

GGA Board Annual Report Update

Dauids Engineering and LSCE
03/22/2023

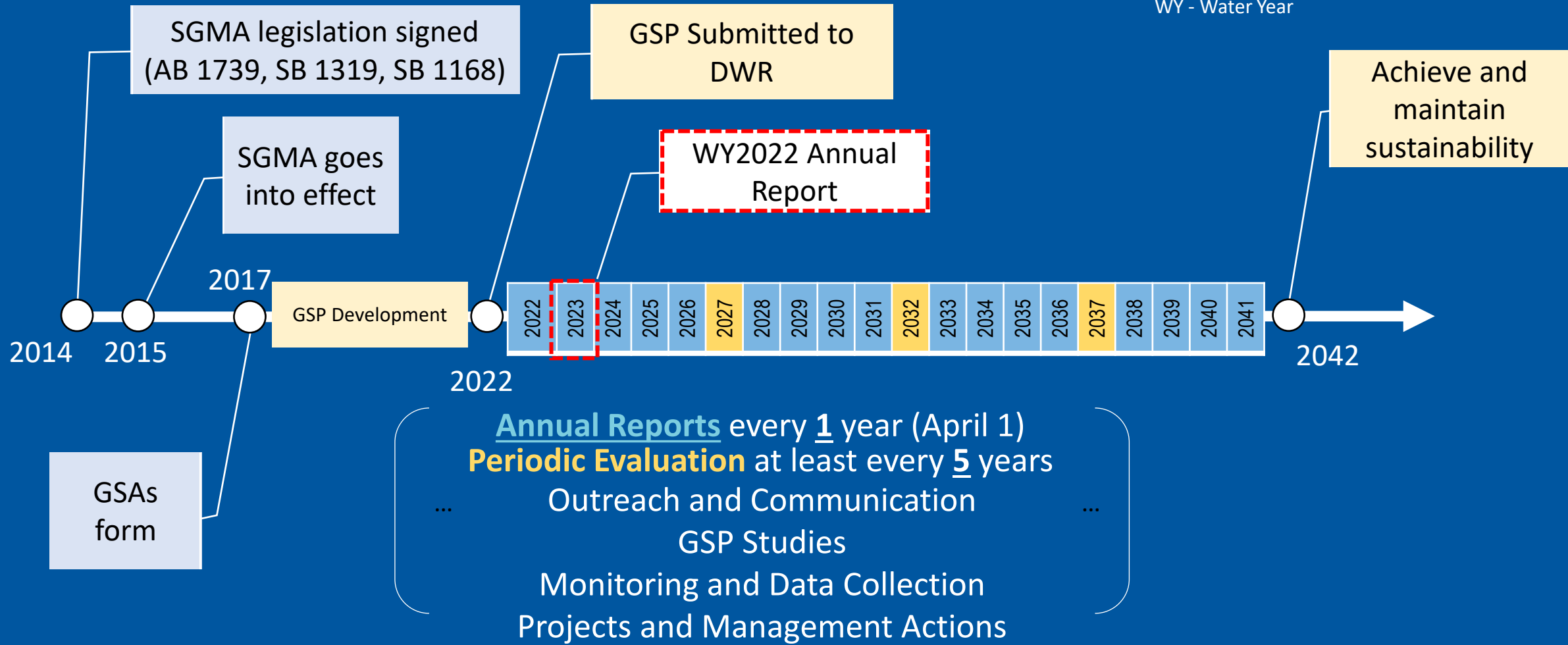


Serving Stewards of
Western Water Since 1993

- Overview
- Groundwater Conditions
- Water Budget
- GSP Implementation

SGMA Implementation Timeline

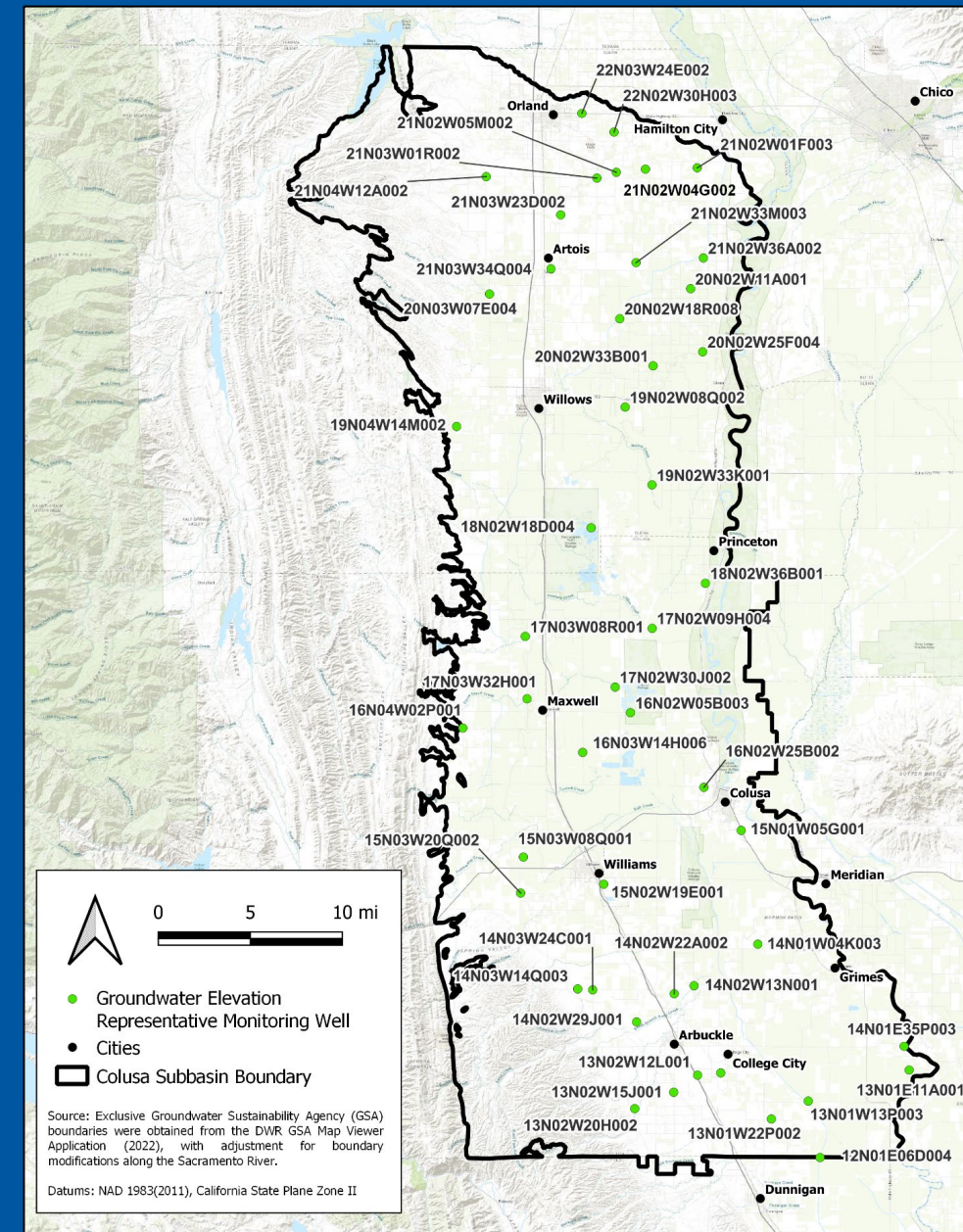
Abbreviations:
 AB - Assembly Bill
 DWR - Department of Water Resources
 GSA - Groundwater Sustainability Agency
 GSP - Groundwater Sustainability Plan
 SB - Senate Bill
 SGMA - Sustainable Groundwater Management Act
 WY - Water Year



- Overview
- Groundwater Conditions
- Water Budget
- GSP Implementation

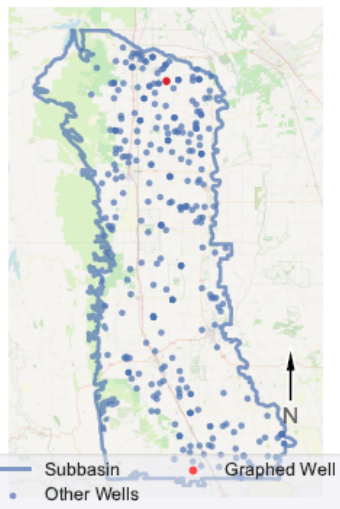
Groundwater Conditions

- Groundwater elevations (48 Representative Monitoring Site Wells (RMS Wells))
- Groundwater storage
- Subsidence



COLUSA Subbasin - State Well Number (SWN): 21N02W05M002M

Well Location Map

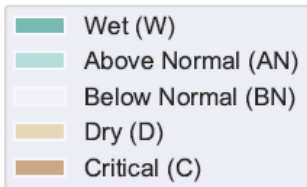


Sustainable Management Criteria:

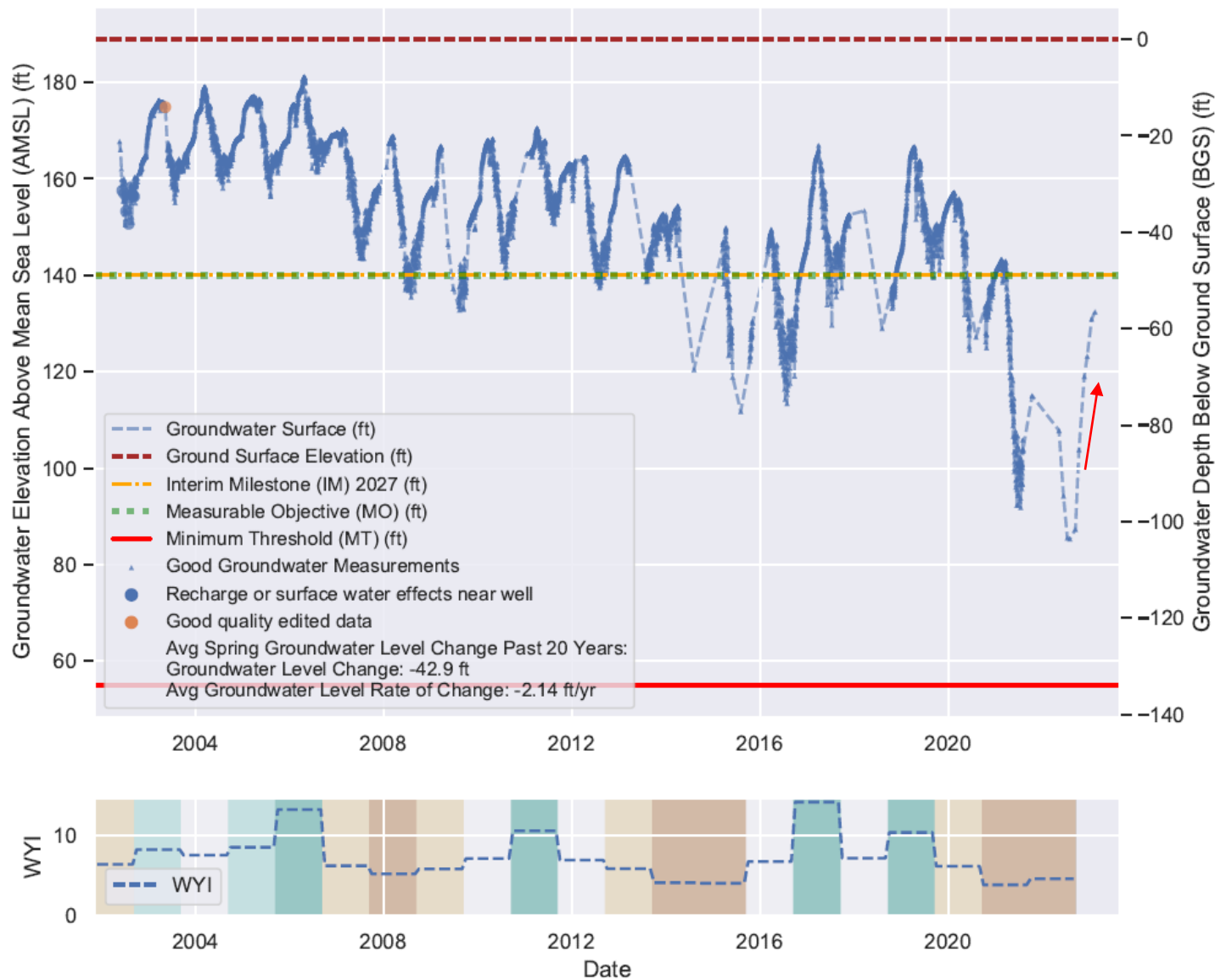
IM (2027) = 140.0 ft AMSL
 MO = 140.0 ft AMSL
 MT = 55.0 ft AMSL

Minimum Threshold is the 20th Percentile of Domestic.

Sacramento Valley Water Year Index (WYI) shown on lower right. Meaning of colors defined below.



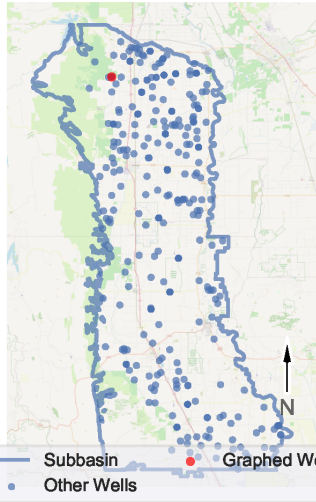
Perforation 1: 122.0 - 132.0 ft BGS



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COLUSA Subbasin - State Well Number (SWN): 21N04W12A002M

Well Location Map

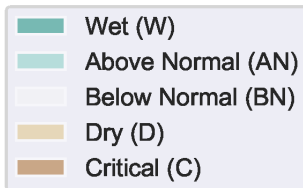


Sustainable Management Criteria:

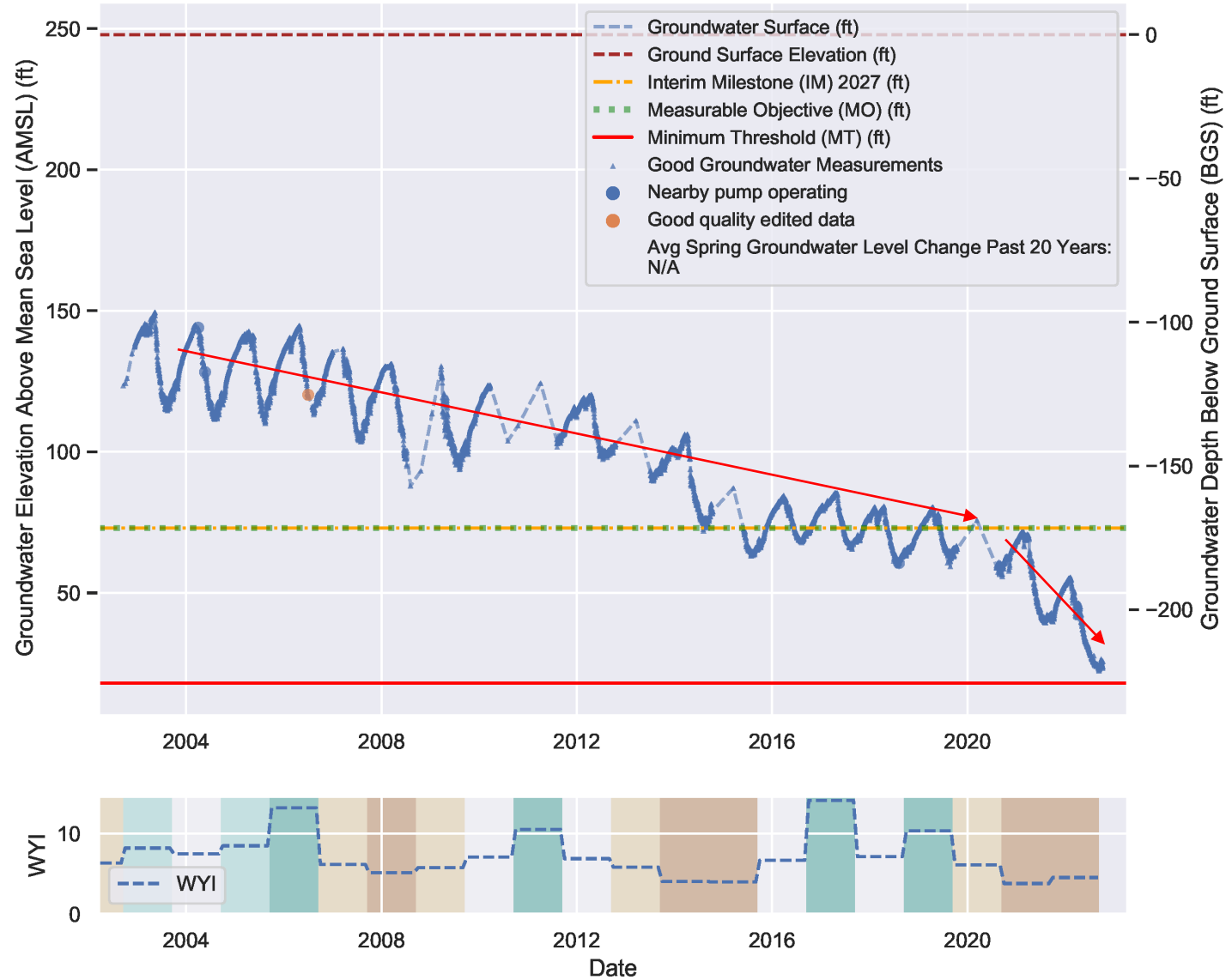
IM (2027) = 73.0 ft AMSL
 MO = 73.0 ft AMSL
 MT = 18.0 ft AMSL

Minimum Threshold is 50% of Range Below Historical.

Sacramento Valley Water Year Index (WYI) shown on lower right. Meaning of colors defined below.

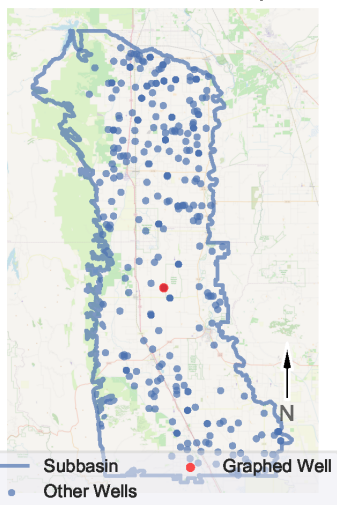


Perforation 1: 247.0 - 257.0 ft BGS



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Well Location Map

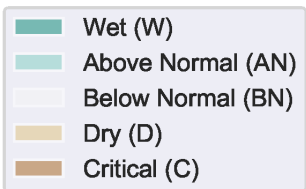


Sustainable Management Criteria:

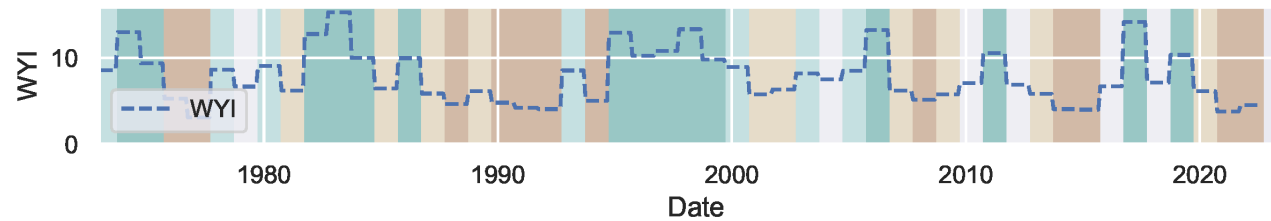
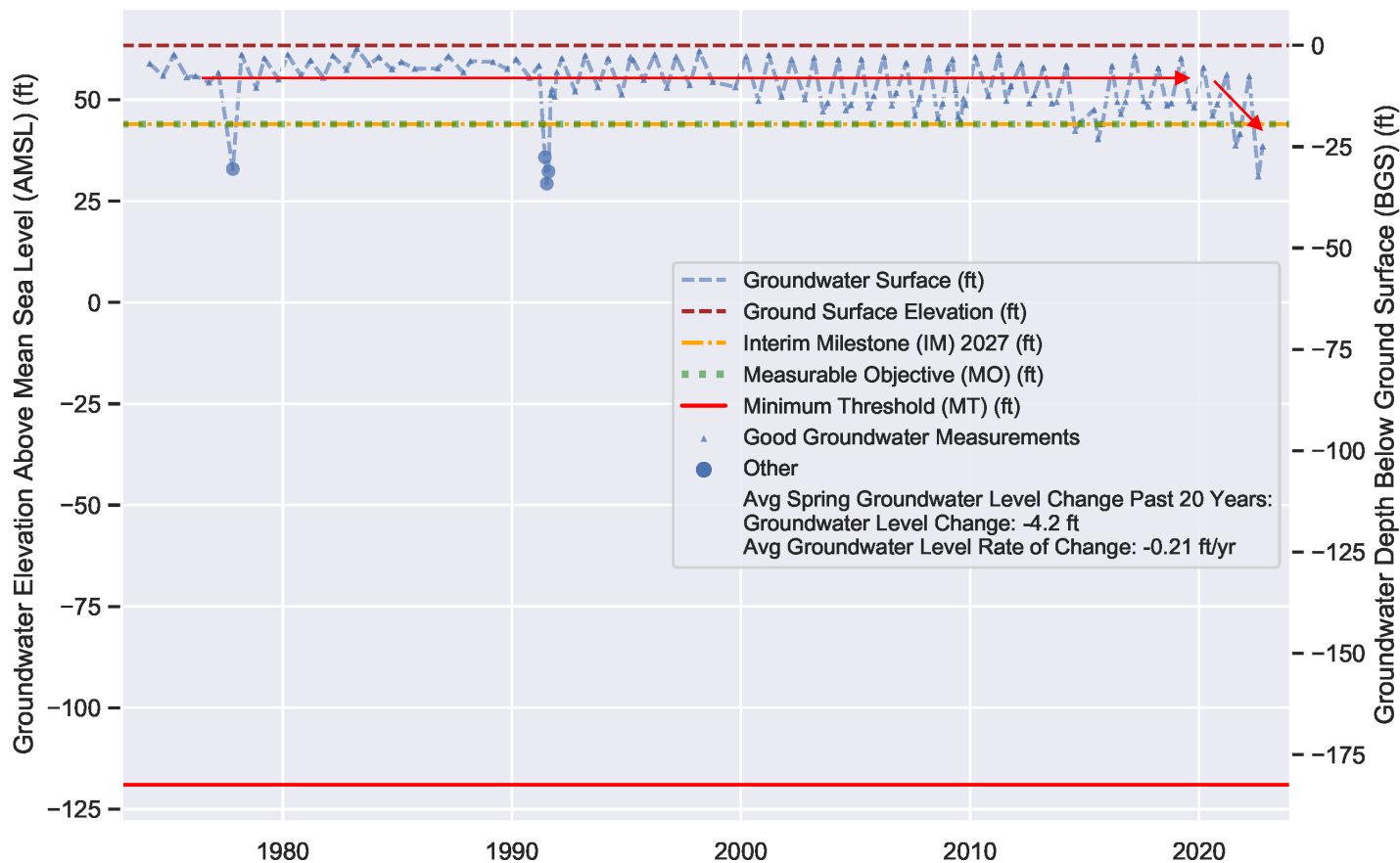
IM (2027) = 44.0 ft AMSL
 MO = 44.0 ft AMSL
 MT = -119.0 ft AMSL

Minimum Threshold is the 20th Percentile of Domestic.

Sacramento Valley Water Year Index (WYI) shown on lower right. Meaning of colors defined below.

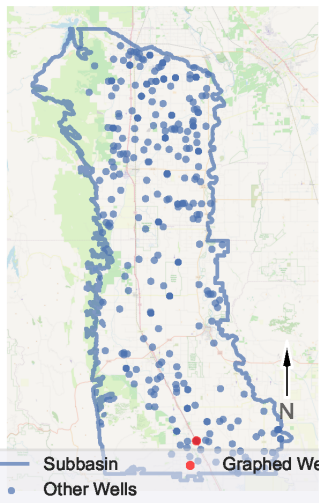


Perforation 1: 157.0 - 159.0 ft BGS



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Well Location Map

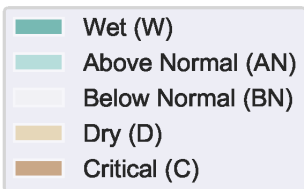


Sustainable Management Criteria:

IM (2027) = 9.0 ft AMSL
 MO = 9.0 ft AMSL
 MT = -72.0 ft AMSL

Minimum Threshold is 50% of Range Below Historical.

Sacramento Valley Water Year Index (WYI) shown on lower right. Meaning of colors defined below.



Perforation data not available.



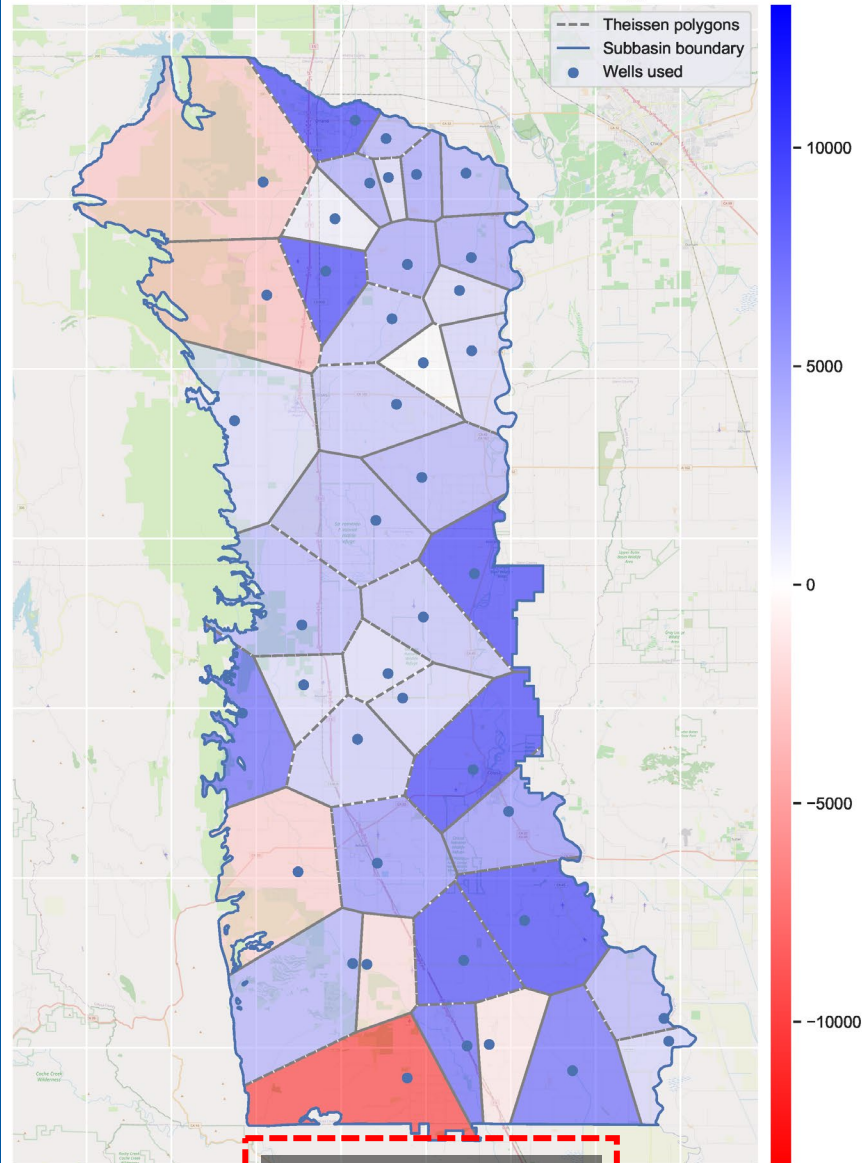
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Change in Groundwater Storage

- Groundwater Elevation from RMS Wells as a Proxy
- Thiessen Polygon Method
 - Applied a spring-to-spring change in water level within each Groundwater Elevation RMS to a Thiessen polygon surrounding the RMS.
 - Annual change in storage calculated for 1968 to 2022 for each Thiessen polygon and summed for the Subbasin.
 - Cumulative change in storage calculated Subbasin-wide for 1968 through 2022.

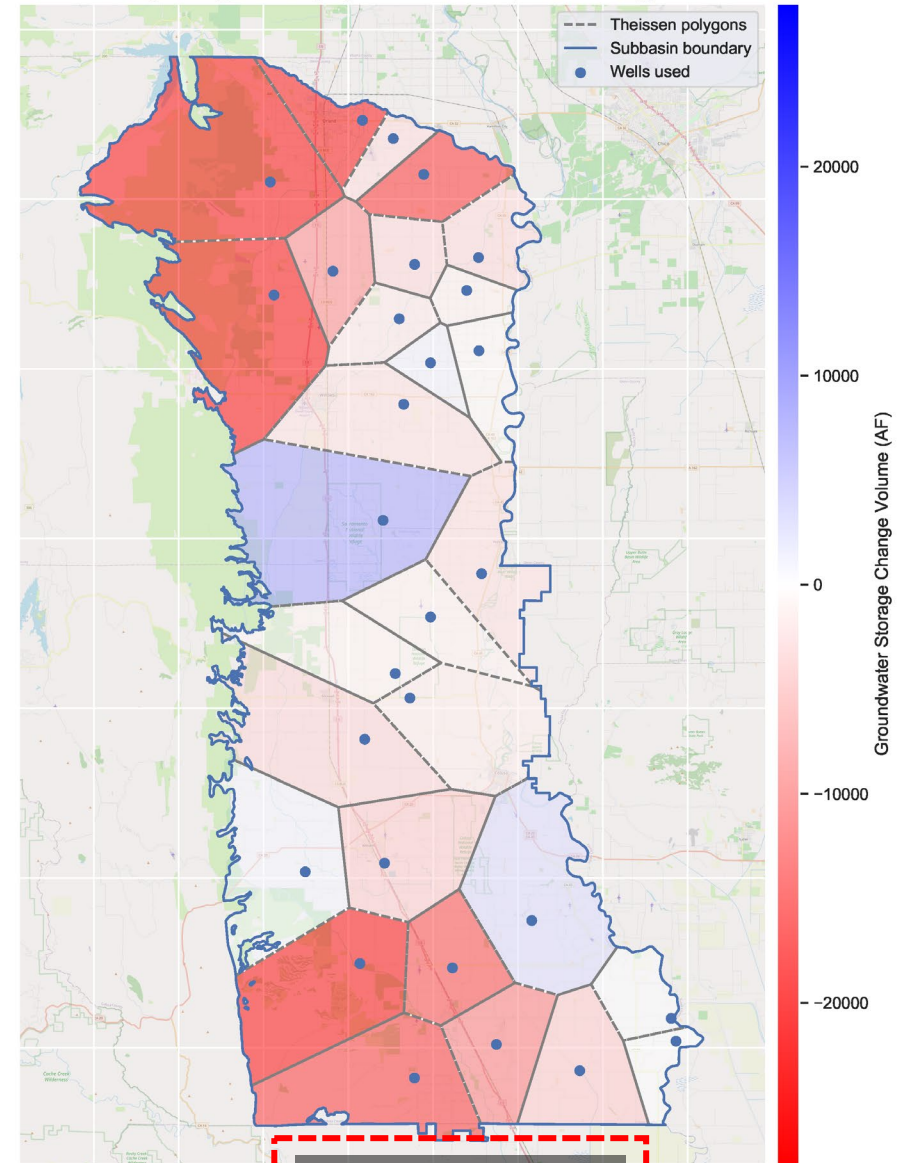
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Subbasin = COLUSA Subbasin; Aquifer = Primary; Year = 2019
 Total Storage Change in Primary Aquifer = 197170.0 AF; Number of Polygons = 42



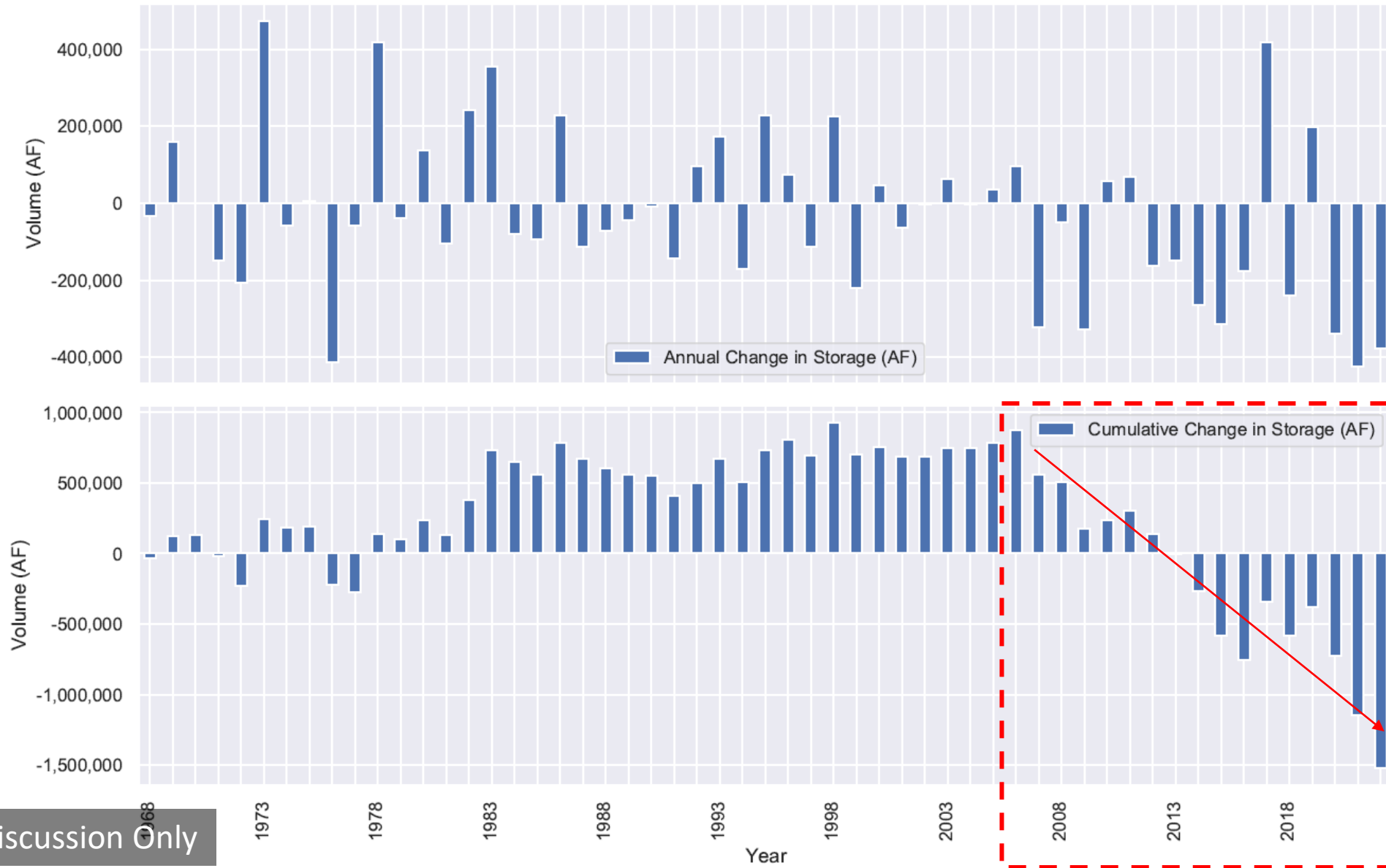
2019: +197 TAF

Subbasin = COLUSA Subbasin; Aquifer = Primary; Year = 2022
 Total Storage Change in Primary Aquifer = -377170.0 AF; Number of Polygons = 29



2022: -377 TAF

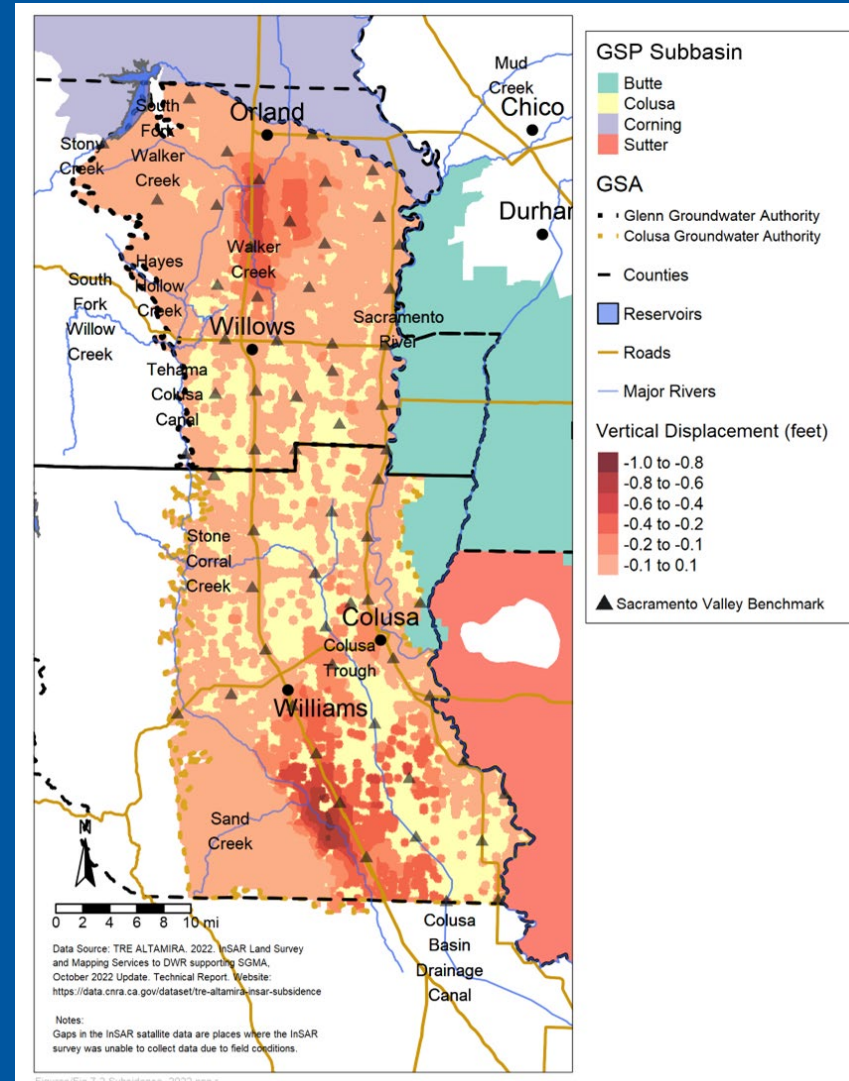
COLUSA Subbasin Spring to Spring Storage Changes for Primary Aquifer



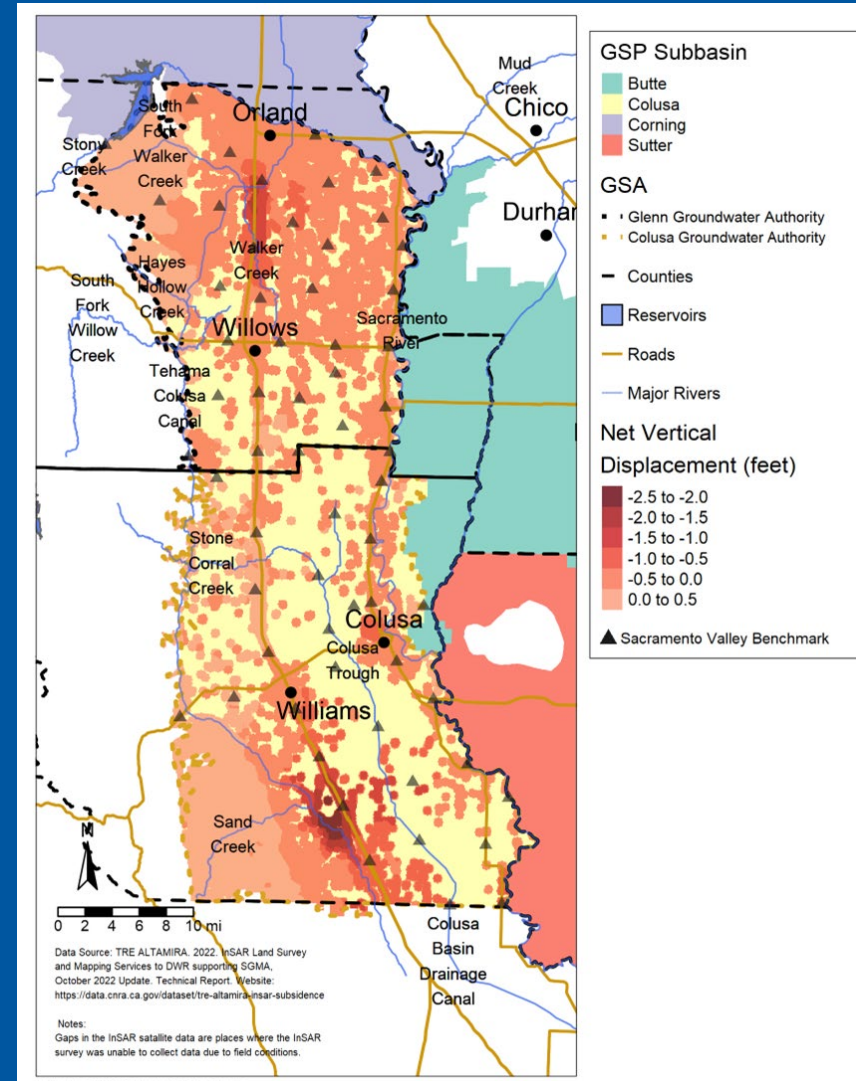
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Subsidence

- Colusa GSP reports on Land Subsidence Since May 2017
- MT = 0.1 feet/year
- Undesirable Result = 20% or more (13 of 63) monitoring sites experience subsidence rates above the MT
- 10-15 benchmark sites near subsidence area but have not been surveyed since 2017



Annual Vertical Displacement (2022)



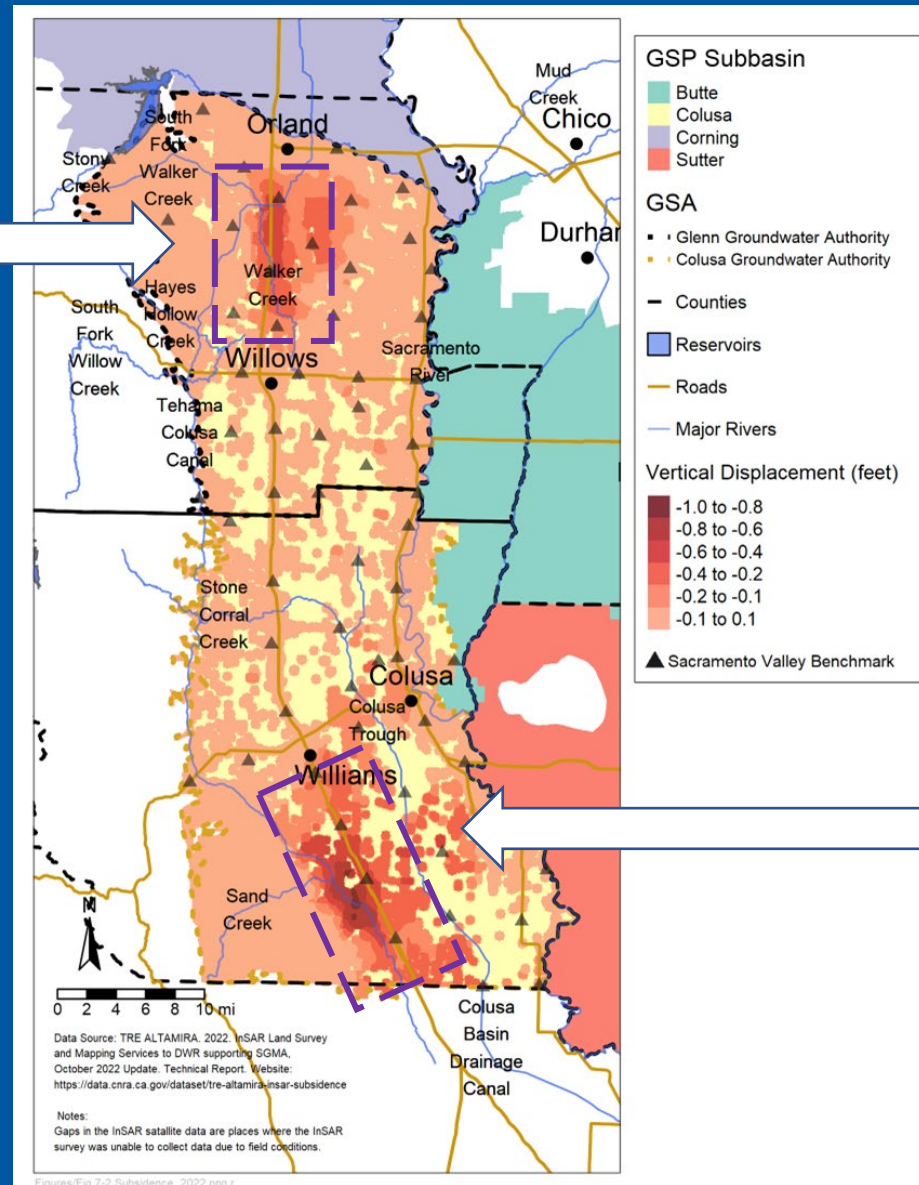
Net Vertical Displacement (2015 - 2022)

Subsidence

North of Willows/South of Orland

Max. = 0.4 feet (WY2020-WY2021)

Max. = 0.6 feet (WY2021-WY2022)



Aruckle Area

0.4 feet to 0.8 feet

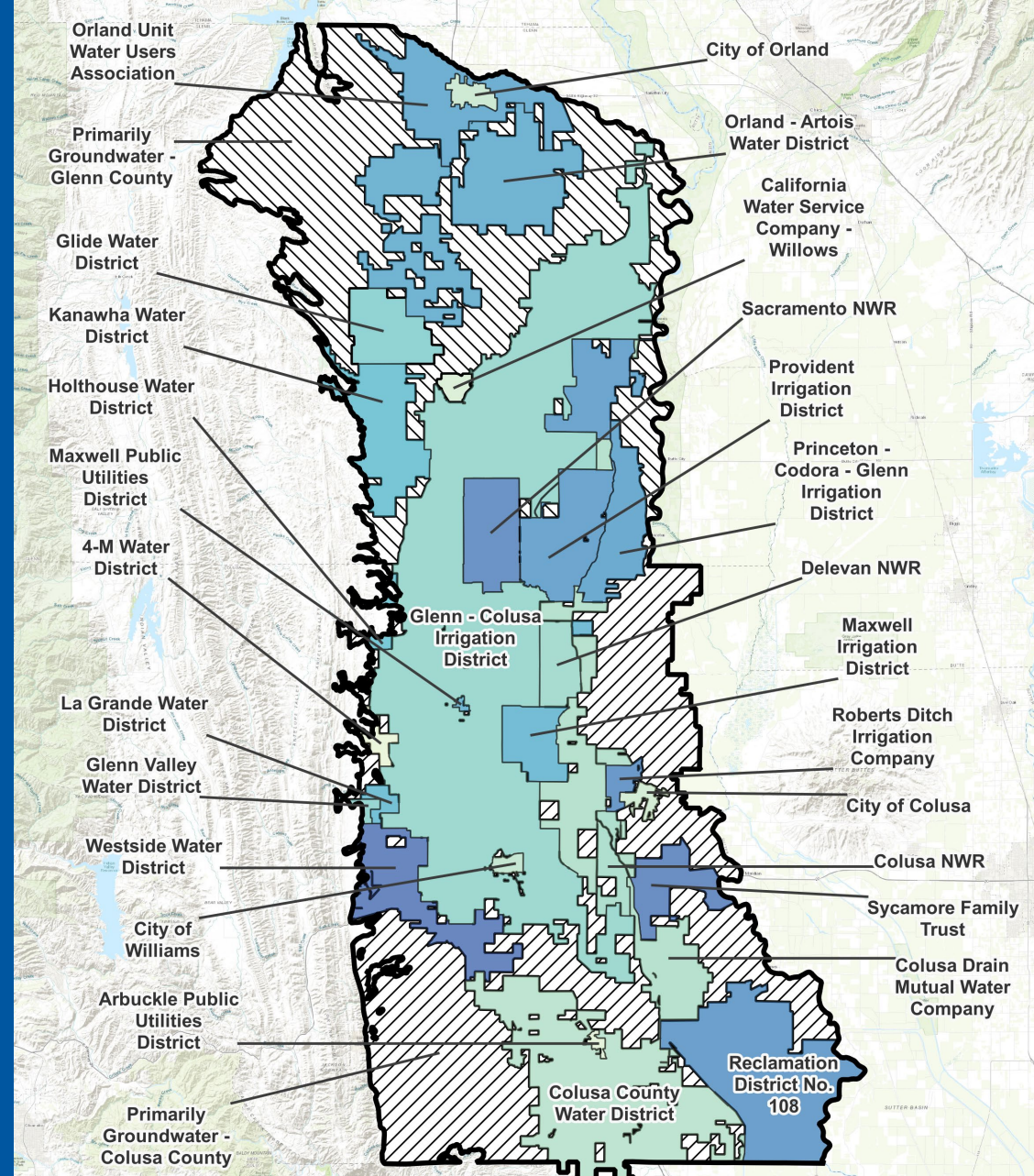
(WY2020 – WY2021 similar to WY 2021 – WY2022)

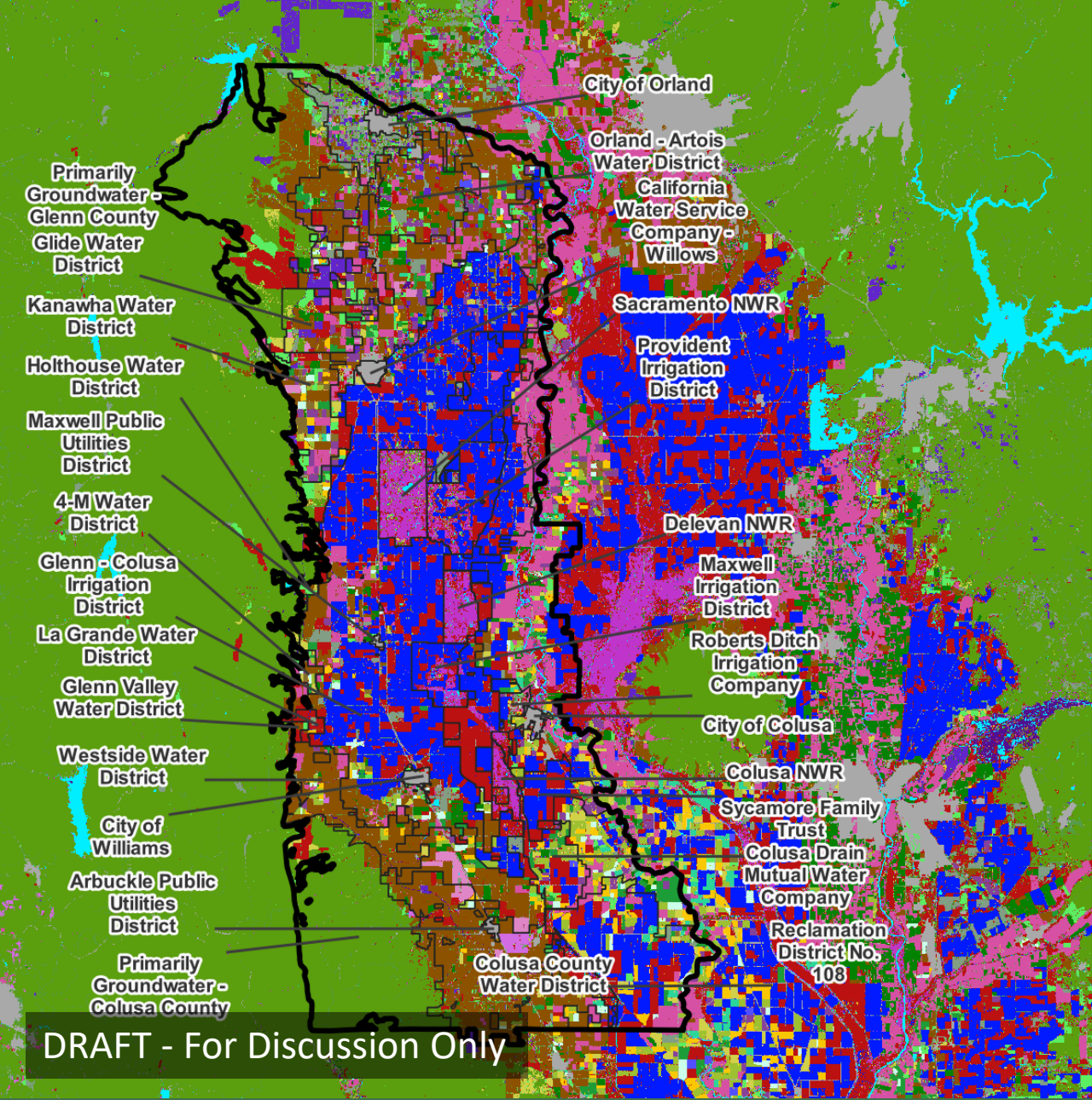
Annual Vertical Displacement (2022)

- Overview
- Groundwater Conditions
- Water Budget
- GSP Implementation

Water Budget

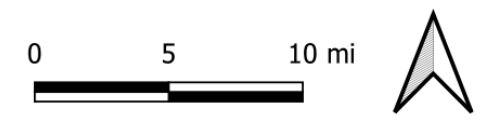
- Monthly timestep
- Based on Evapotranspiration (ET) from OpenET and Precipitation from PRISM
- Results summarized by water budget region and land use classifications





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2021 Land Use and Land Cover

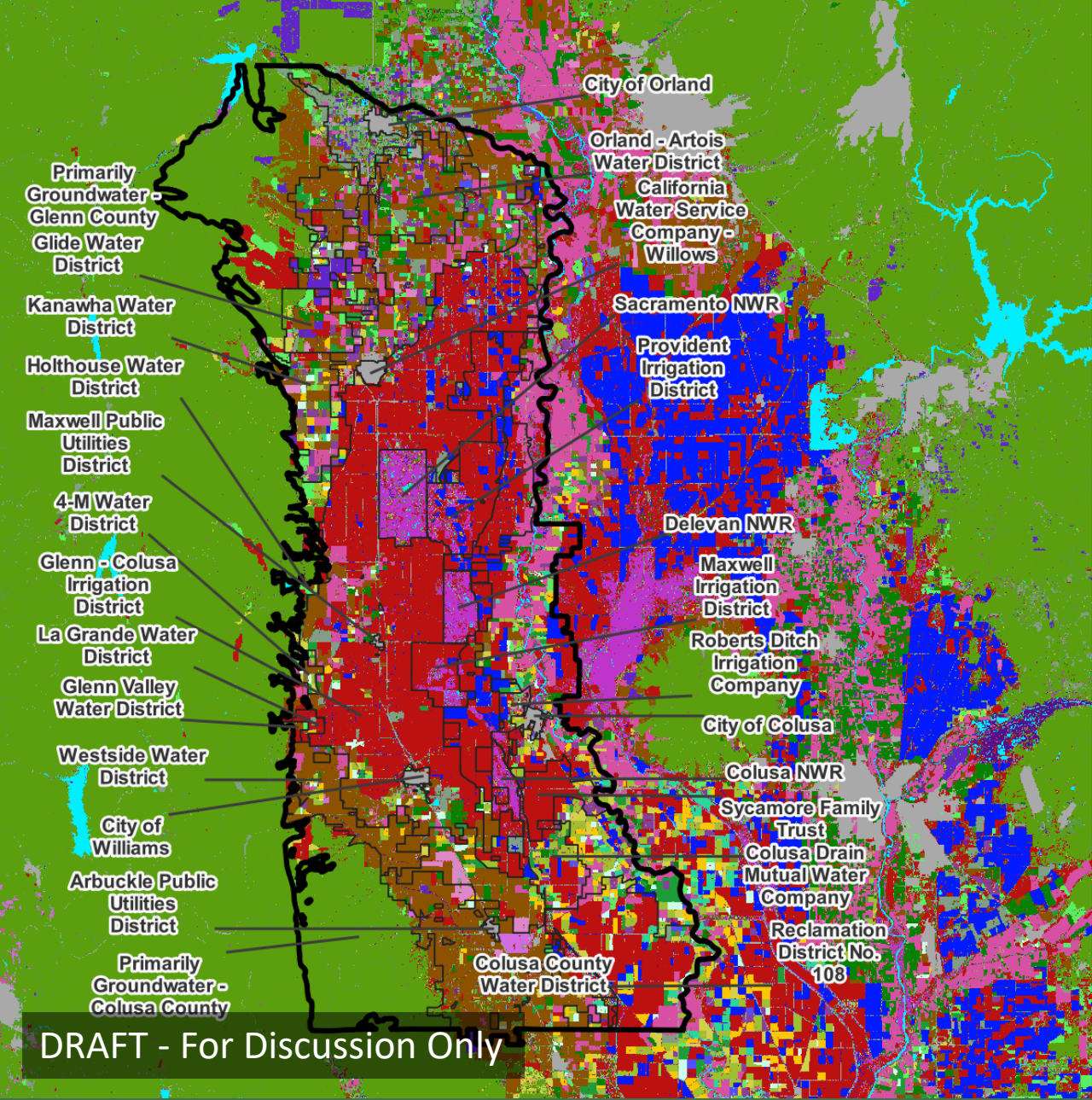


- | | | |
|--------------------------|---|--------------------------|
| Colusa Subbasin | 13-Grapes (Table) | 29-Safflower |
| • Cities | 14-Grapes (Wine) | 30-Semiagricultural |
| Land Use Land Cover | 15-Idle | 31-Sugar Beets |
| 1-Alfalfa | 16-Miscellaneous Deciduous | 32-Sunflower |
| 2-Almonds | 17-Miscellaneous Field Crop | 33-Tomatoes |
| 3-Mature Almonds | 18-Miscellaneous Pasture | 34-Tomatoes (Fresh) |
| 4-Young Almonds | 19-Miscellaneous Truck Crop | 35-Tomatoes (Processing) |
| 5-Citrus and Subtropical | 20-Native Vegetation | 36-Urban |
| 6-Corn | 21-Onions and Garlic | 37-Open Urban |
| 7-Cotton | 22-Pistachios | 38-Walnuts |
| 8-Cucurbits | 23-Potatoes | 39-Water |
| 9-Dry Beans | 24-Rice | 90-Managed Recharge |
| 10-Wheat | 25-Rice (Flooded with Decomposition) | 91-Seasonal Refuge |
| 11-Grain and Hay | 26-Rice (Nonflooded with Decomposition) | 92-Permanent Refuge |
| 12-Grapes | 27-Rice (No Decomposition) | 93-Managed Wetlands |
| | 28-Riparian Vegetation | 900-Barren |

Source: Land use and land cover (LULC) dataset is a combination of DWR Statewide landuse data from 2019 and USDA CropScope data from 2022. DWR 2019 is given preference over 2022 CropScope, except in the case of rice, where following from CropScope is used.

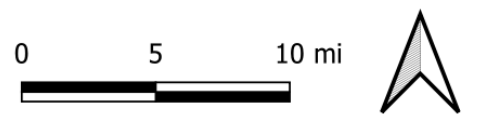
Datums: NAD 1983(2011), California State Plane Zone II





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2022 Land Use and Land Cover



- | | | |
|--------------------------|---|--------------------------|
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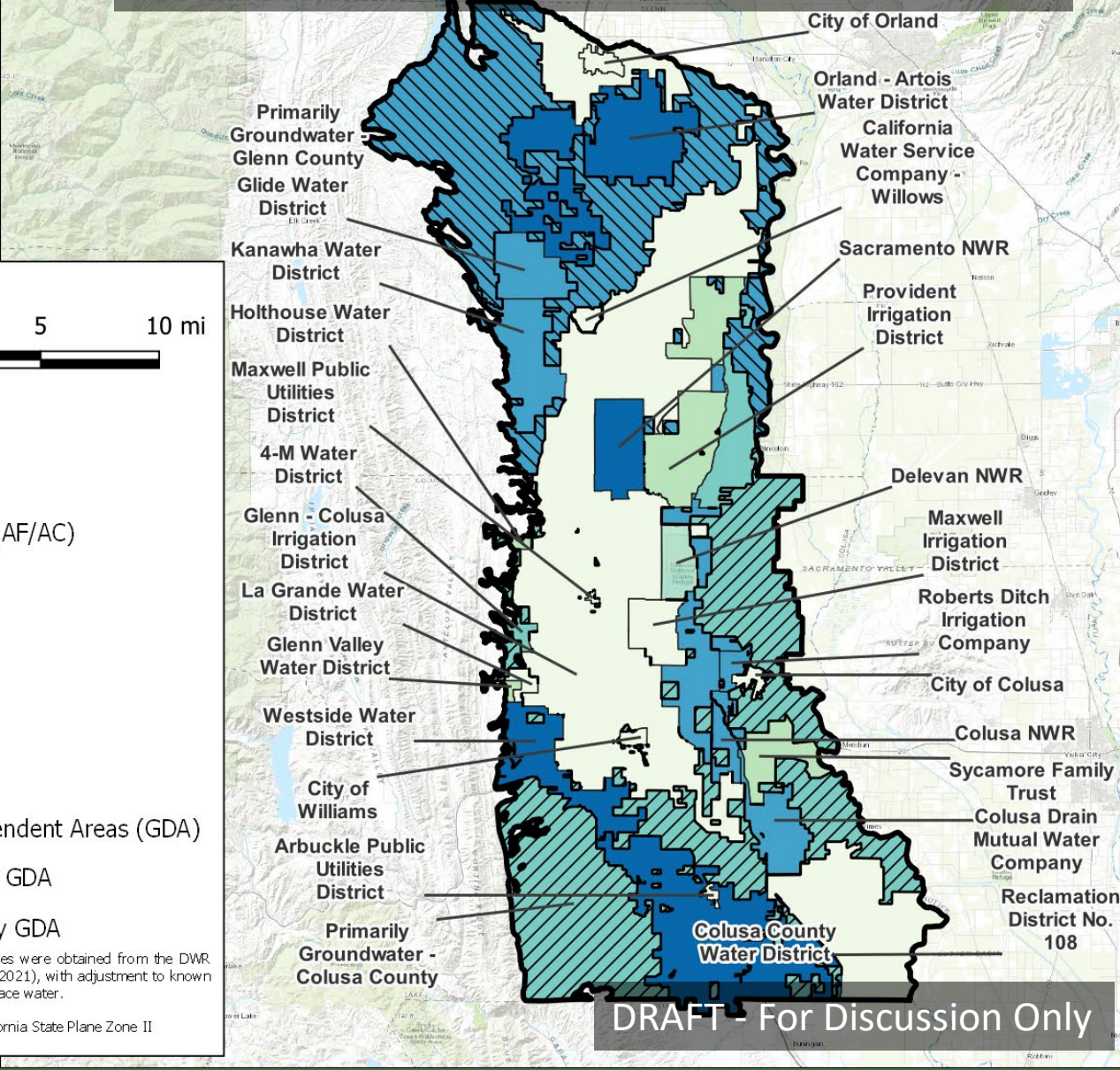
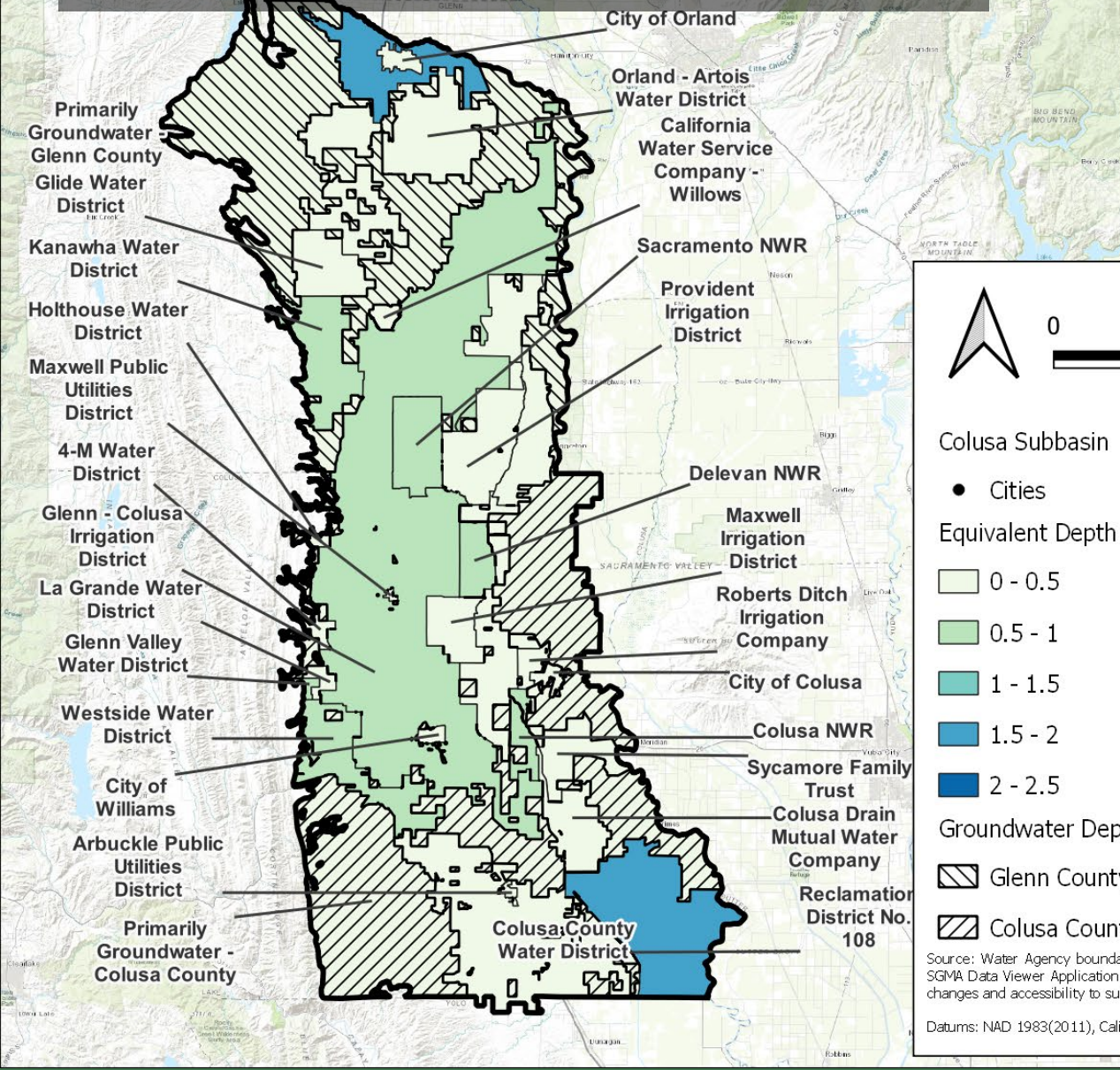


Water Use Sector	Groundwater Extraction, 2022 (acre-feet, rounded)	Measurement Method	Description
Agricultural	832,000	Estimate	Estimated from water budget (based on land use, ET, consumptive use fraction, and surface water supplies)
	4,480	Direct	Flowmeter records
Urban	6,000	Estimate	Estimated based on population and per capita water use requirements
	4,930	Direct	Flowmeter records
Managed Wetlands	47,000	Estimate	Estimated from water budget (based on land use, ET, consumptive use fraction, surface water supplies)
Native Vegetation	-	Estimate	No noted groundwater extraction for native vegetation, per GSP analyses
Colusa Subbasin	Groundwater Extraction, 2022 (acre-feet, rounded)	Estimated Uncertainty	Uncertainty Source
Total	894,000	20%	Volume-weighted combined uncertainty of water budget estimates (approximately 20%) and flowmeter records (approximately 5%)

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Estimated Applied Surface Water (AF/AC) (WY2022)

Estimated Groundwater Extraction (AF/AC) (WY2022)



0 5 10 mi

Colusa Subbasin

- Cities

Equivalent Depth (AF/AC)

- 0 - 0.5
- 0.5 - 1
- 1 - 1.5
- 1.5 - 2
- 2 - 2.5

Groundwater Dependent Areas (GDA)

- Glenn County GDA
- Colusa County GDA

Source: Water Agency boundaries were obtained from the DWR SGMA Data Viewer Application (2021), with adjustment to known changes and accessibility to surface water.

Datums: NAD 1983(2011), California State Plane Zone II

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- Overview
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GSP Implementation

- Updates discussed in the DRAFT Annual Report (Section 7)
- Highlights in 2022:
 - Submitted SGMA Implementation Round 2 grant application in December 2022
 - Funding and Financing Plan efforts
 - Progress noted for seven projects and management actions, 8,400 AF of benefits
 - Development of new projects and management actions since GSP development:
 - GGA Recharge Project
 - Spring Valley Recharge Project
 - Others refined in the Round 2 grant application

Main point: Surface water reliability is critical to groundwater sustainability (and economic and environmental vitality)!

Reduced SW supplies
(Hydrological/Regulatory
Drought)



Mitigation Strategy 1:
Fallow Agricultural Lands

Mitigation Strategy 2:
Increase GW Extractions



Adverse Economic
Impacts

Adverse Ecological
Impacts

Increasing Subsidence
Rates

Lowering GW Levels and
Storage

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Western Water Since 1993