Colusa Subbasin Water Year 2022 Update

Davids Engineering and LSCE

04/20/2023

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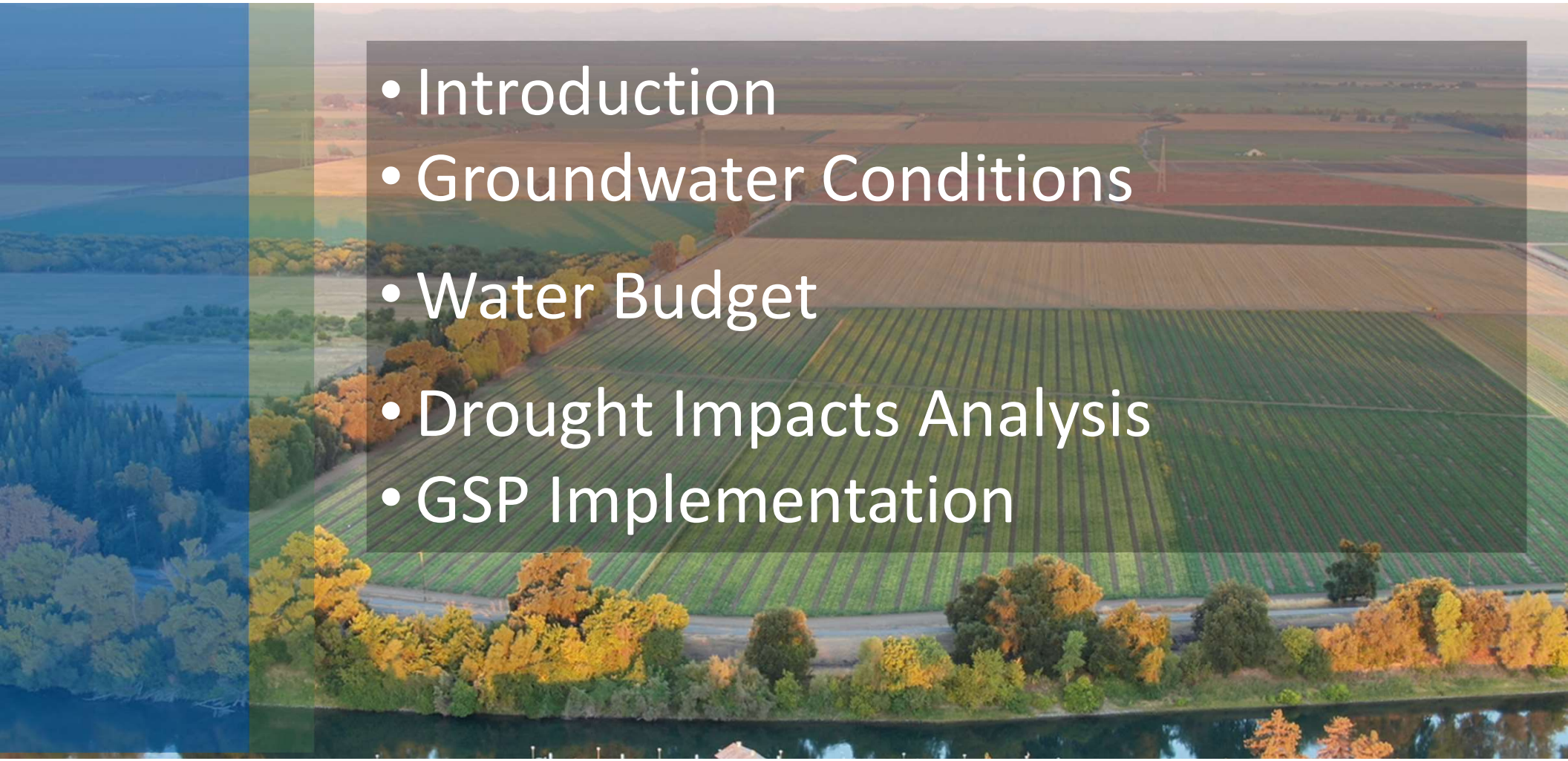

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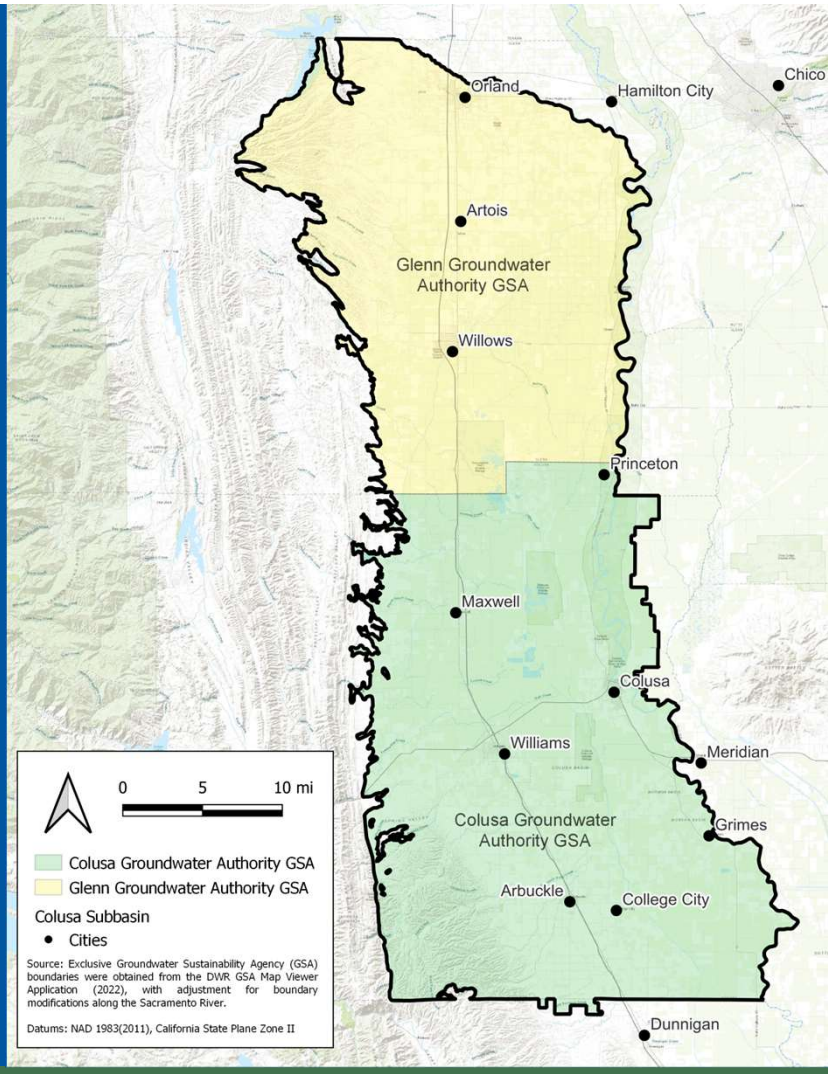
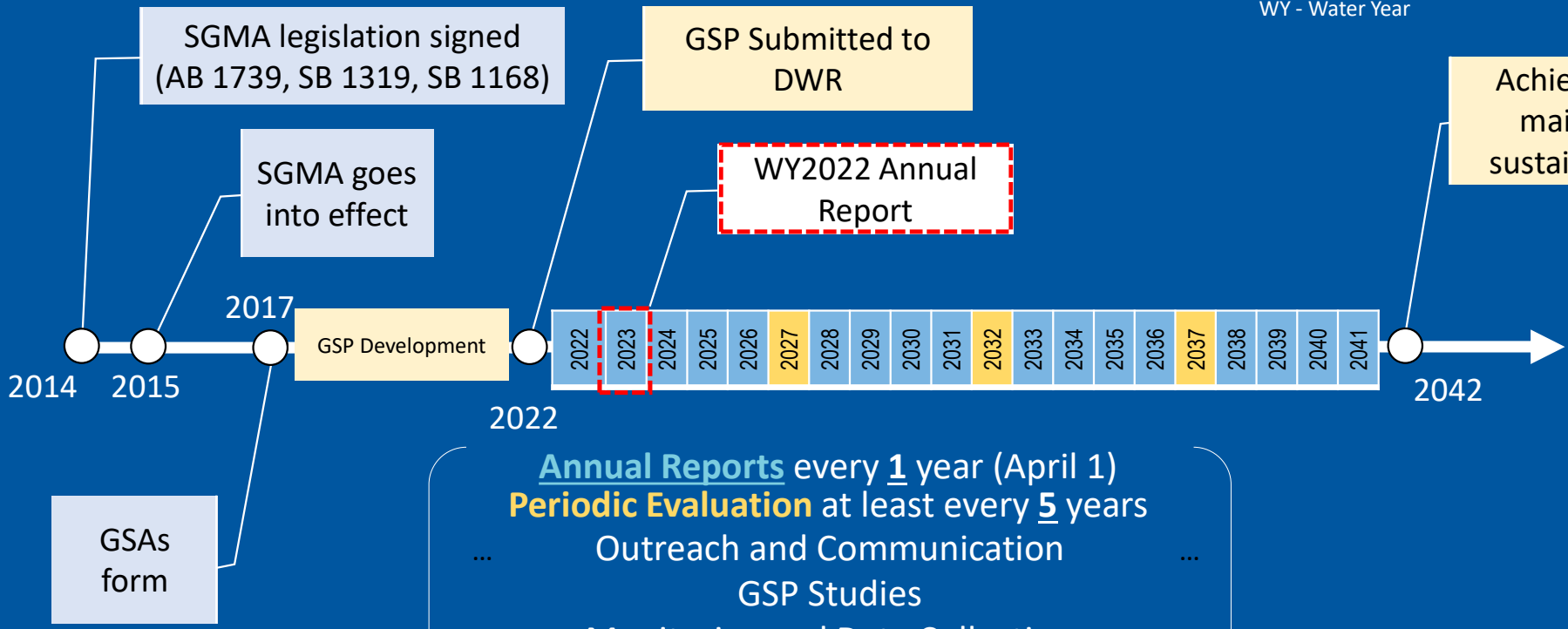
Colusa Subbasin Groundwater Sustainability Plan (GSP)

- The **GSP is a dynamic planning document** that guides how groundwater conditions are monitored and managed in the Colusa Subbasin.
  - Initial GSP development: 2016-2022
  - GSP implementation: 2022-2042
- As conditions change and data gaps are filled, the GSP will be updated.



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

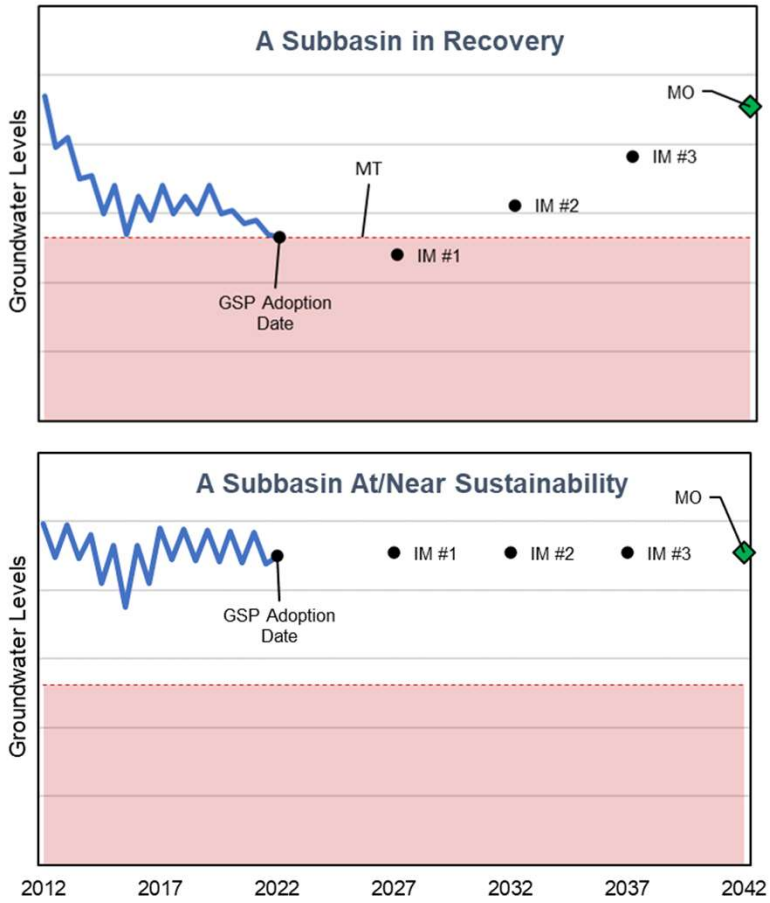


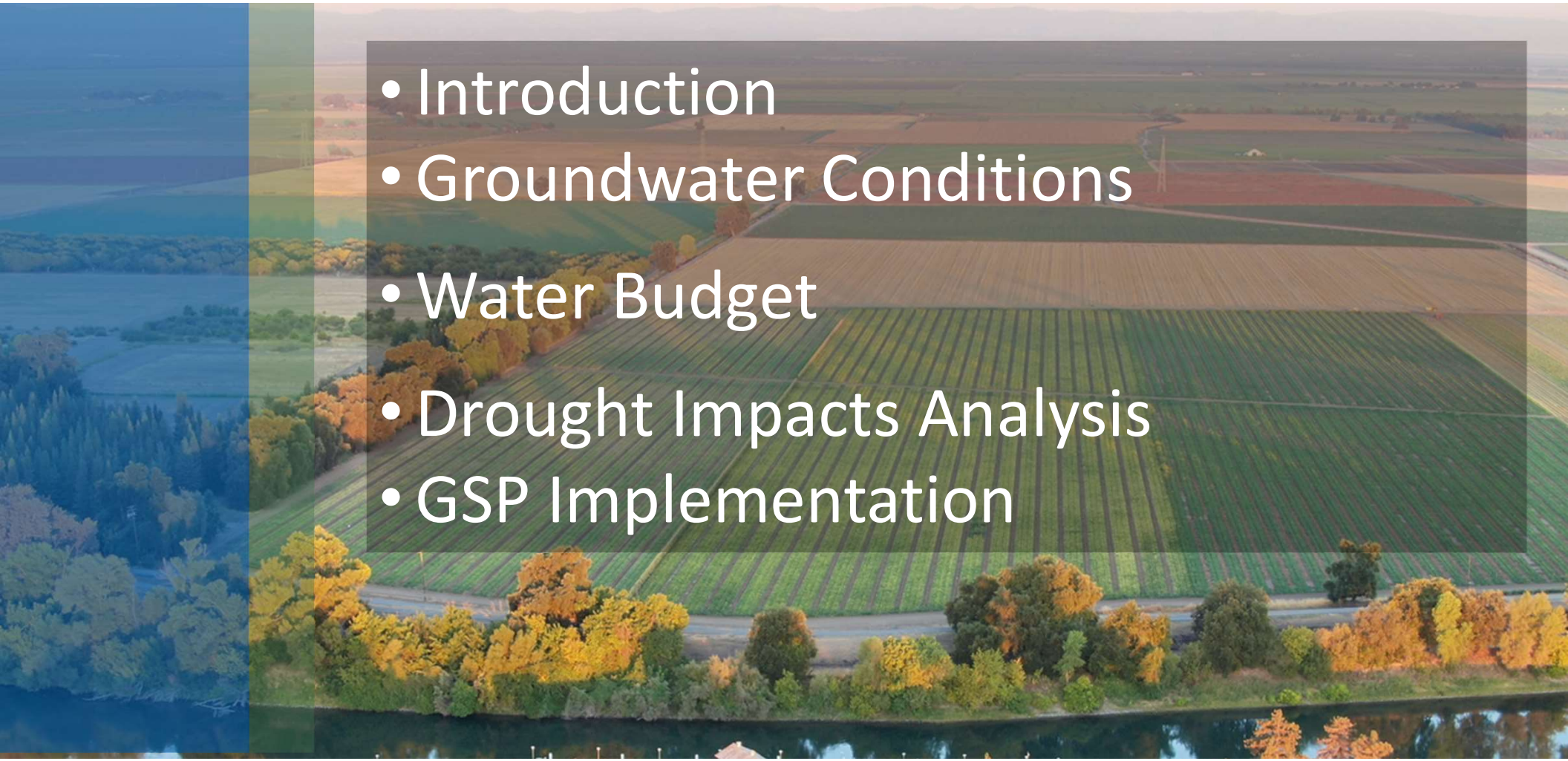
Annual Reports every 1 year (April 1)
Periodic Evaluation at least every 5 years
... Outreach and Communication ...
GSP Studies
Monitoring and Data Collection
Projects and Management Actions

Sustainable Management Criteria

- Quantitative and measurable criteria for monitoring "sustainable" conditions.
  - Measurable Objectives (MOs): Goal by 2042
  - Interim Milestones (IMs): Steps toward MOs
  - Minimum Thresholds (MTs): Undesirable conditions
- Sustainable management criteria created for five sustainability indicators

Focus of this presentation





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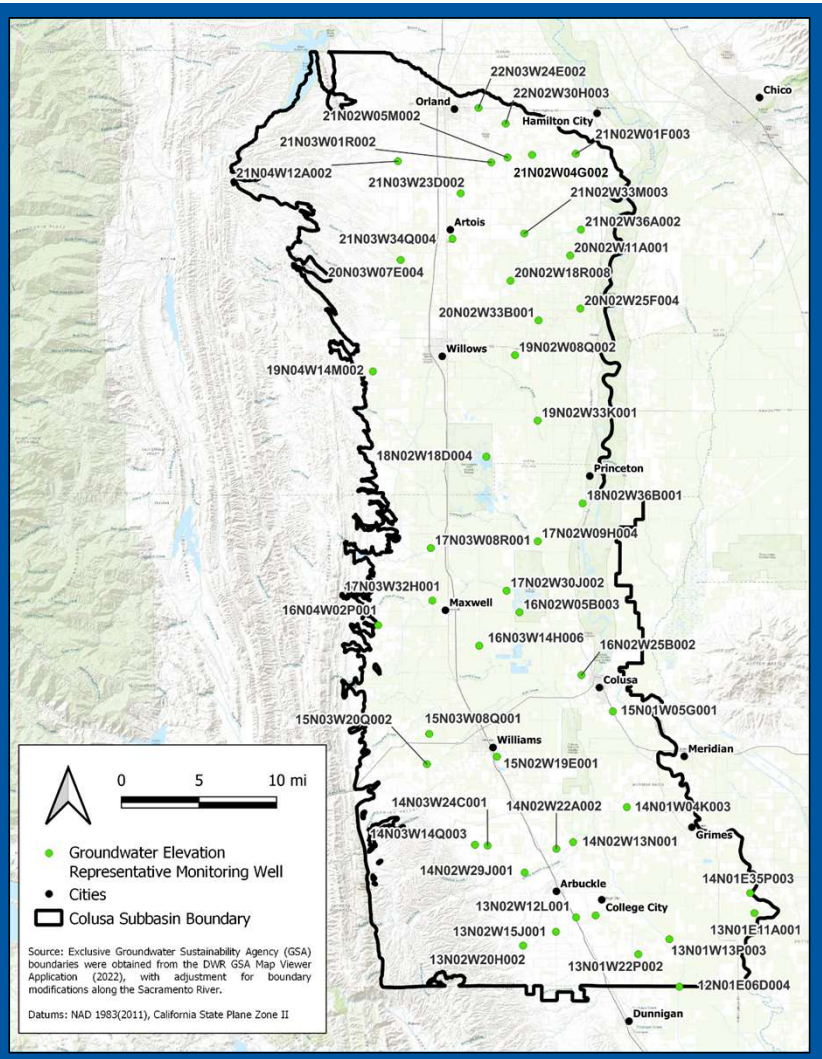
Groundwater Conditions

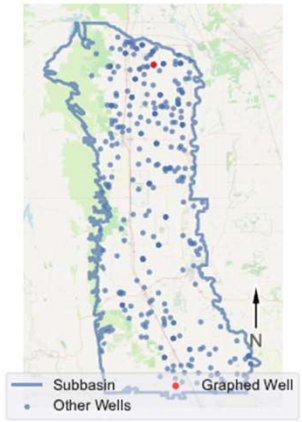
- Groundwater elevations (48 Representative Monitoring Site Wells (RMS Wells)
- Groundwater storage
- Subsidence



Source: WY2022 Annual Report Section 1.2

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

Well Location Map



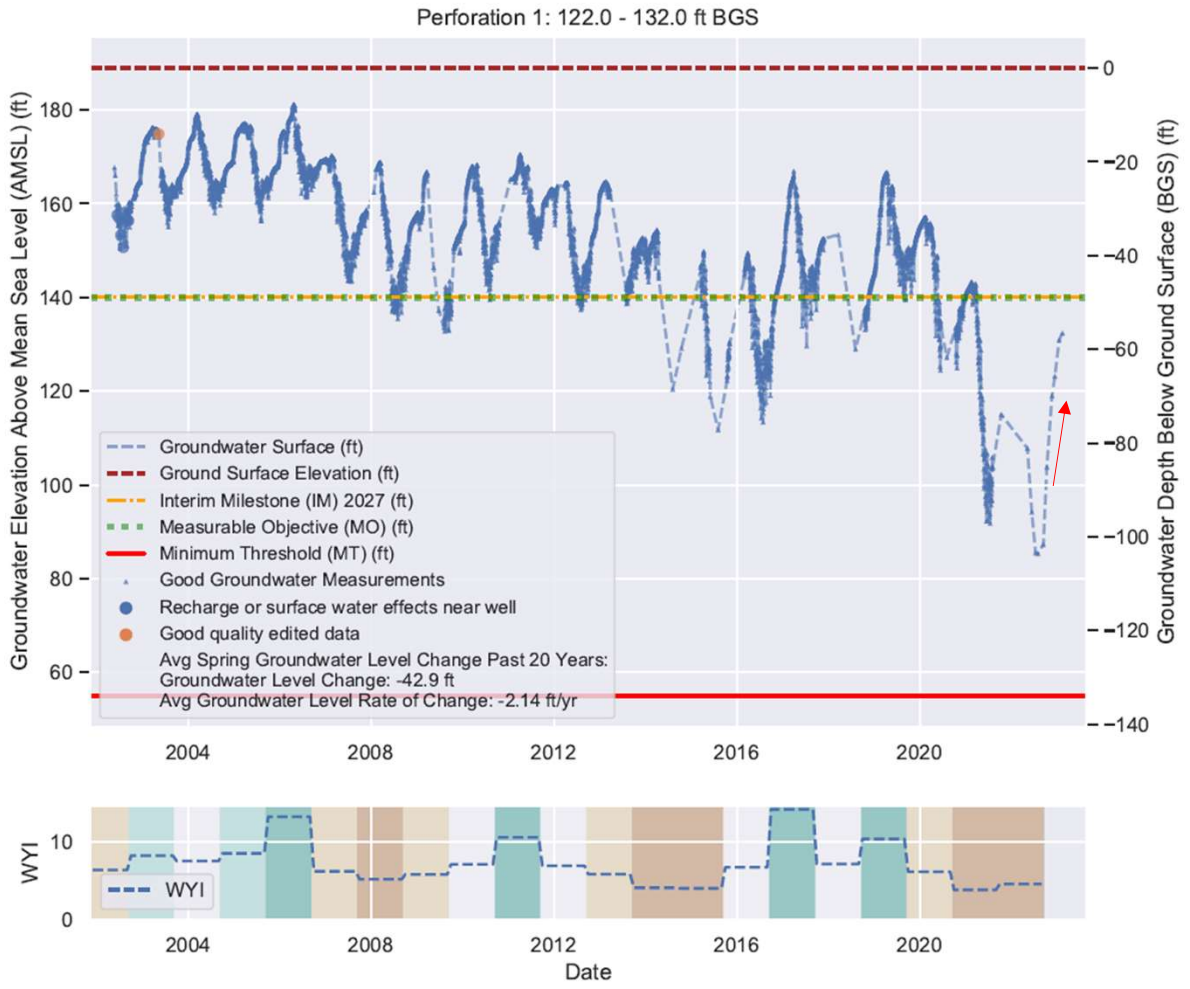
Sustainable Management Criteria:

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.

- Wet (W)
- Above Normal (AN)
- Below Normal (BN)
- Dry (D)
- Critical (C)



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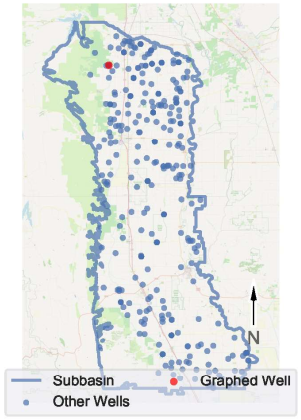
Source: WY2022 Annual Report Appendix B

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

Well Location Map



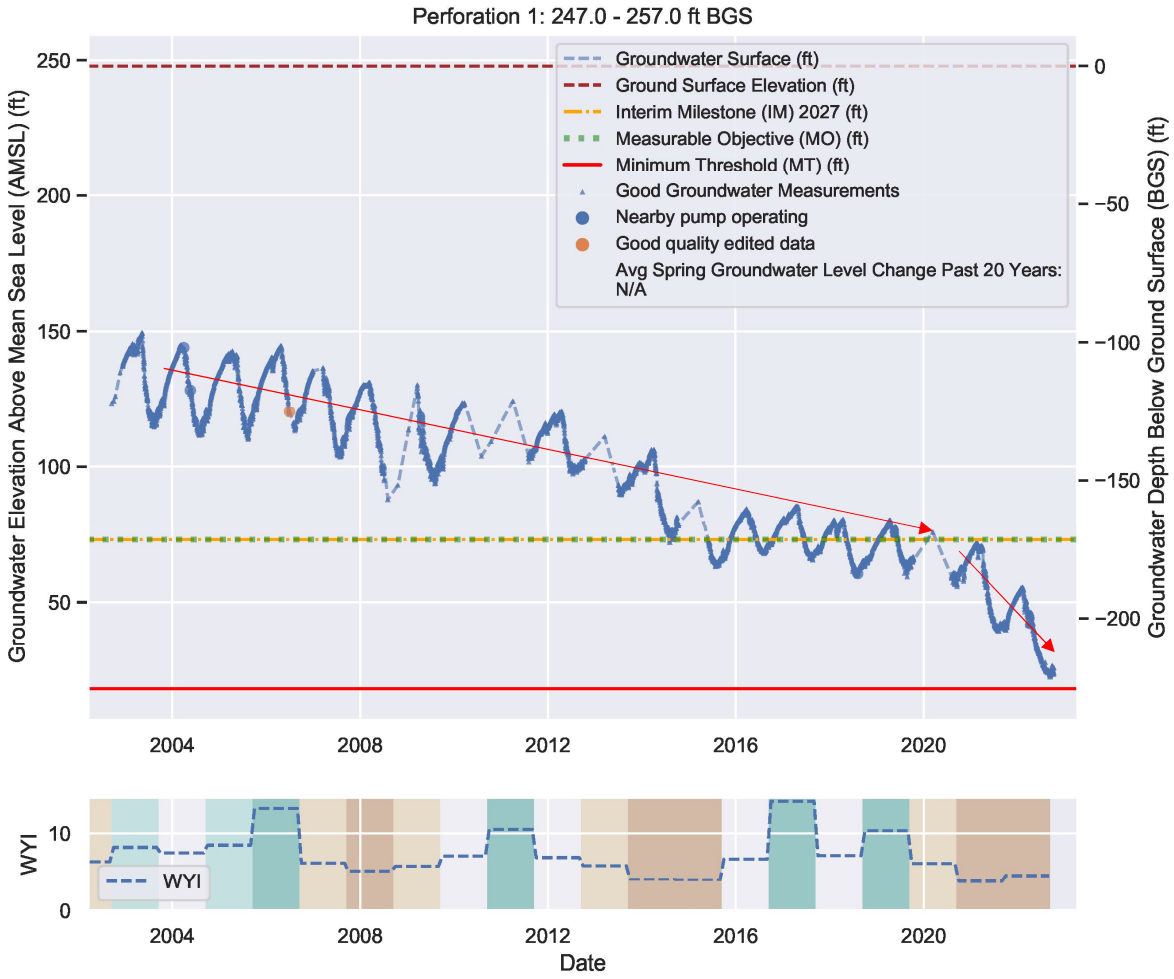
Sustainable Management Criteria:

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.

- Wet (W)
- Above Normal (AN)
- Below Normal (BN)
- Dry (D)
- Critical (C)



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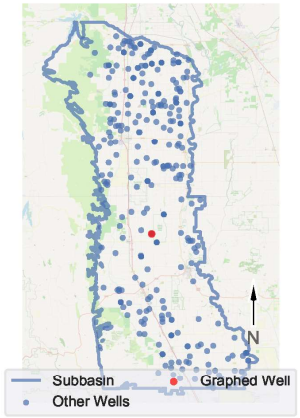
Source: WY2022 Annual Report Appendix B

COLUSA Subbasin - State Well Number (SWN): 17N02W30J002M

Well Location Map



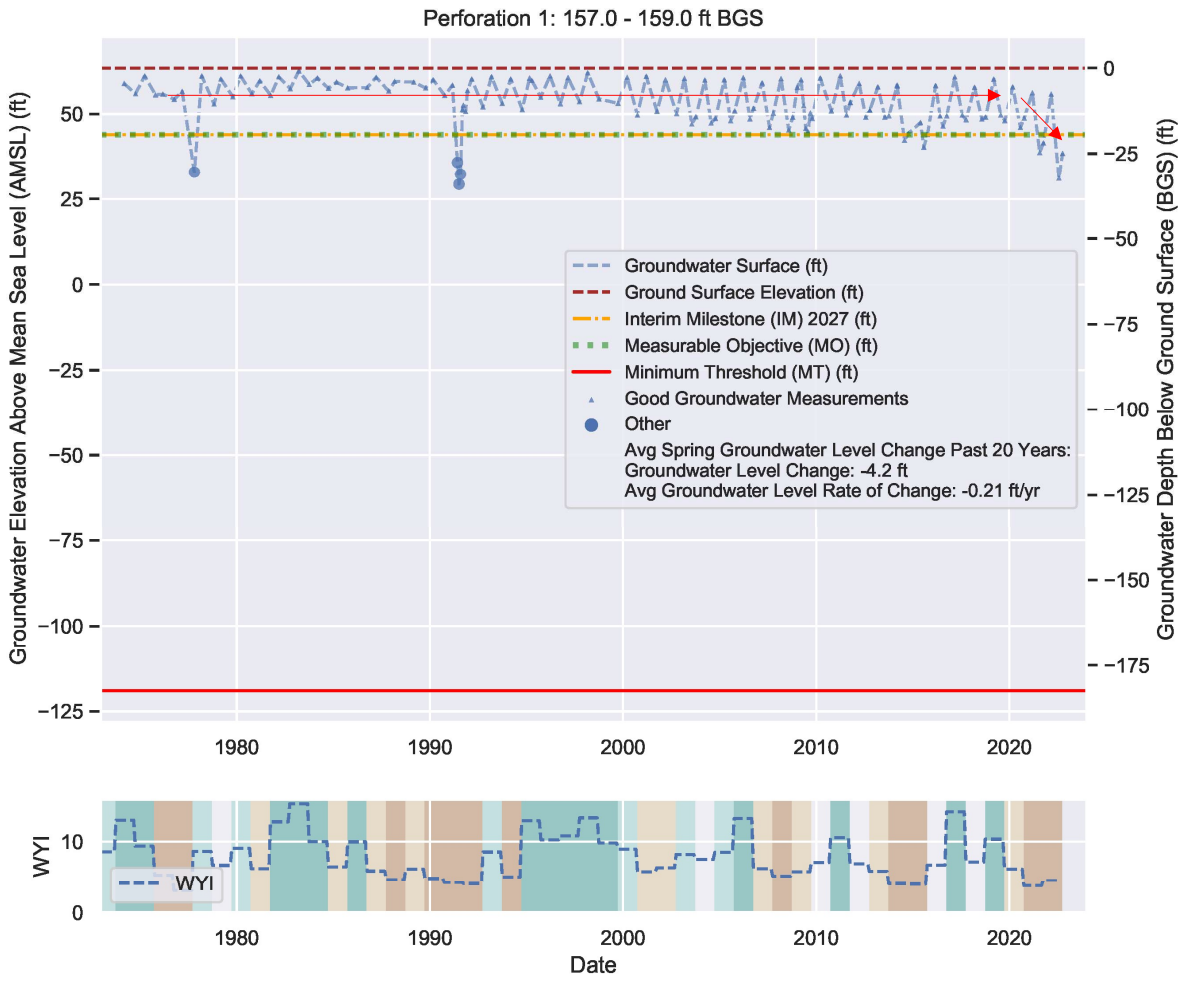
Sustainable Management Criteria:

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.

- Wet (W)
- Above Normal (AN)
- Below Normal (BN)
- Dry (D)
- Critical (C)



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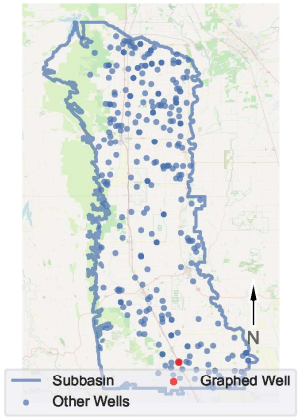
Source: WY2022 Annual Report Appendix B

COLUSA Subbasin - State Well Number (SWN): 13N02W12L001M

Well Location Map



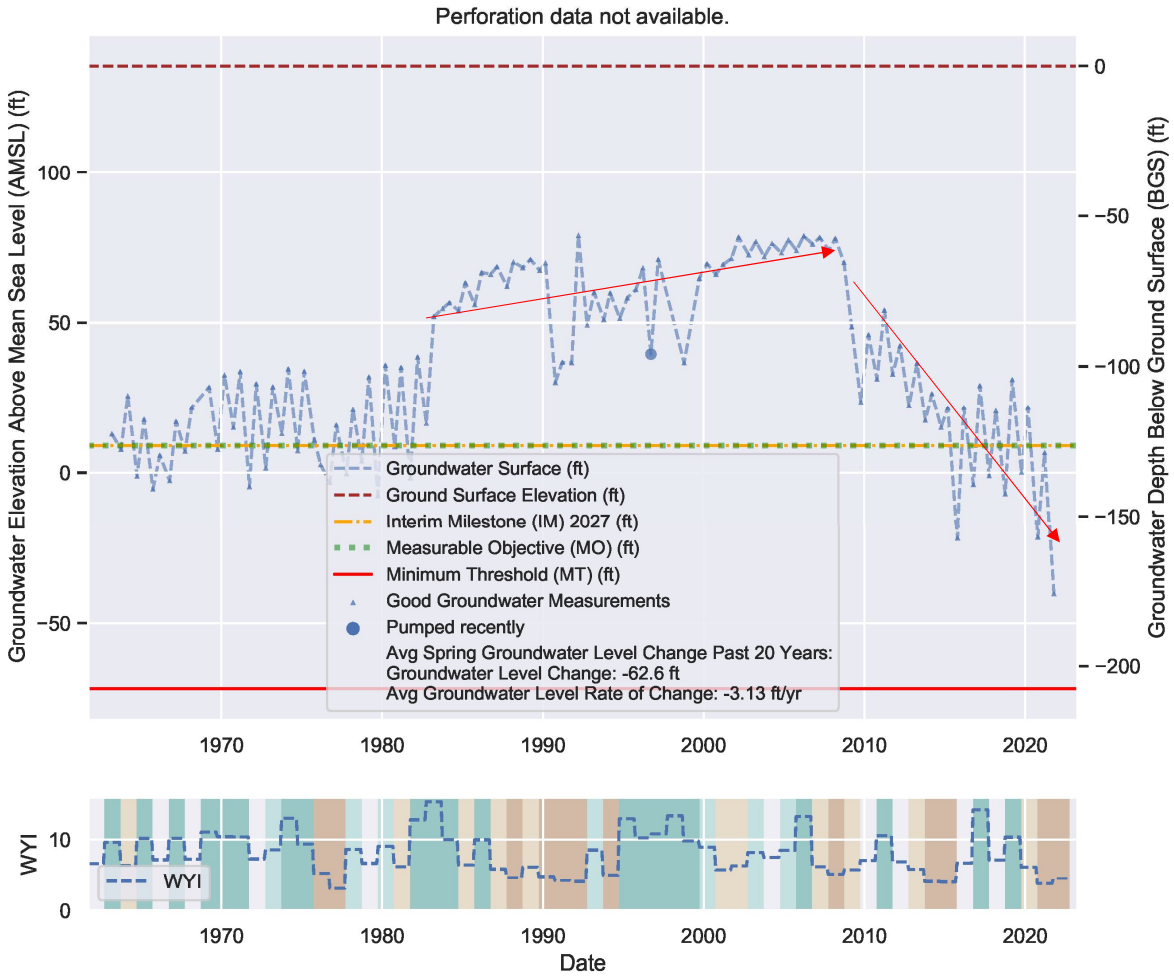
Sustainable Management Criteria:

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.

- Wet (W)
- Above Normal (AN)
- Below Normal (BN)
- Dry (D)
- Critical (C)



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Source: WY2022 Annual Report Appendix B

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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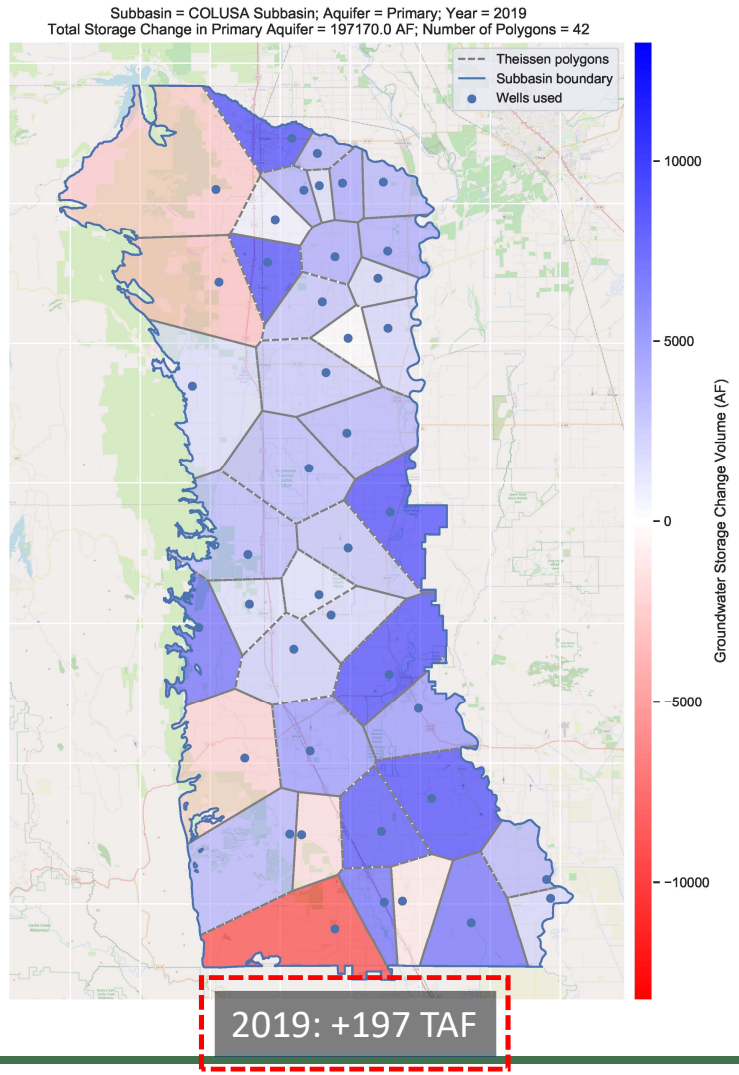
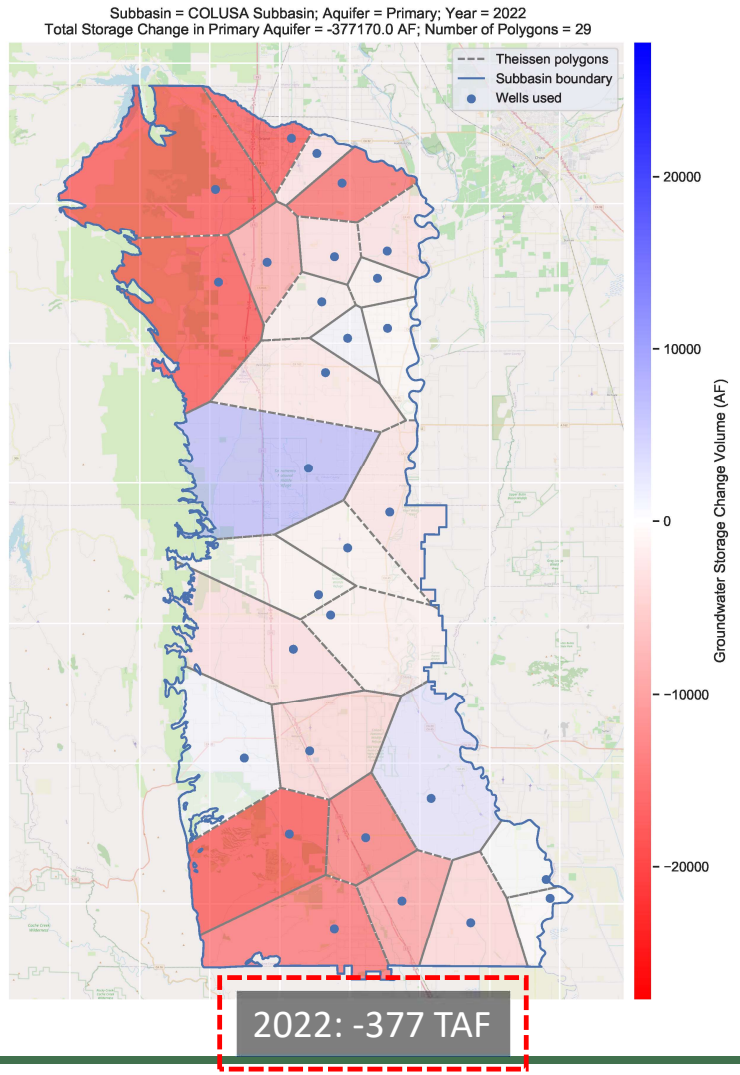


2019: +197 TAF



2022: -377 TAF

Source: WY2022 Annual Report Section 6

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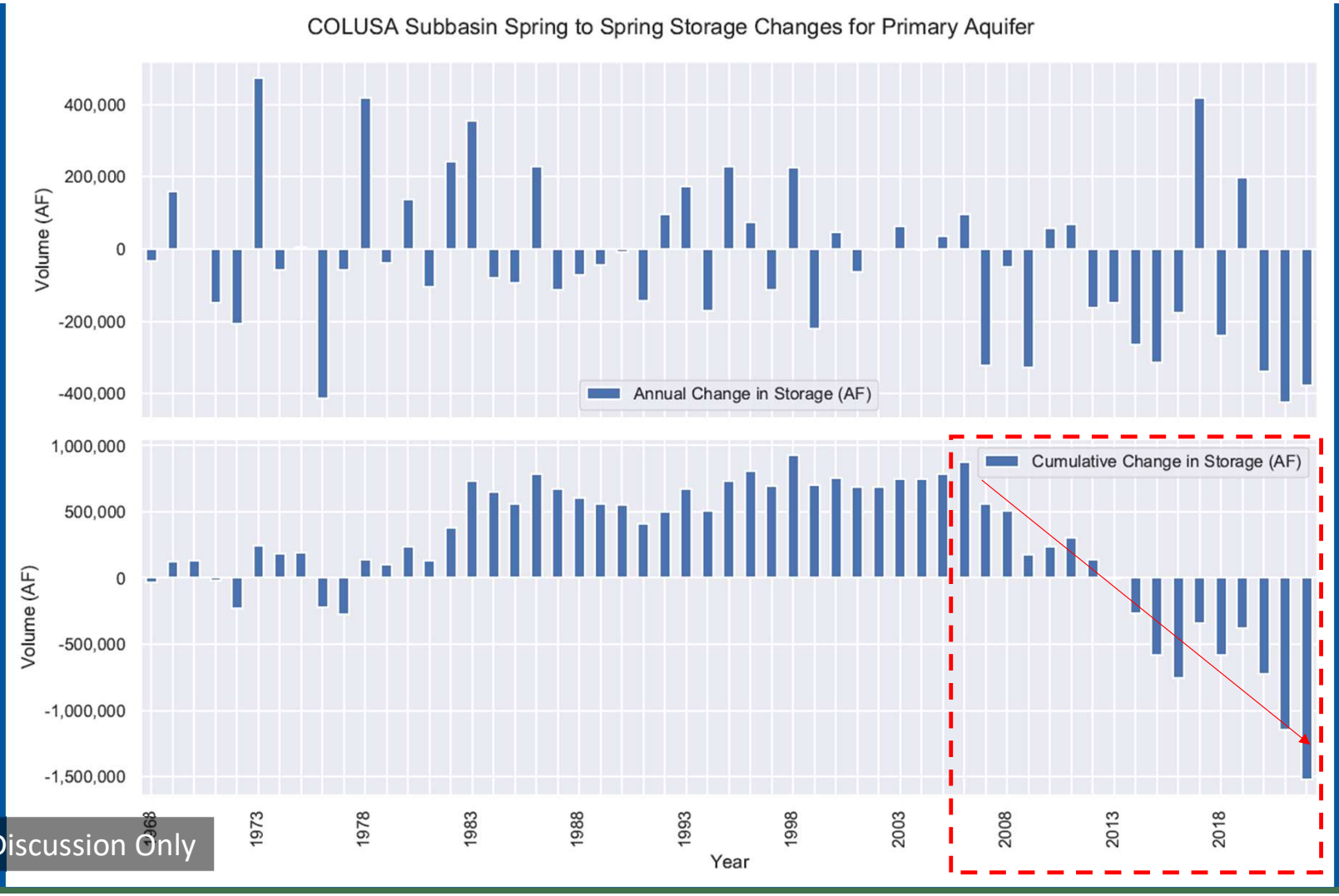

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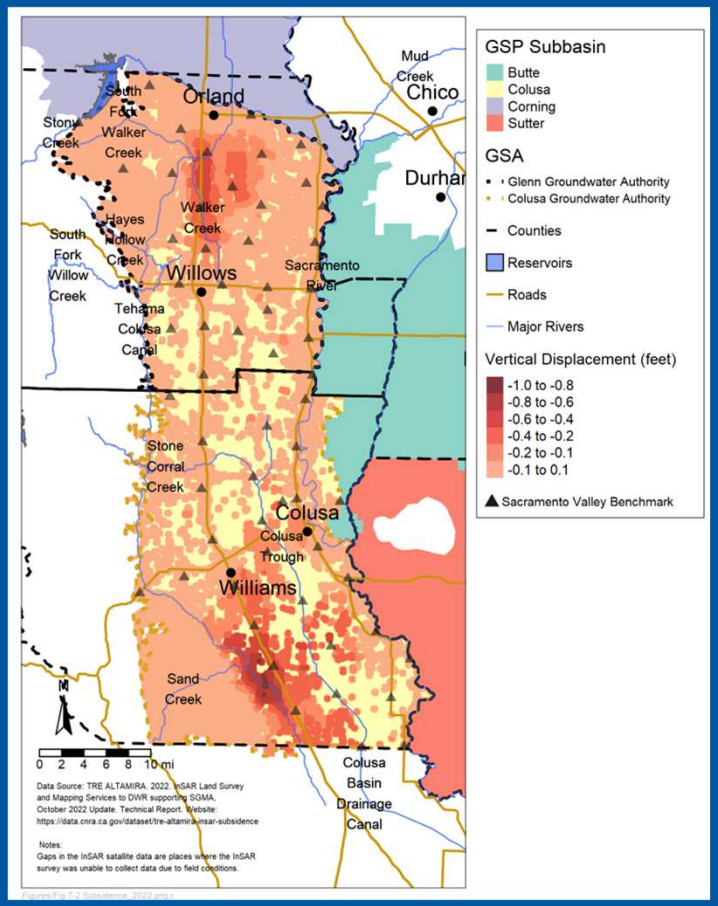
Source: WY2022 Annual Report Section 6

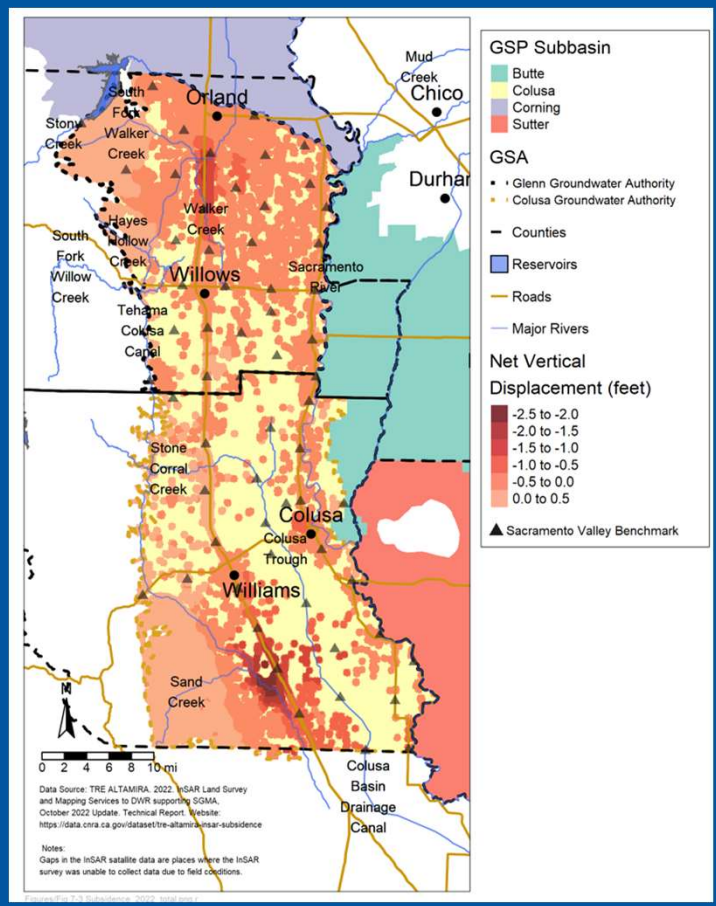
Subsidence

- 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

Interferometric Synthetic Aperture Radar (InSAR)



Annual Vertical Displacement (2022)



Net Vertical Displacement (2015 - 2022)

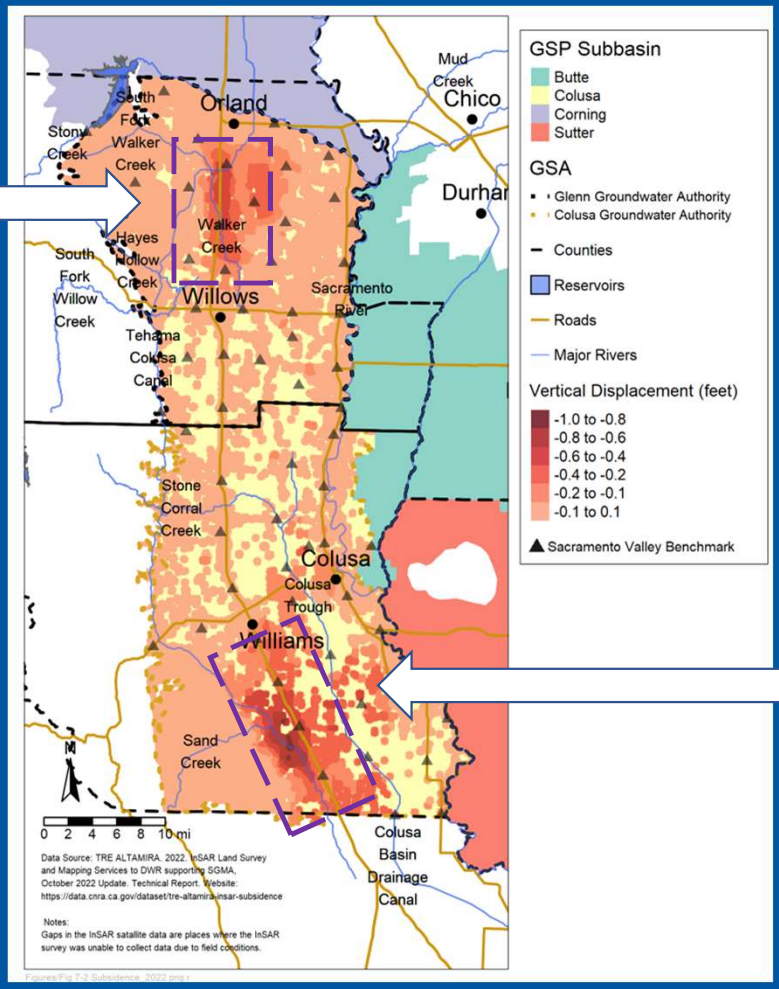
Source: WY2022 Annual Report Section 7

Subsidence

North of Willows/South of Orland

Max. = 0.4 feet (WY2020-WY2021)

Max. = 0.6 feet (WY2021-WY2022)



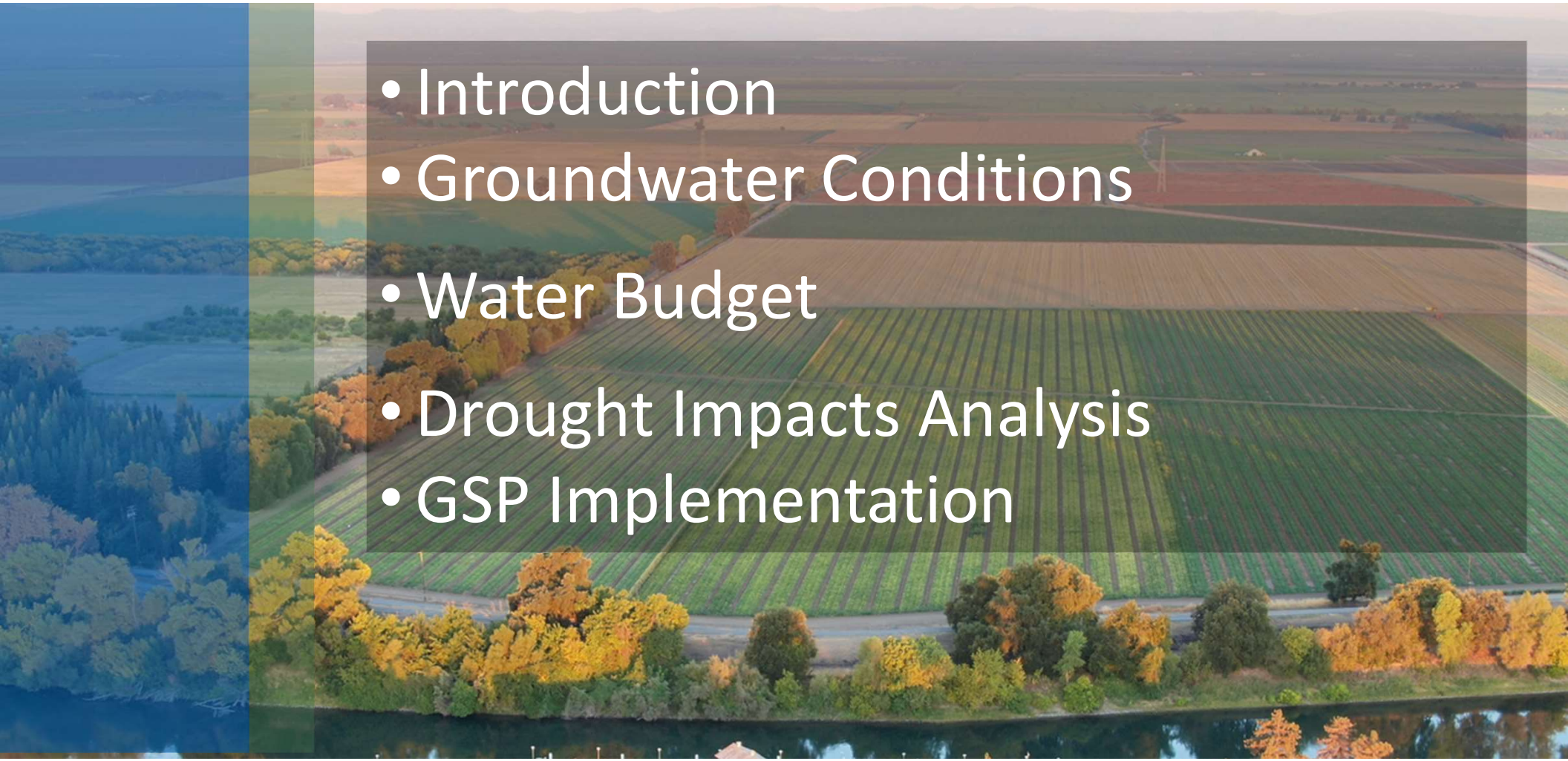
Annual Vertical Displacement (2022)

Arbuckle Area

0.4 feet to 0.8 feet

(WY2020 – WY2021 similar to WY 2021 – WY2022)

Source: WY2022 Annual Report Section 7



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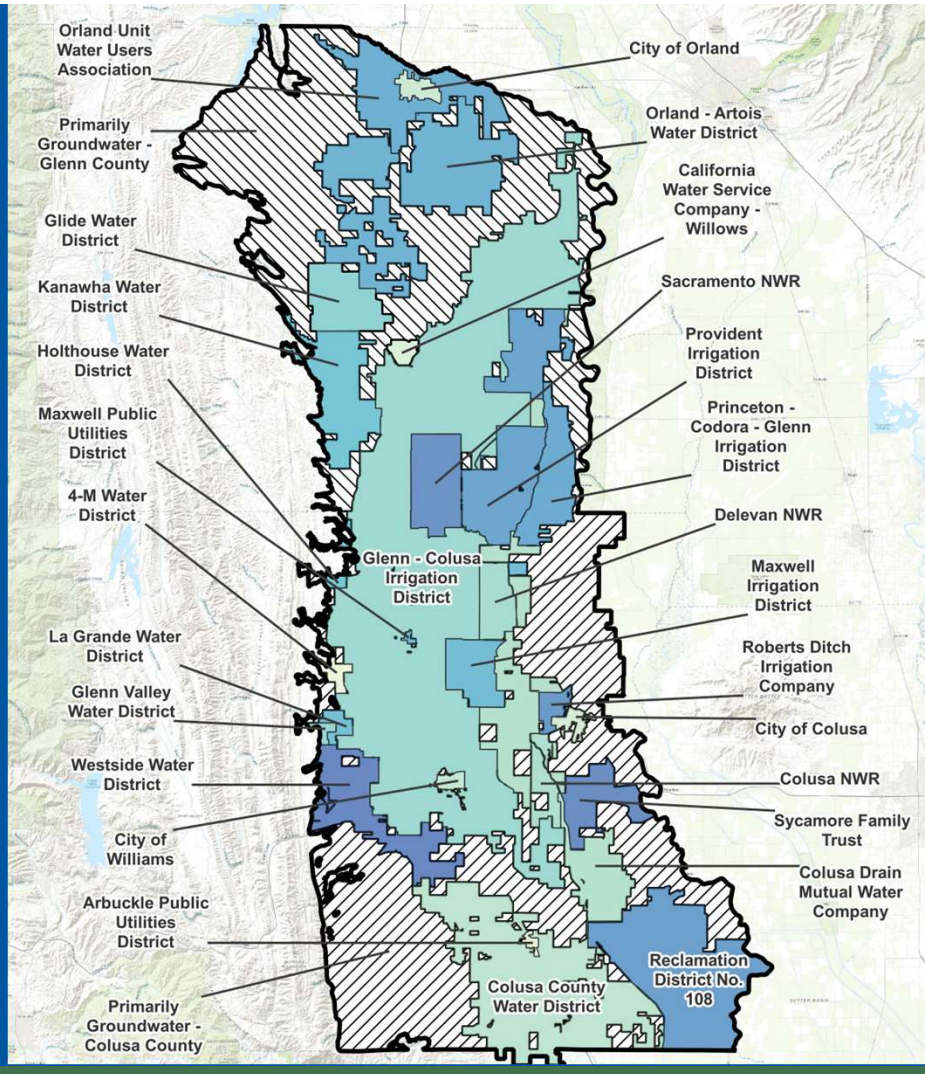
Water Budget

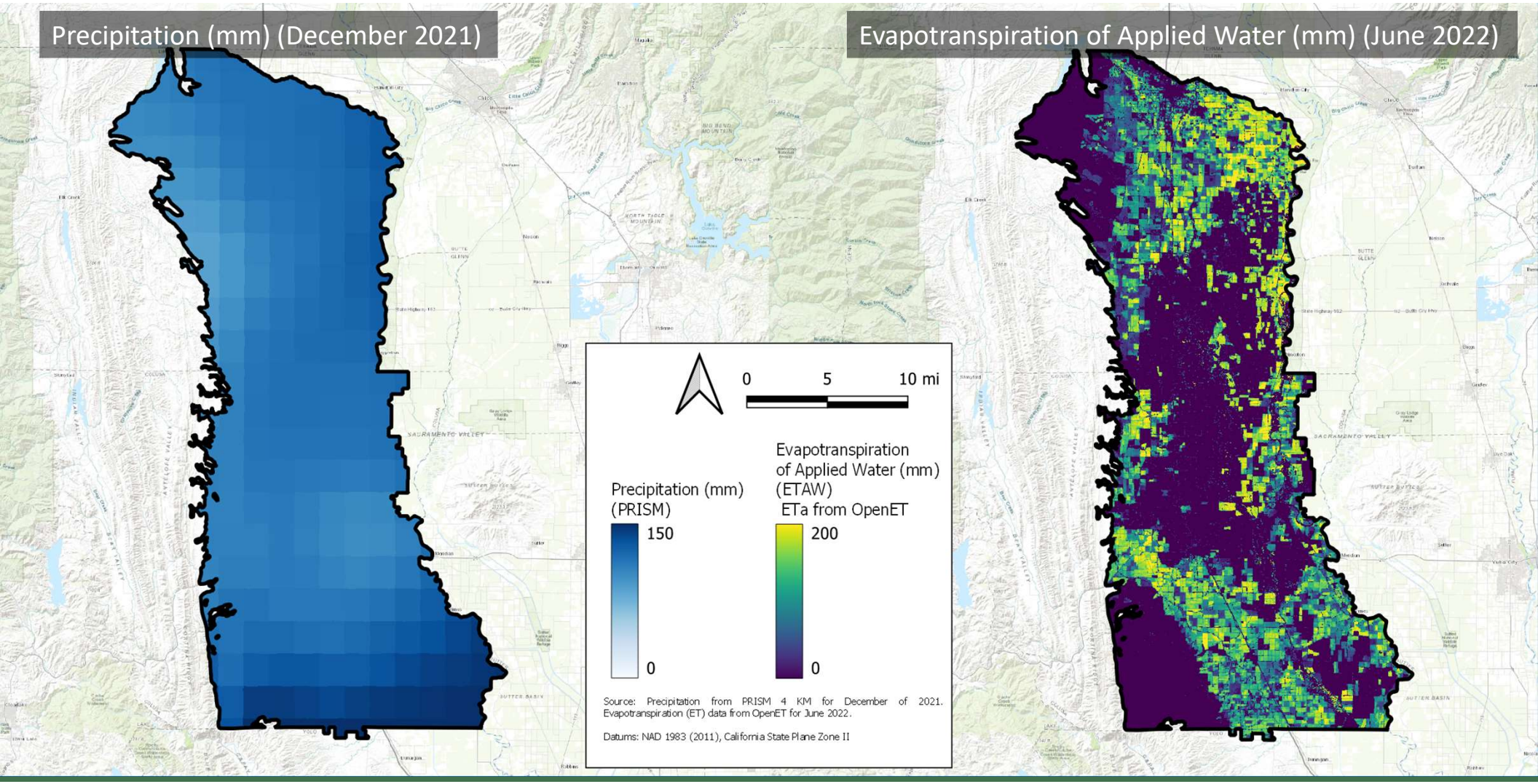
- Monthly timestep
- Based on Evapotranspiration (ET) from OpenET and Precipitation from PRISM
- Results summarized by water budget region and land use classifications

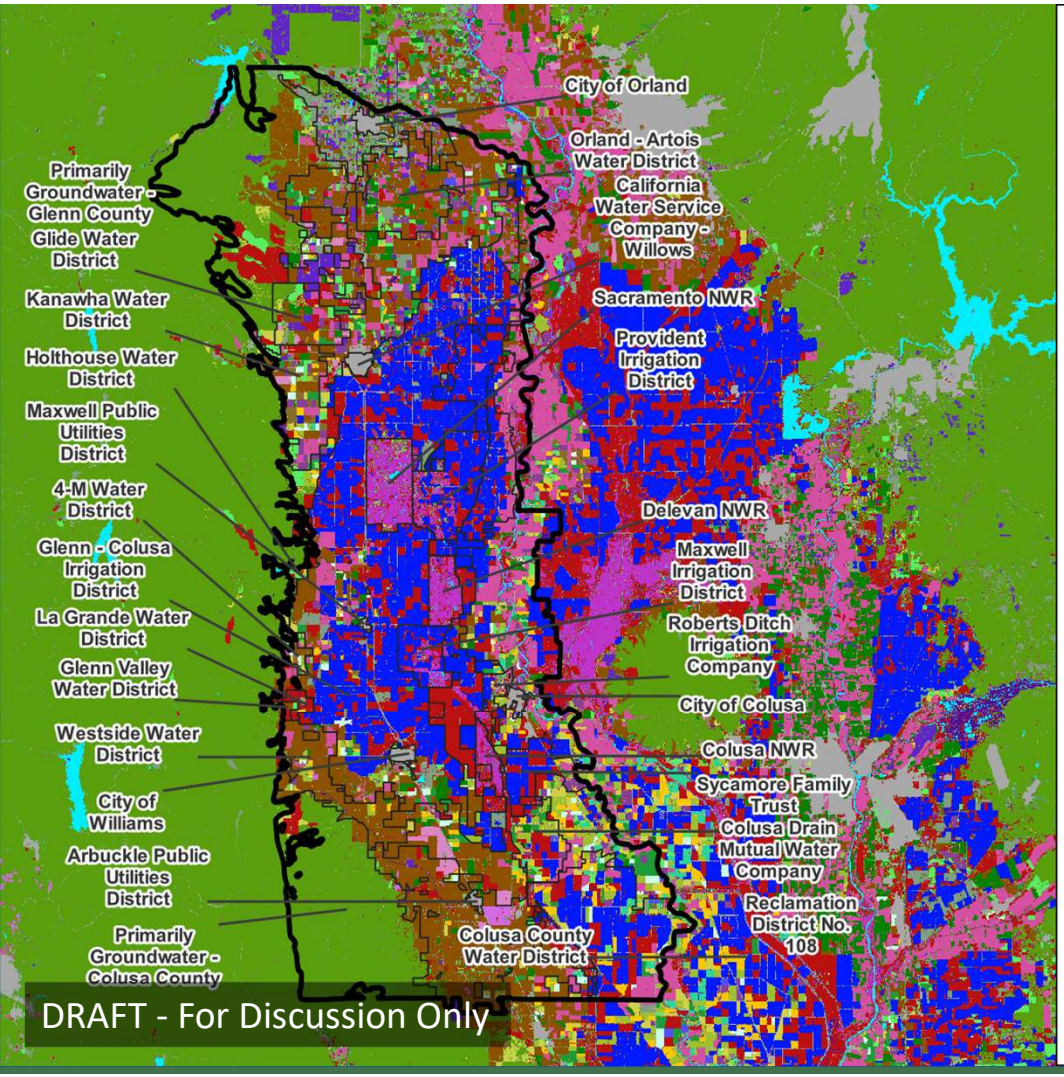


Source: WY2022 Annual Report Section 2

Precipitation (mm) (December 2021)

Evapotranspiration of Applied Water (mm) (June 2022)





2021 Land Use and Land Cover

0 5 10 mi

Colusa Subbasin

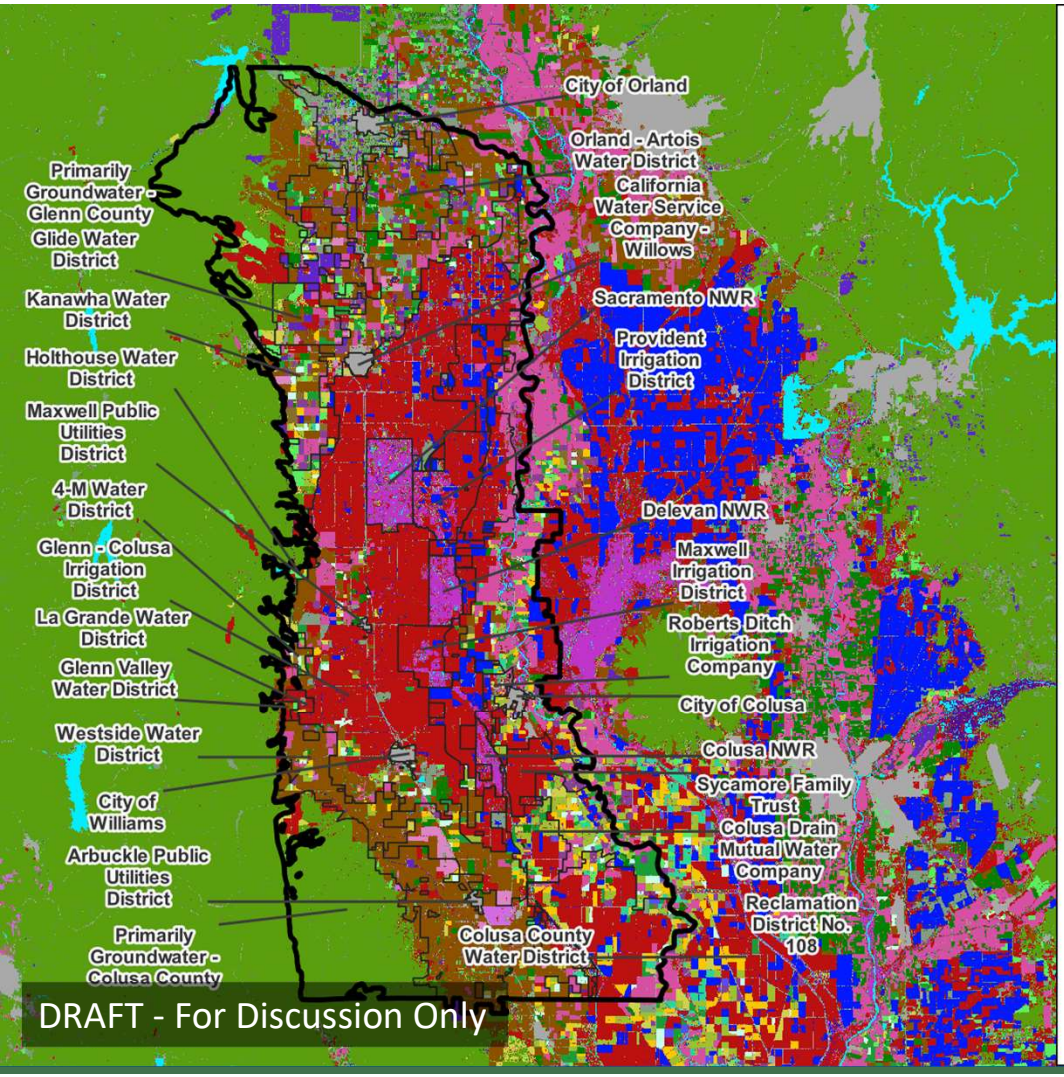
Cities

Land Use Land Cover

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

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

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



2022 Land Use and Land Cover

0 5 10 mi

Colusa Subbasin

Cities

Land Use Land Cover

- 1-Alfalfa
- 2-Almonds
- 3-Mature Almonds
- 4-Young Almonds
- 5-Citris and Subtropical
- 6-Corn
- 7-Cotton
- 8-Cucurbits
- 9-Dry Beans
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Source: Land use and land cover (LULC) dataset is a combination of DWR Statewide landuse data from 2019 and USDA CropScape data from 2022. DWR 2019 is given preference over 2022 CropScape, except in the case of rice, where fallowing from CropScape is used.

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

Water Use Sector	Groundwater Extraction, 2022 (Acre-Feet, rounded)	Measurement Method	Description
Agricultural	856,000	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	28,000	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	**899,000**	**20%**	Volume-weighted combined uncertainty of water budget estimates (approximately 20%) and flowmeter records (approximately 5%)

Source: WY2022 Annual Report Section 2

Water Budget - By Land Use (WY2022)

Land Use Classification	Area (AC)	Estimated Groundwater Extraction (Acre-Feet)	Estimated Groundwater Extraction (Acre-Feet/AC)
Idle	223,136	0	0.0
Almonds	126,075	337,000	2.7
Native Vegetation	98,569	0	0.0
Walnuts	47,397	134,000	2.8
Rice	27,515	102,000	3.7
Riparian Vegetation	25,914	0	0.0
Urban	19,813	0	0.0
Miscellaneous Deciduous	19,430	39,000	2.0
Grain and Hay	15,615	31,000	2.0
Miscellaneous Truck Crop	13,839	31,000	2.2
Miscellaneous Pasture	13,321	24,000	1.8
Alfalfa	12,660	37,000	2.9
Wheat	12,137	24,000	2.0
Miscellaneous Field Crop	11,685	28,000	2.4
Others	56,621	75,000	1.3
Totals ->	**723,725**	**861,000**	**1.2**

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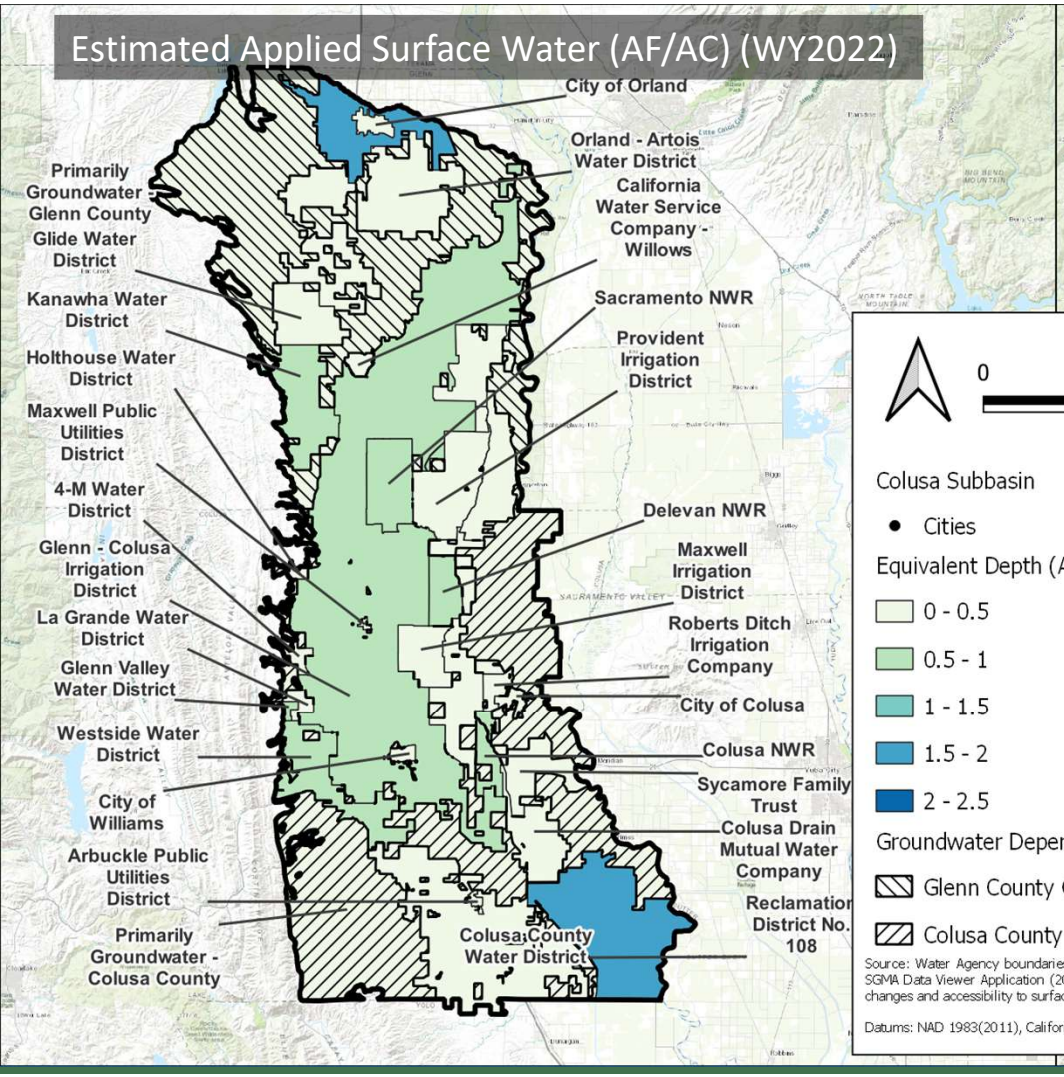
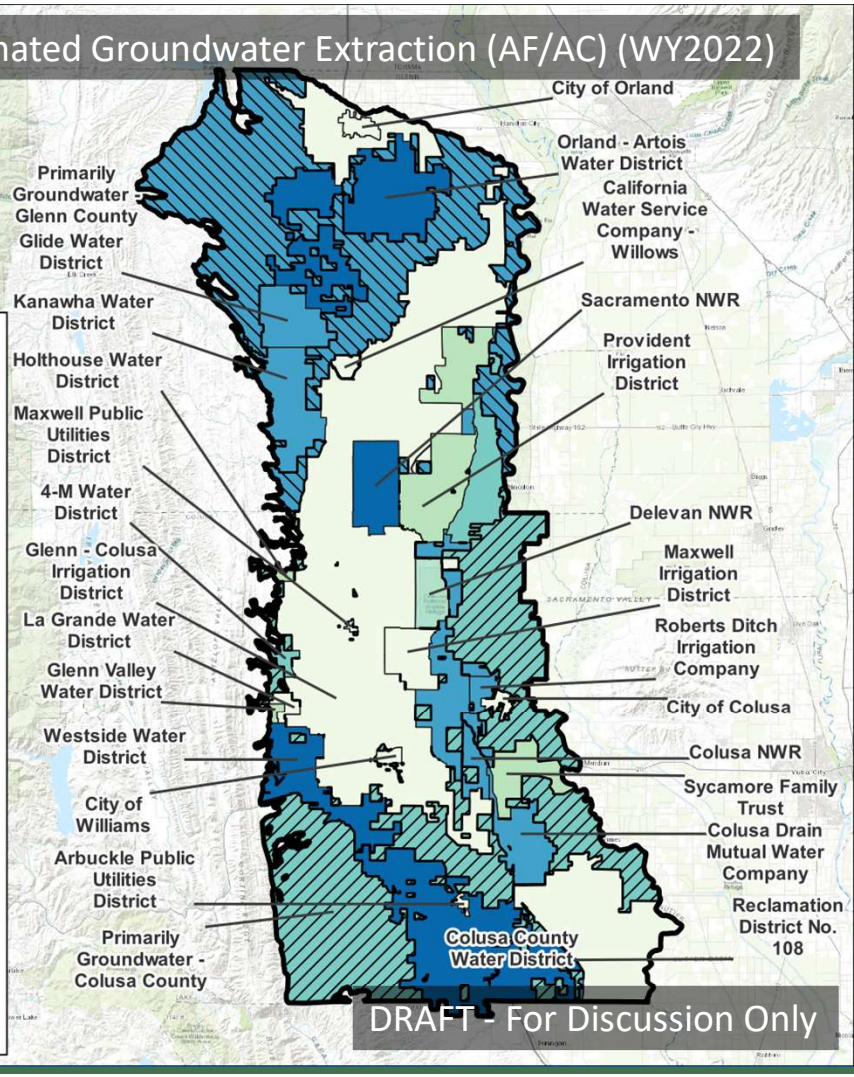
Estimated Applied Surface Water (AF/AC) (WY2022)



Estimated Groundwater Extraction (AF/AC) (WY2022)



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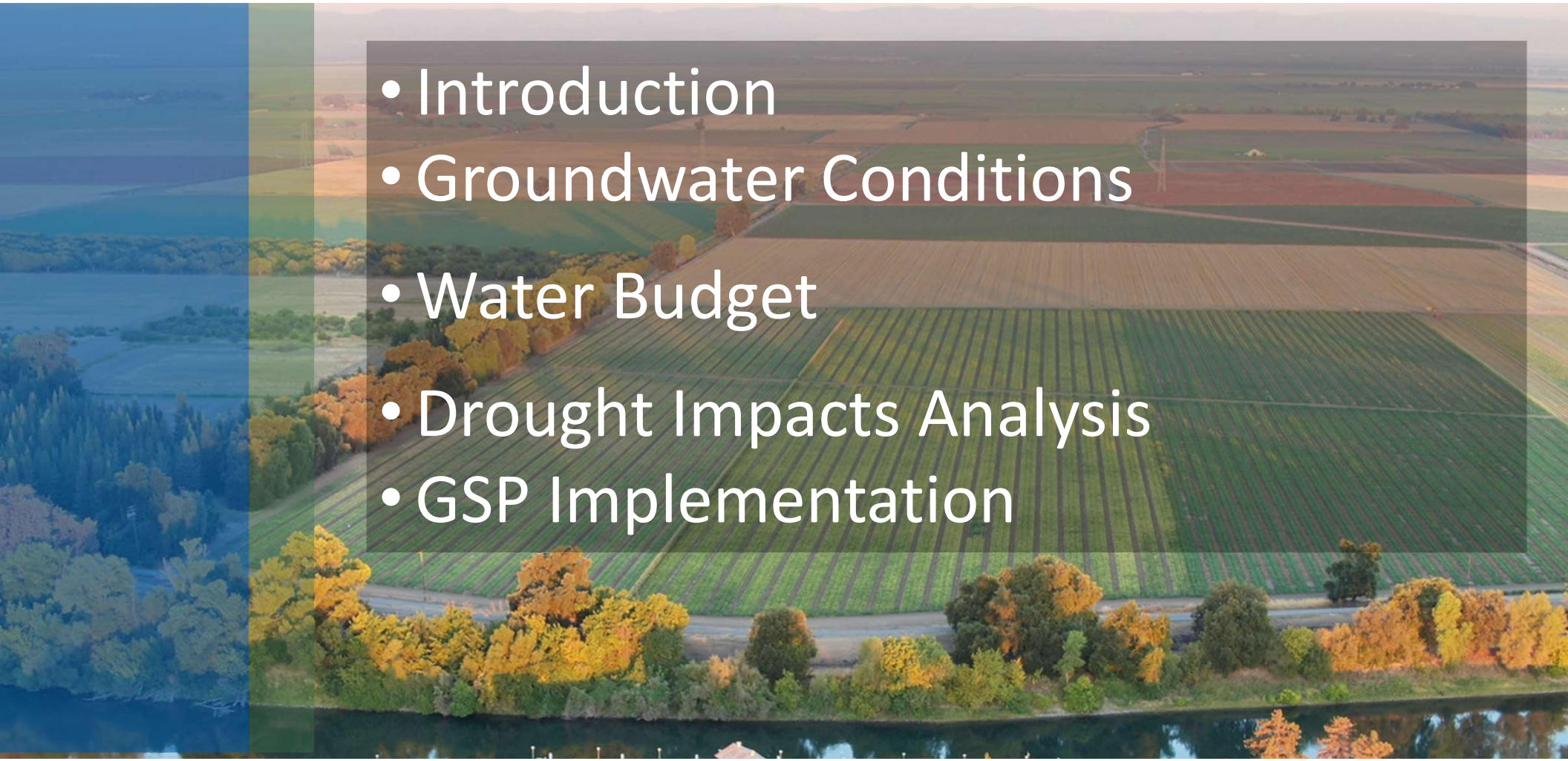
Source: WY2022 Annual Report Section 2



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Drought Impacts Analysis

- Current Conditions
- Climate
- Streamflow
- Agricultural Acreage
- Reservoir Levels
- Vulnerable Well Analysis
- Well Completion Reports
- Drought Restrictions and Dry Wells

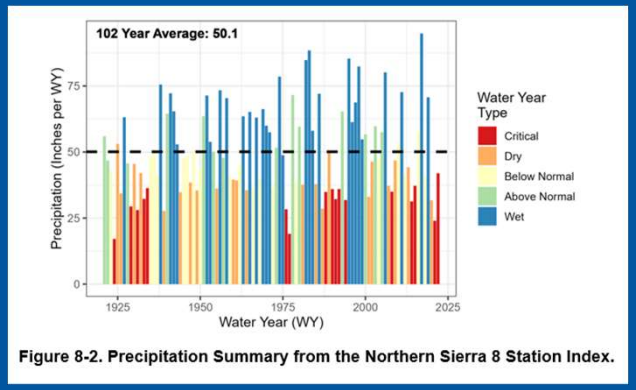


Figure 8-2. Precipitation Summary from the Northern Sierra 8 Station Index.

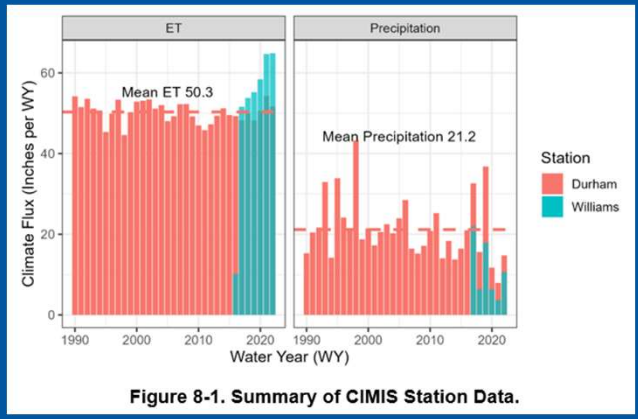
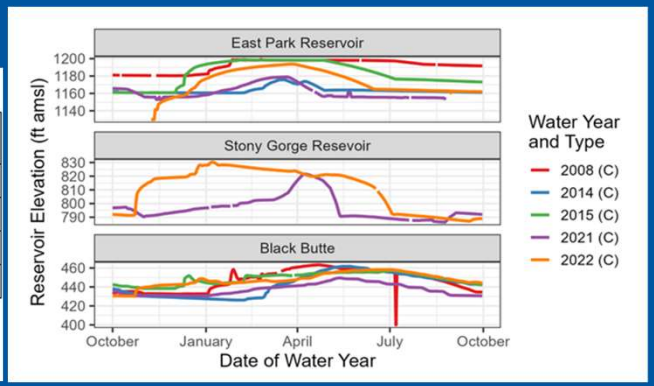


Figure 8-1. Summary of CIMIS Station Data.

Table 8-1. Mean Yearly Surface Flows of Selected Stations (mean CFS).

Station	River	2014 (C)	2015 (C)	2016 (BN)	2017 (W)	2018 (BN)	2019 (W)	2020 (D)	2021 (C)	2022 (C)
SCG	Stony Creek	--	339	441	755	137	675	666	420	17
ORD	Sacramento River	5774	7167	9715	22489	7185	16655	7081	5264	5227
COL	Sacramento River	5594	6809	9467	18024	7341	14974	7131	5170	5131
CDR	Colusa Drain	179	372	232	907	258	862	262	127	141

CFS = cubic feet per second
Water Year Types Classified According to the Sacramento Valley Water Year Index:
AN = Above Normal, BN = Below Normal, C = Critical, D = Dry, W = Wet



Source: WY2022 Annual Report Section 8

Drought Impacts Analysis – Vulnerable Well Analysis

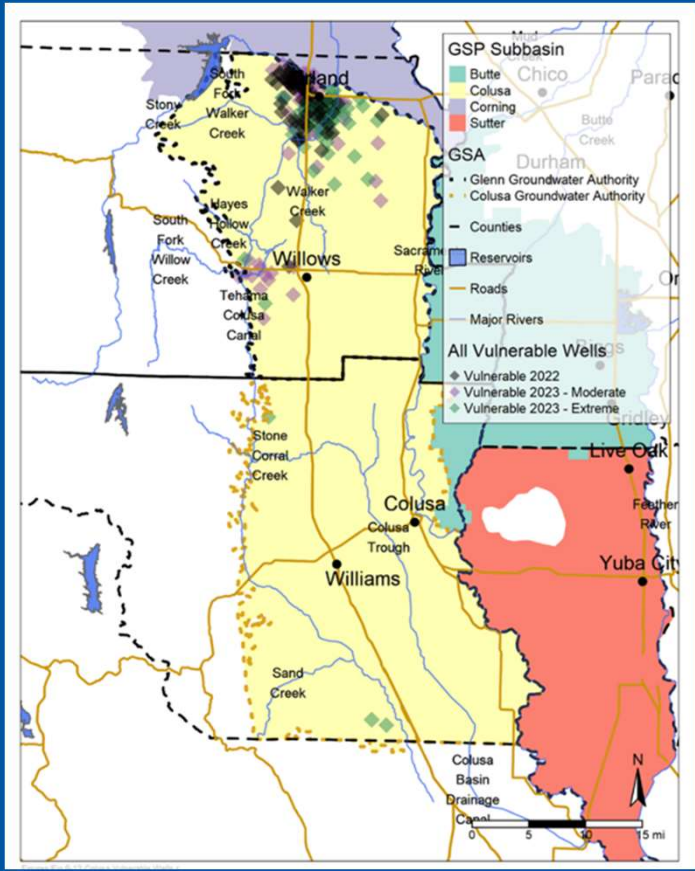


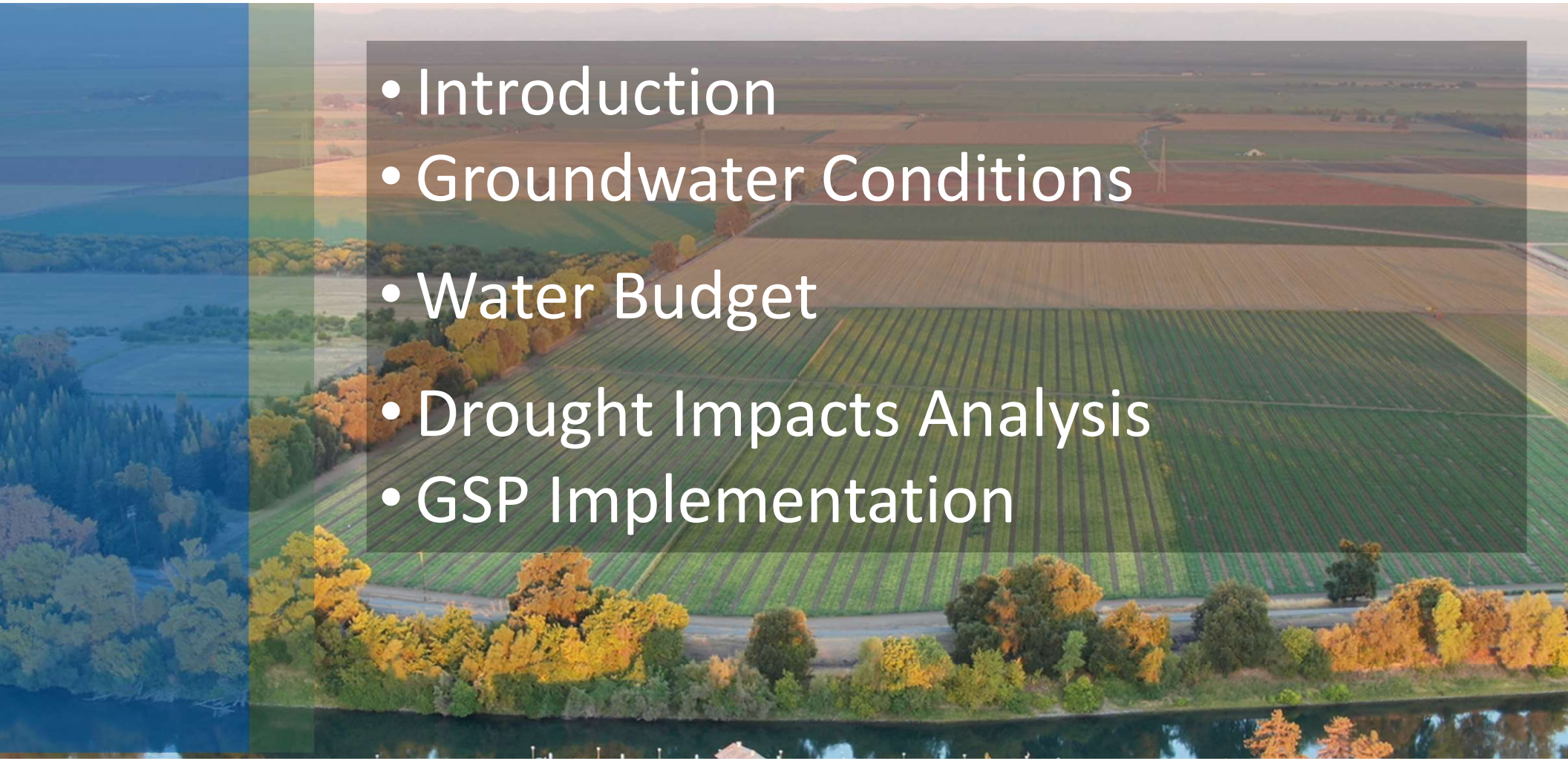
Table 8-3. Summary of Vulnerable Wells Analysis in Colusa Subbasin.

Management Area	Vulnerable in 2022	Vulnerable 2022 - Moderate	Vulnerable 2022 - Extreme
Glenn GSA	62	80	68
Colusa GSA	--	--	3

County Dry Well Records

CGA		Glenn County	
2021 = 14	**2022 = 11**	***2021 - 2022 = 284***	
Arbuckle = 9	Arbuckle = 6		
College City = 2	Colusa = 1	**2021 = 196**	**2022 = 88**
Williams = 1	Williams = 4		
Maxwell = 2			

Source: WY2022 Annual Report Section 8



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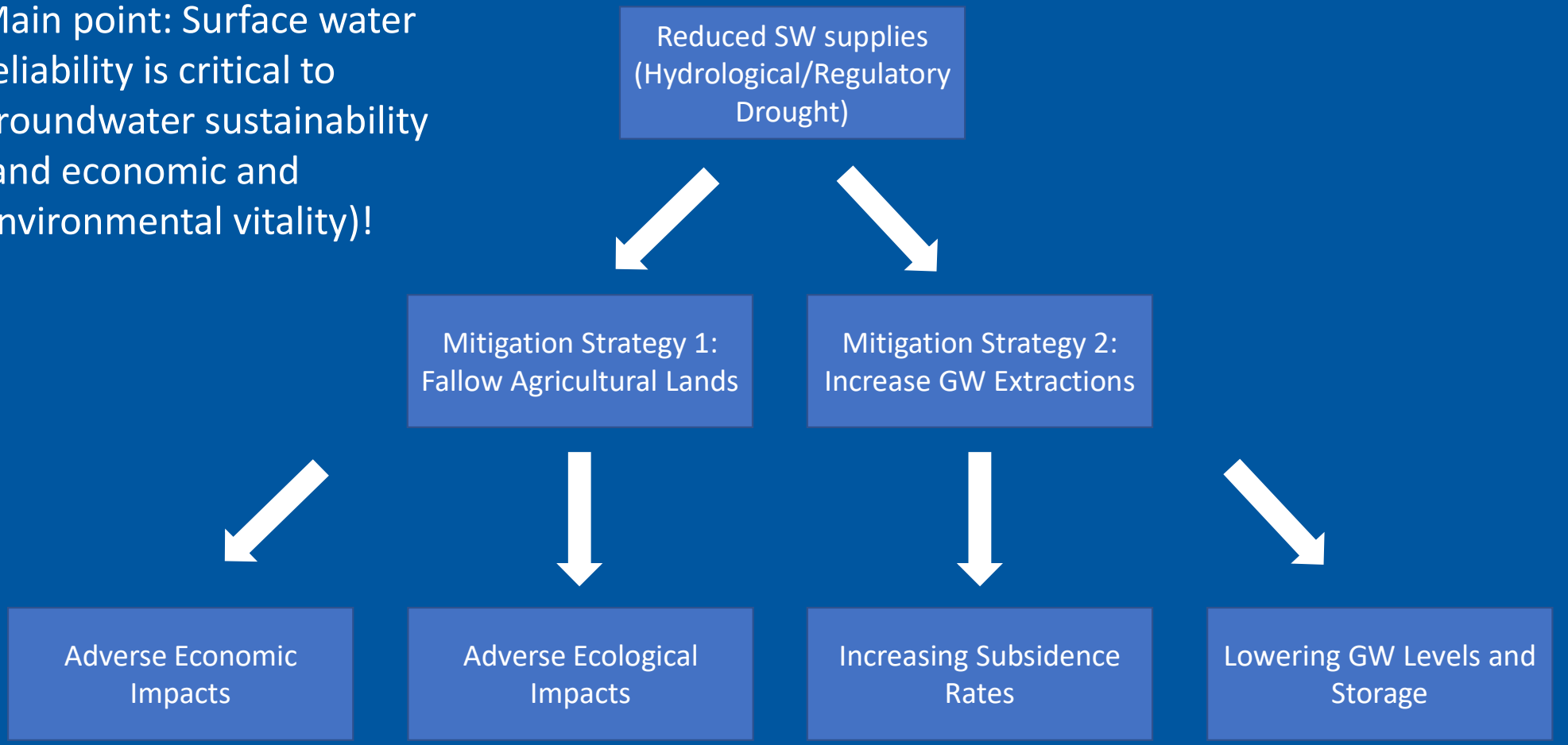
GSP Implementation

- Updates discussed in the 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 11 projects and management actions, 840 AF of benefits
  - Development of new projects and management actions since GSP development:
    - GGA Recharge Project
    - Spring Valley Recharge Project
    - Sycamore Slough Reconnection and Recharge Project
    - Others refined in the Round 2 grant application

Source: WY2022 Annual Report Section 7

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



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