Results



Approximately 25% of stream depletion occurred from pumping and very dry conditions in WY 2020 through 2022.

Napa River at Oak Knoll Simulated Stream Flow (June - Oct)
Annual Report 2023 Model Run





Stream Depletion in WY 2023

- The wet winter was not enough to completely recover the groundwater system, additional stream depletion occurred in response to the 2020-2022 impacts.
- It is expected that the effect of 2023 on 2024 will be less due to widespread recovery of the aquifer system.



Groundwater Sustainability Indicators

Lowering of
GW Levels

Reduction of
GW Storage

Seawater
Intrusion

Water Quality
Degradation

Land
Subsidence

Depletion of
Surface Water



Water Quality Sampling

- There are three constituents of concern in Napa Valley Subbasin.
 - Total dissolved solids (TDS)
 - Nitrate
 - Arsenic
- Saltwater intrusion is monitored by sampling for chloride.
- Water quality sampling began in 2023 and will continue to be monitored for any trends in constituents of concern and chloride.

RMS Groundwater Levels: Response Action Required



- 1 RMS/Chronic GW Level Lowering wells have Fall 2023 MT exceedances
- 1 RMS/Chronic GW Level Lowering wells have three consecutive Fall MT exceedances
 - **No UR for Chronic GWL lowering since only 1 well has had three consecutive years**
- 0 RMS/ISW wells have Fall 2023 MT exceedances
- 0 RMS/ISW well has three consecutive Fall MT exceedances
- 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.

WY 2023 Annual Report: Summary

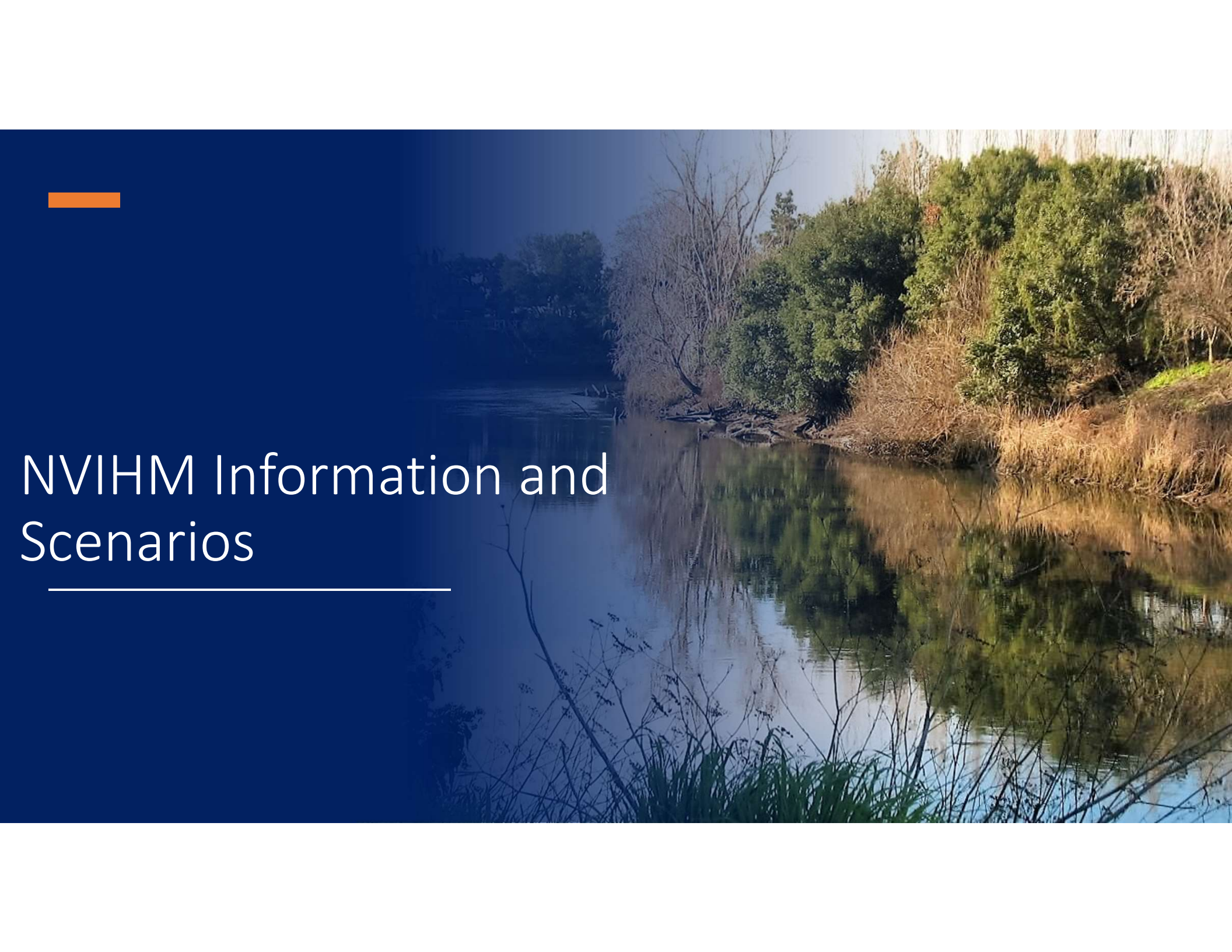
- Subbasin: GW level increased in response to wet conditions
 - One GW level MT exceedances in WY 2023
 - One MT exceedance: Interconnected Surface Water Depletion
 - **UR: Reduction of GW Storage**
 - Coordination occurring for RMS Wells for GW Quality and Seawater Intrusion
- GW level declines in MST showed some recovery but less than the alluvial system.



NAPA COUNTY GROUNDWATER SUSTAINABILITY ANNUAL REPORT - WATER YEAR 2022

March 2023





NVIHM Information and Scenarios

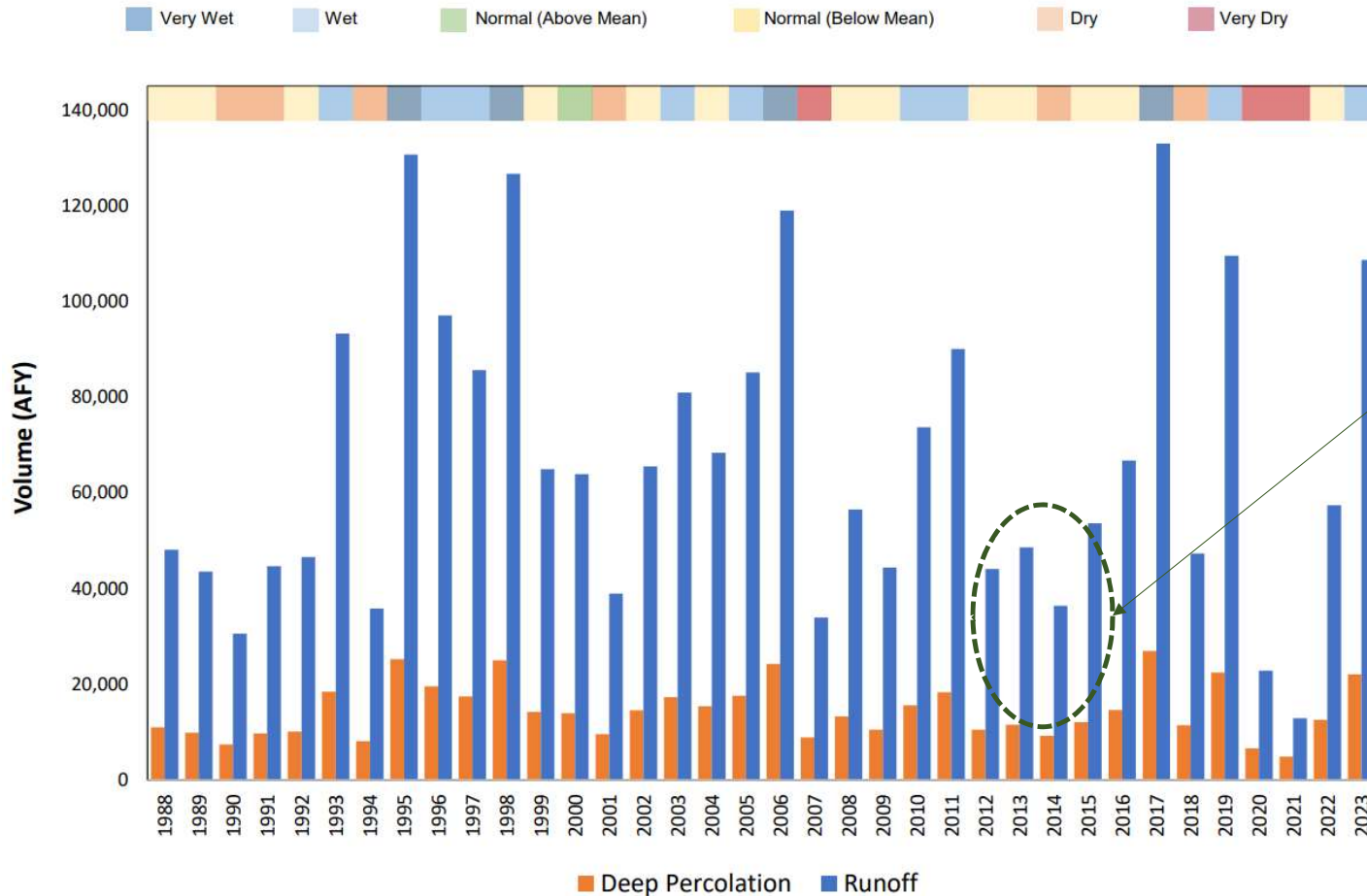


Supply Augmentation and the Potential for Recharge

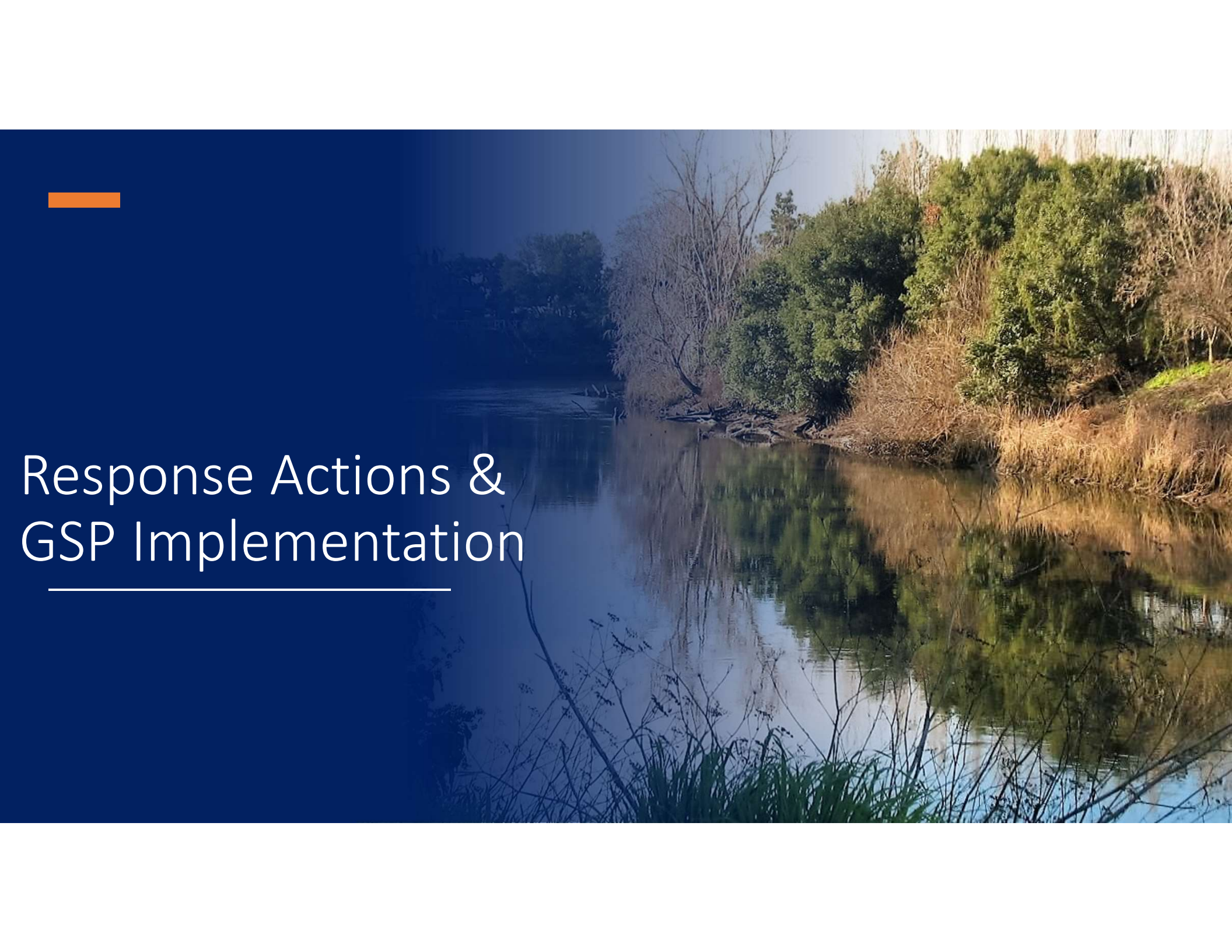


- Investigations into the amount of recharge that can occur, where it occurs, and the fraction of runoff are actively being investigated.
- Use of the NVIHM will help identify where runoff may be slowed on the landscape and allow additional time to recharge the aquifer.

Supply Augmentation and the Potential for Recharge



Dry years provide the largest opportunity to increase recharge to mitigate drought effects.



Response Actions & GSP Implementation



Response Actions: Near-Term and Subsequent

Very Near-Term



- Voluntary Drought Measures
- GSA: Subbasin
- County: Watershed/County
- Local: Cities/Communities
- Agricultural/Wineries

Short Term



- Stormwater Resource
- Water Conservation
- Groundwater Pumping Reduction
- Interconnected Surface Water & GDEs

Mid-Term



- ID Recharge Areas of Interest
- Explore Recharge Opportunities
- Implement Workplans
- GW Pumping Reduction Options



GSP Implementation

- NCGSA Technical Advisory Group (Monthly Public Meetings)
- Annual Report WY 2023 (March 2024)
- ISW and GDEs Workplan (Spring 2024)
- Napa County Water Conservation Workplan (Spring 2024)
- Groundwater Pumping Reduction Workplan (Spring 2024)
- Combined Program Overview (Spring 2024)
- Refining Water Use Data (ET: OpenET and Local Land-Based Sensors; in Progress)
- NVIHM Model Updates (in Progress)
- Stream Gage Monitoring (8 Sites: Summer 2024)
- Other MW Sites (being Evaluated)
- RCD and Stream Watch Monitoring (in Progress)
- Evaluate Potential Recharge Areas and Feasibility (in Progress)
- Stakeholder Coordination and Outreach (Ongoing)
- Coordination with Napa County Drought and Water Shortage Efforts



*DWR Approved Napa
Valley Subbasin GSP
January 26, 2023*





Thank You

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