Corning Subbasin Advisory Board WY 2022 Annual Report Update

Eddy Teasdale, PG, CHG (LSCE) &
Jeff Davids, PhD, PE (DE)

April 5, 2023

Luhdorff & Scalmanini Consulting Engineers

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Annual Report Requirements

- Updates on Groundwater Conditions
  - Groundwater Elevation (Hydrographs, Contour Maps)
  - Change in Groundwater Storage
- Water Supply and Water Use
  - Groundwater Extraction
  - Surface Water Supplies
  - Total Water Use
- Progress Toward Plan Implementation
  (e.g., implementation of planned projects and management actions)

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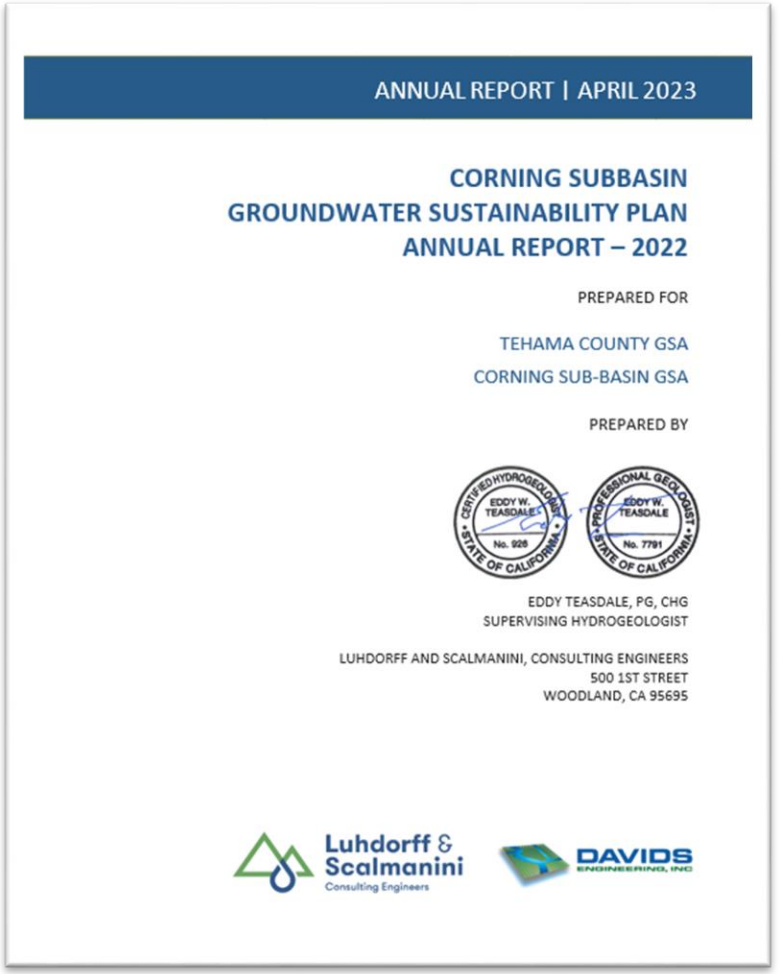
Where are We Headed Today?

- Overview
- Groundwater Conditions
- Water Supply and Water Use (Water Budget)
- Progress Towards GSP Implementation


ANNUAL REPORT | APRIL 2023

CORNING SUBBASIN
GROUNDWATER SUSTAINABILITY PLAN
ANNUAL REPORT – 2022

PREPARED FOR

TEHAMA COUNTY GSA

CORNING SUB-BASIN GSA

PREPARED BY

EDDY TEASDALE, PG, CHG
SUPERVISING HYDROGEOLOGIST

LUHDORFF AND SCALMANINI, CONSULTING ENGINEERS
500 1ST STREET
WOODLAND, CA 95695

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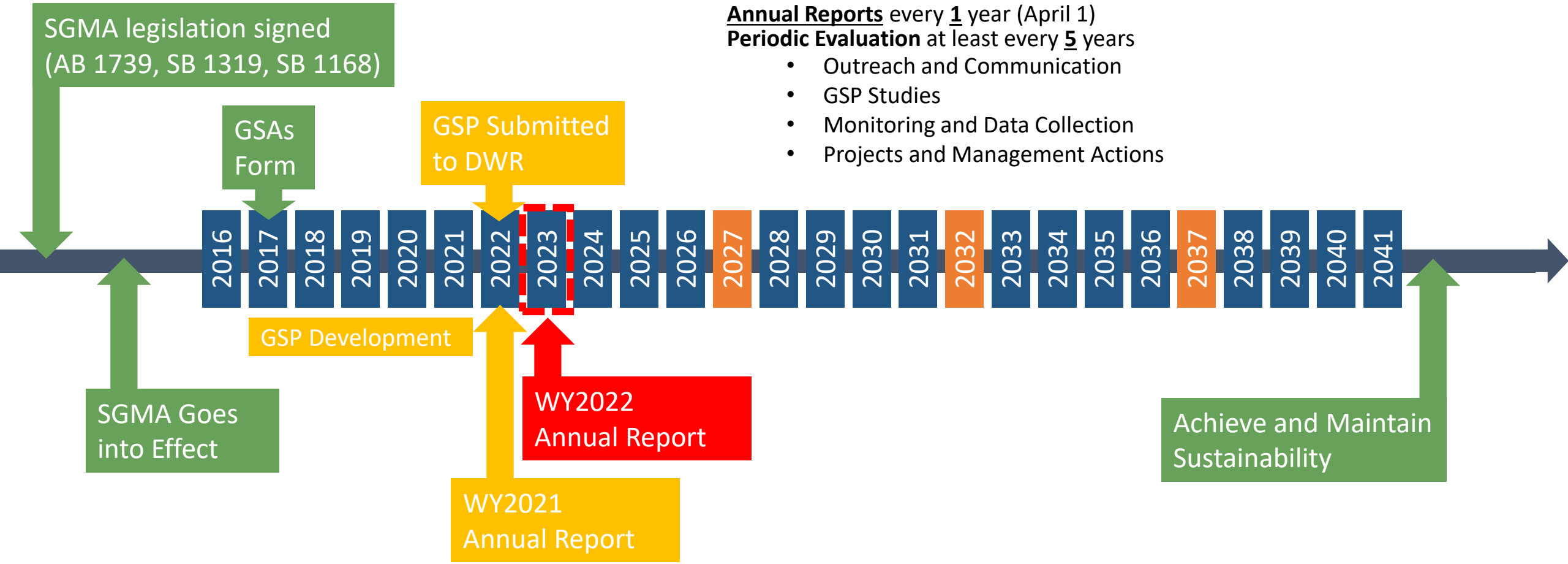
Overview – SGMA Implementation Timeline



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

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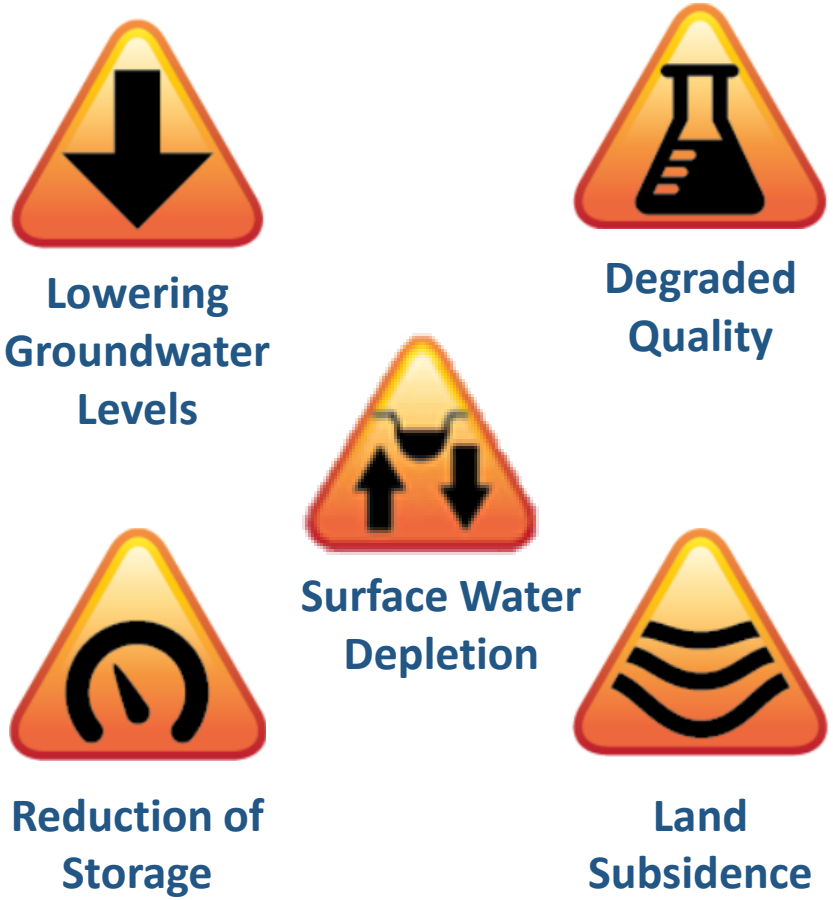
Groundwater Conditions

- Groundwater Elevations
  - 54 Representative Monitoring Site Wells
  - 35 shallow portion of the aquifer
  - 19 wells screened in the deeper portion of the aquifer
- Groundwater Storage
  - Utilizing RMP wells
- Groundwater Quality
  - Utilize Existing Production Well data
- Subsidence
  - InSAR
- Surface Water Depletion
  - 8 Shallow Wells



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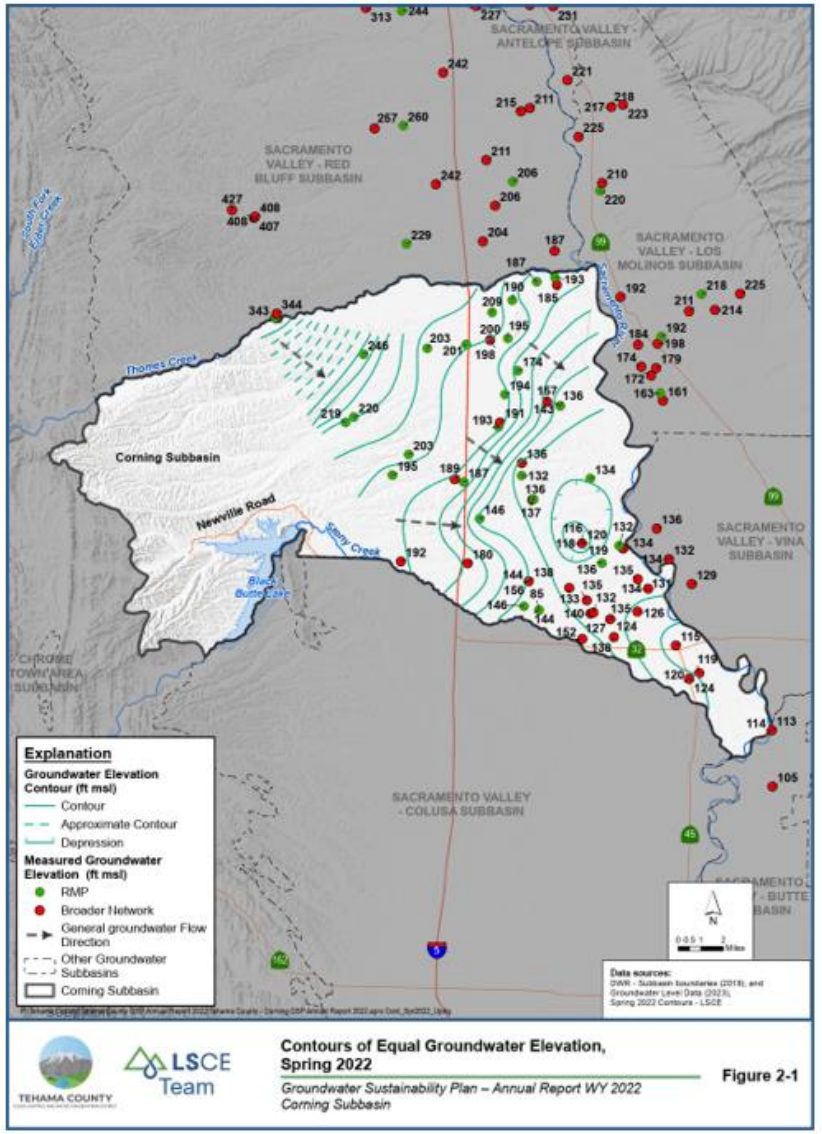
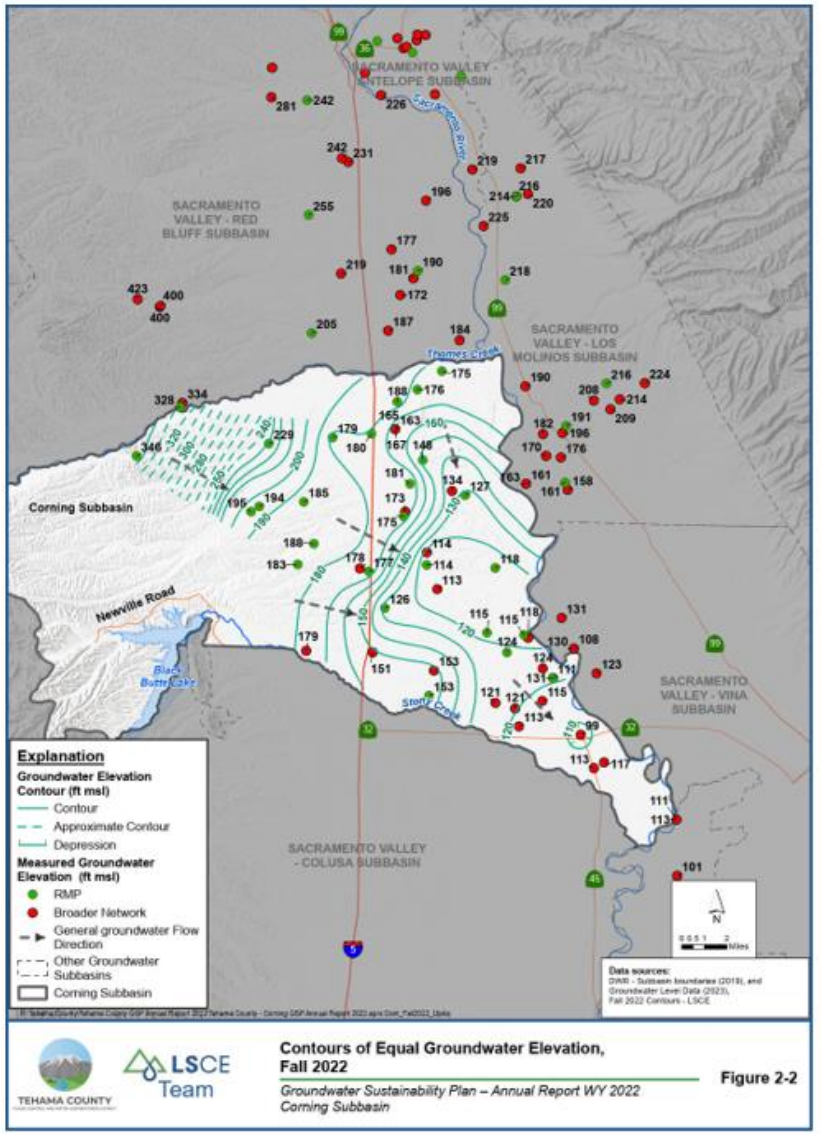
Groundwater Conditions – Groundwater Elevations





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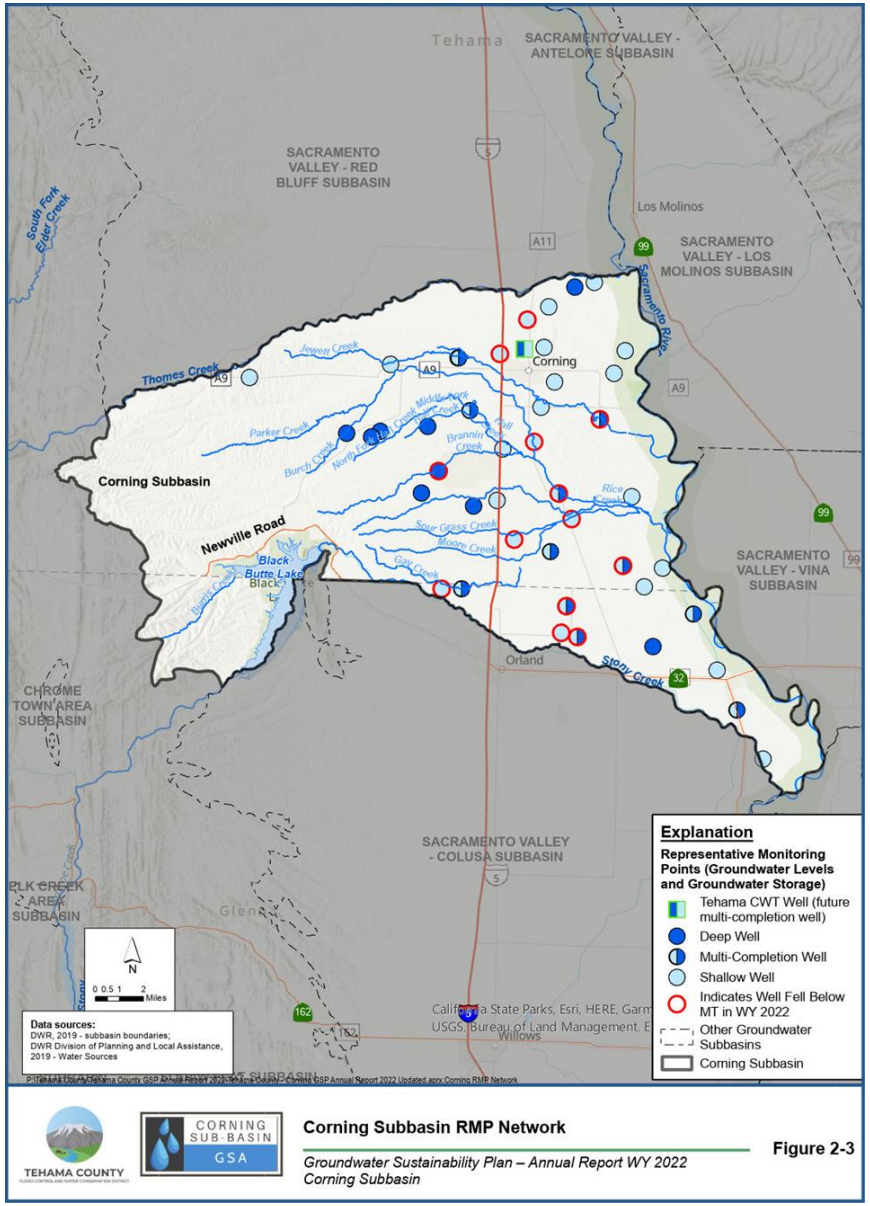
Groundwater Conditions – Groundwater Elevations

Groundwater Elevations

- 54 Representative Monitoring Point (RMP) Wells
- 35 shallow portion of the aquifer
- 19 wells screened in the deeper portion of the aquifer
- 16 of the 54 wells had fall measurements below the MT in 2022.
- Undesirable results occur when 20% of the RMP wells fall below the MT in two consecutive years
- No undesirable results as only 15% (6 wells) of RMP wells fall below the MT in two consecutive years



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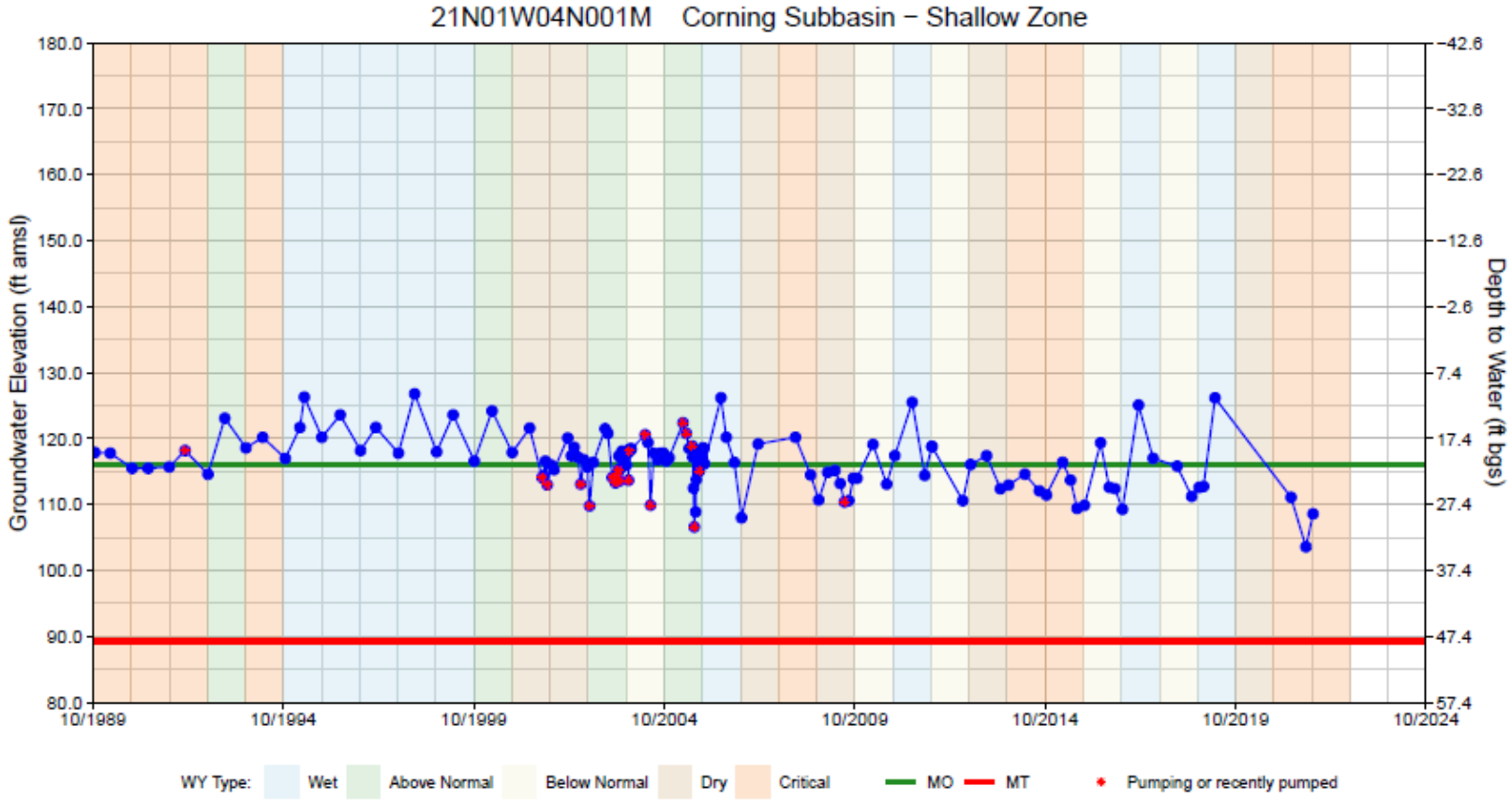
Groundwater Conditions – Groundwater Elevations



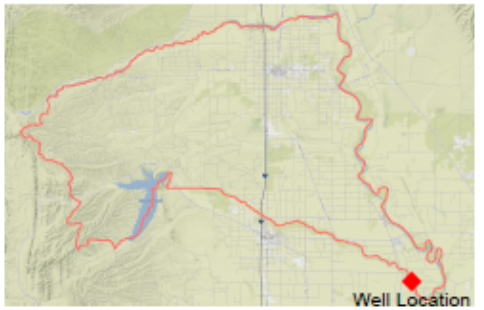
Site Code: 396971N1219893W001 Well Type: Residential

Total Depth (ft):100 GSE (ft amsl): 137.4

Perf. Top (ft bgs): NA Sustainable Management Criteria

Perf. Bottom (ft bgs): NA MO: 116.1 ft amsl (21.3 ft bgs)

MT: 89.3 ft amsl (48.1 ft bgs)



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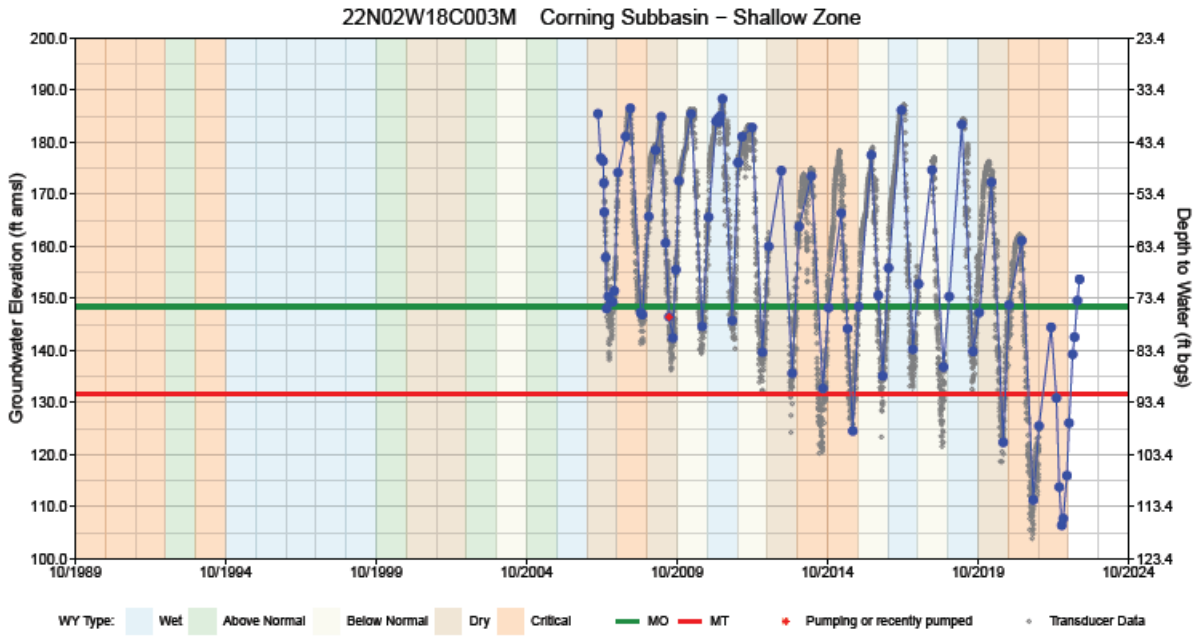
Groundwater Conditions – Groundwater Elevations



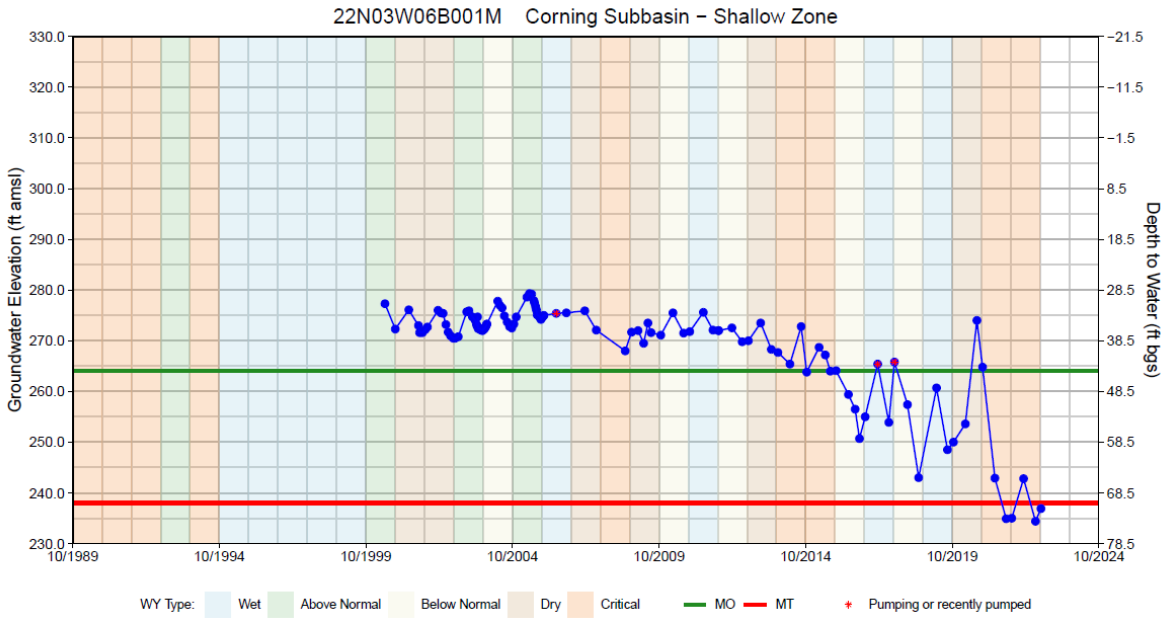
Site Code: 397682N1221364W003 Well Type: Observation

Total Depth (ft):188 GSE (ft amsl): 223.4

Perf. Top (ft bgs): 165 Sustainable Management Criteria

Perf. Bottom (ft bgs): 175 MO: 148.4 ft amsl (75 ft bgs)

MT: 131.6 ft amsl (91.8 ft bgs)



Site Code: 397953N1222433W001 Well Type: Residential

Total Depth (ft):210 GSE (ft amsl): 308.5

Perf. Top (ft bgs): 195 Sustainable Management Criteria

Perf. Bottom (ft bgs): 210 MO: 264.1 ft amsl (44.4 ft bgs)

MT: 238 ft amsl (70.5 ft bgs)

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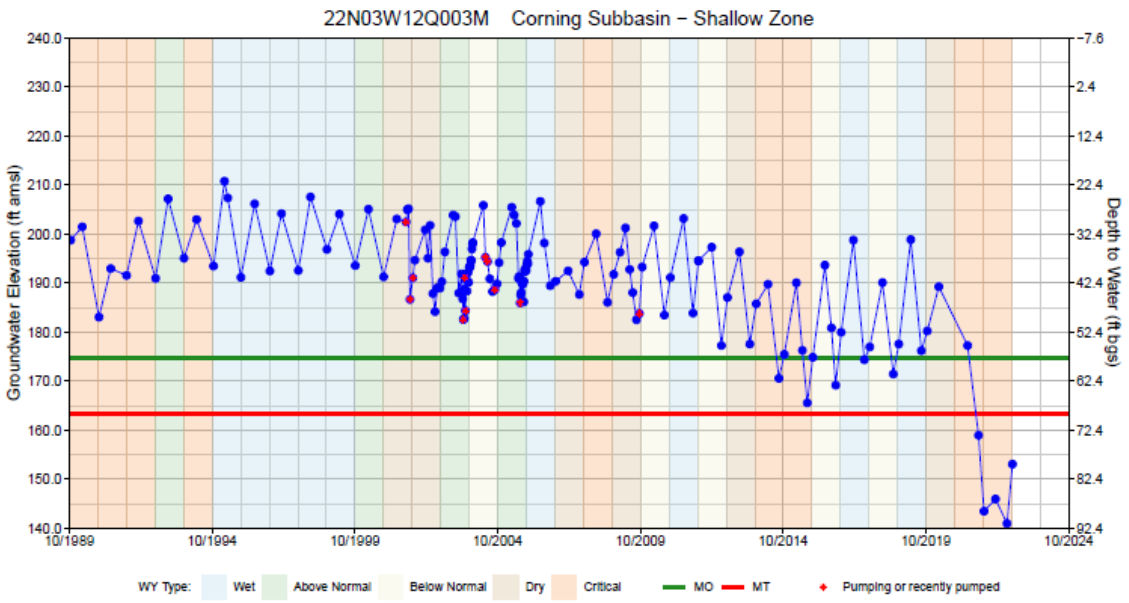
Groundwater Conditions – Groundwater Elevations



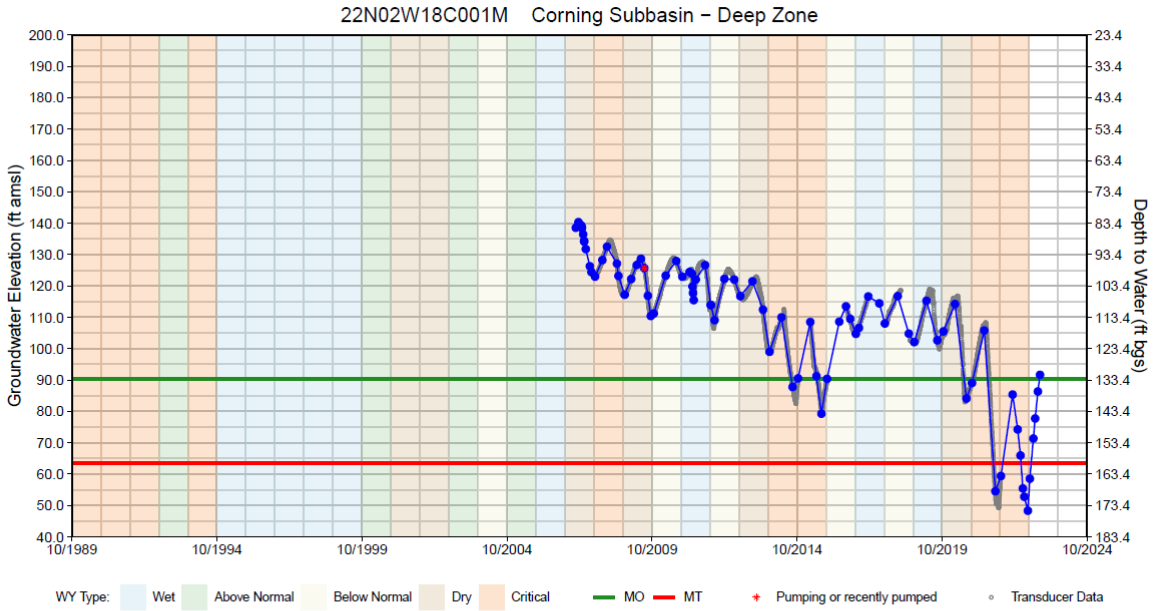
Site Code: 397705N1221491W001 Well Type: Residential

Total Depth (ft):124 GSE (ft amsl): 232.4

Perf. Top (ft bgs): 112 Sustainable Management Criteria

Perf. Bottom (ft bgs): 123 MO: 174.8 ft amsl (57.6 ft bgs)

MT: 163.2 ft amsl (69.2 ft bgs)



Site Code: 397682N1221364W001 Well Type: Observation

Total Depth (ft):1062 GSE (ft amsl): 223.4

Perf. Top (ft bgs): 841 Sustainable Management Criteria

Perf. Bottom (ft bgs): 1029 MO: 90.4 ft amsl (133 ft bgs)

MT: 63.5 ft amsl (159.9 ft bgs)

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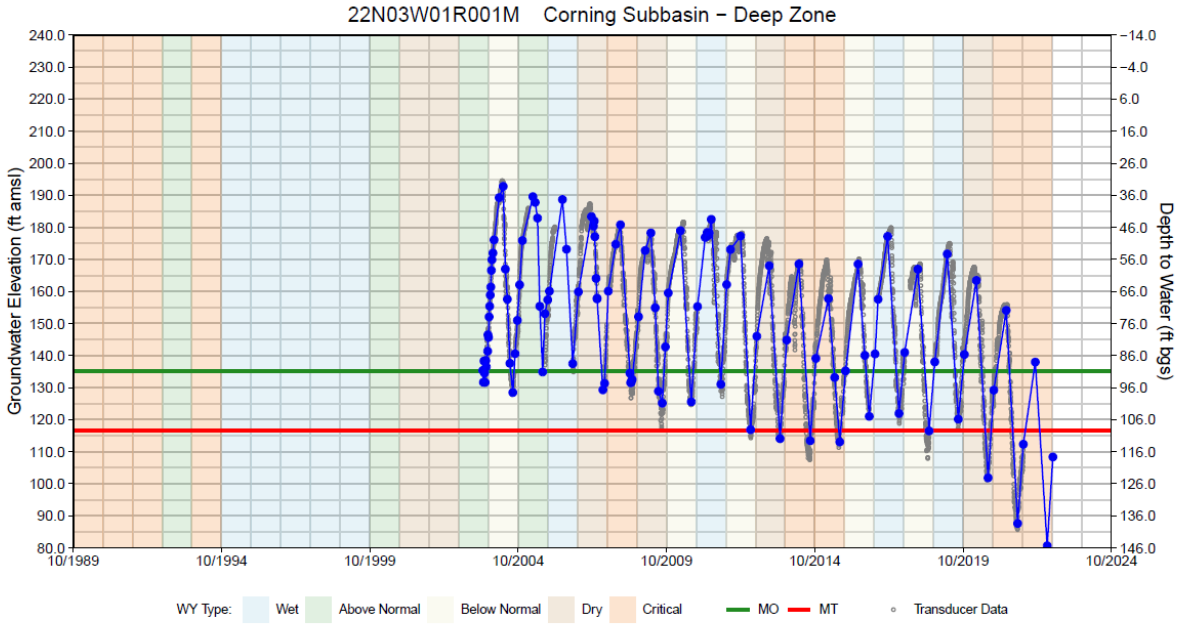
Groundwater Conditions – Groundwater Elevations



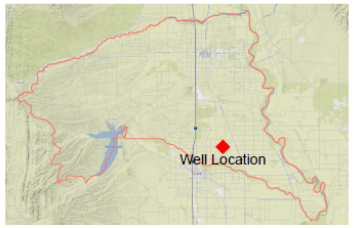
Site Code: 397866N1221455W001 Well Type: Observation

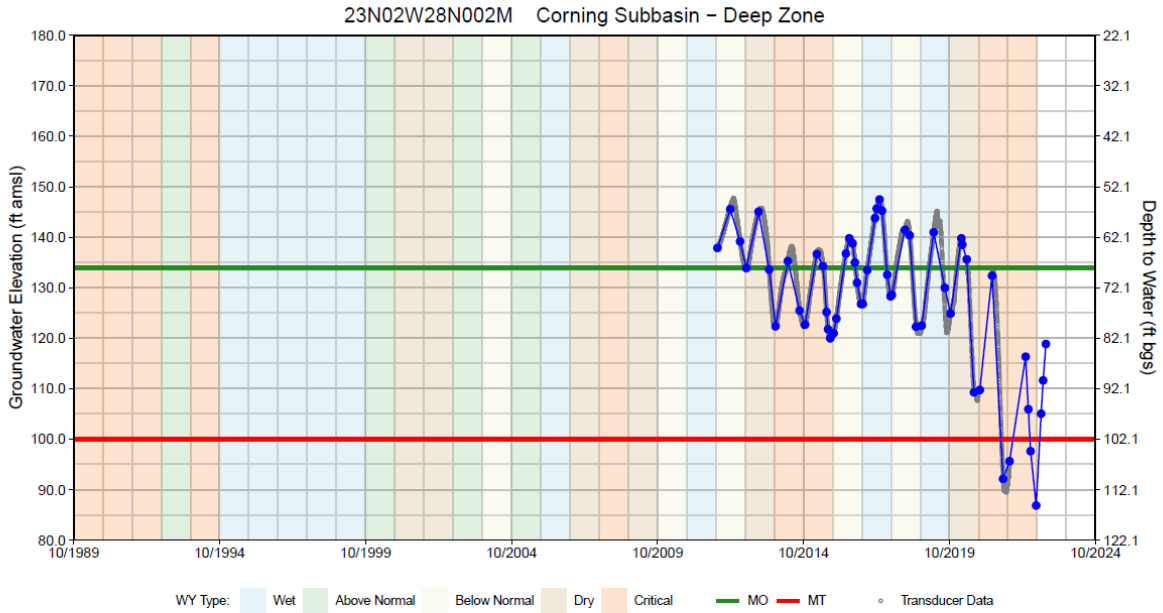
Total Depth (ft):515 GSE (ft amsl): 226

Perf. Top (ft bgs): 470 Sustainable Management Criteria

Perf. Bottom (ft bgs): 480 MO: 135.2 ft amsl (90.8 ft bgs)

MT: 116.6 ft amsl (109.4 ft bgs)





Site Code: 398117N1221020W003 Well Type: Observation

Total Depth (ft):580 GSE (ft amsl): 202.1

Perf. Top (ft bgs): 550 Sustainable Management Criteria

Perf. Bottom (ft bgs): 570 MO: 133.9 ft amsl (68.2 ft bgs)

MT: 100 ft amsl (102.1 ft bgs)

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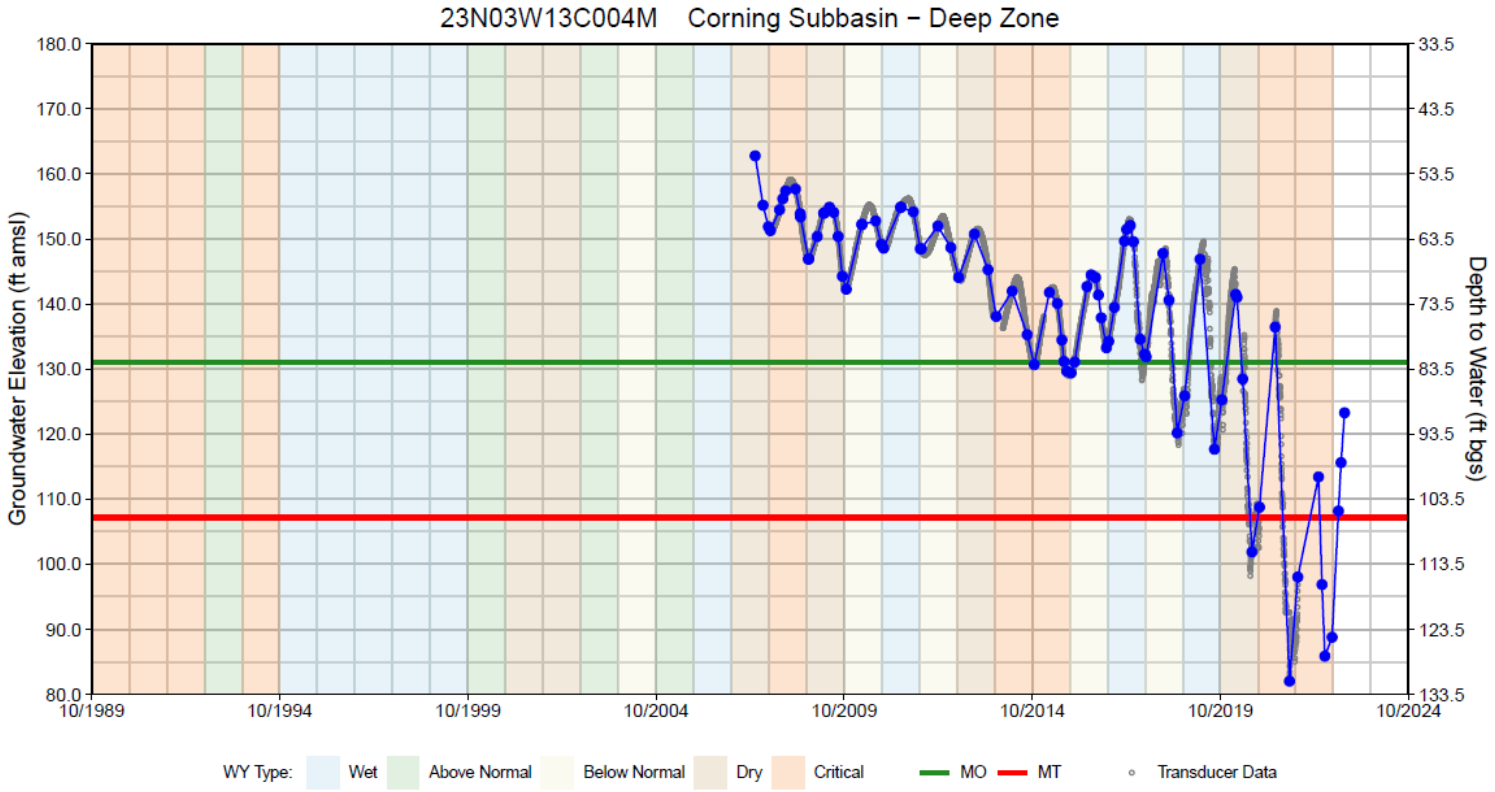
Groundwater Conditions – Groundwater Elevations



Site Code: 398543N1221535W002 Well Type: Observation

Total Depth (ft):835 GSE (ft amsl): 213.5

Perf. Top (ft bgs): 815 Sustainable Management Criteria

Perf. Bottom (ft bgs): 825 MO: 131.1 ft amsl (82.4 ft bgs)

MT: 107.2 ft amsl (106.3 ft bgs)

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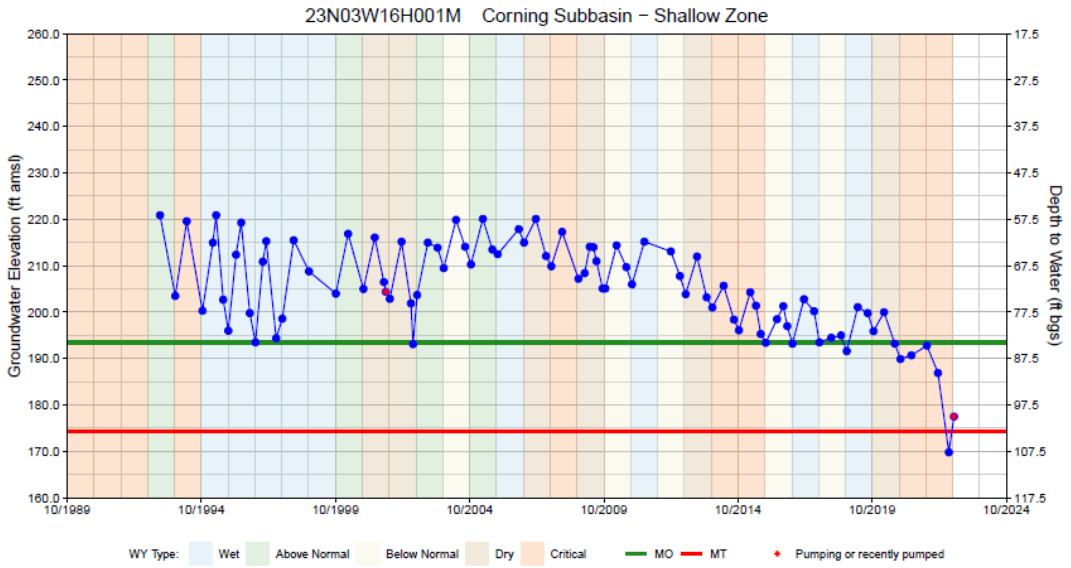
Groundwater Conditions – Groundwater Elevations



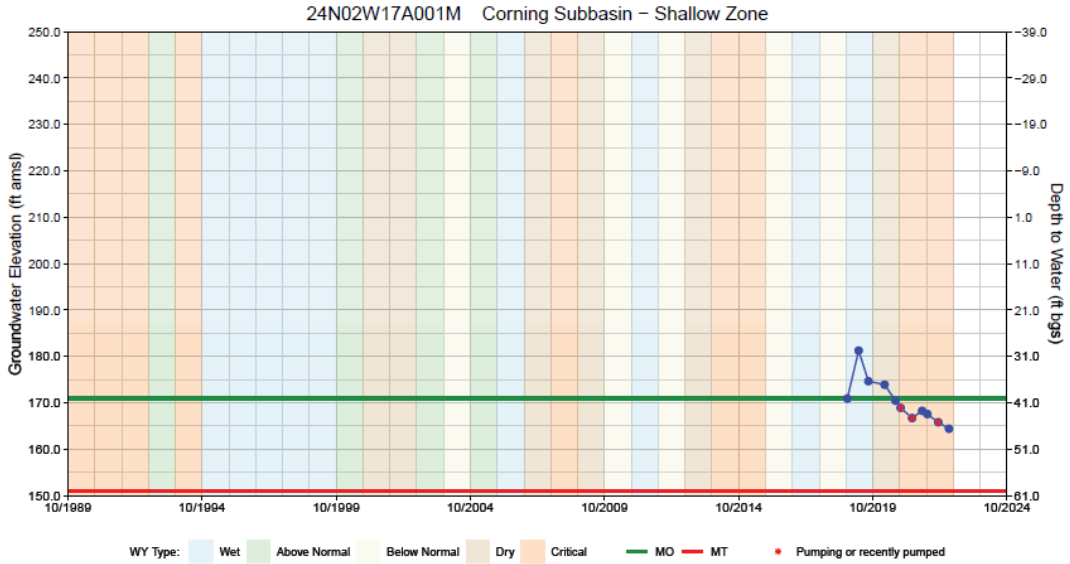
Site Code: 398493N1222016W001 Well Type: Residential

Total Depth (ft):150 GSE (ft amsl): 277.5

Perf. Top (ft bgs): 144 Sustainable Management Criteria

Perf. Bottom (ft bgs): 150 MO: 193.4 ft amsl (84.1 ft bgs)

MT: 174.3 ft amsl (103.2 ft bgs)



Site Code: 399412N1221040W002 Well Type: Residential

Total Depth (ft):140 GSE (ft amsl): 211

Perf. Top (ft bgs): 120 Sustainable Management Criteria

Perf. Bottom (ft bgs): 140 MO: 170.9 ft amsl (40.1 ft bgs)

MT: 150.9 ft amsl (60.1 ft bgs)

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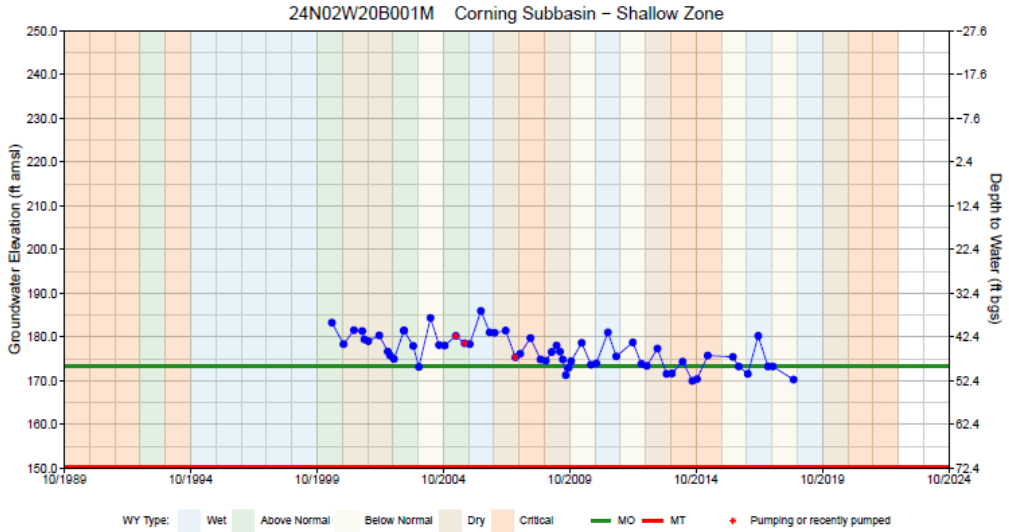
Groundwater Conditions – Groundwater Elevations



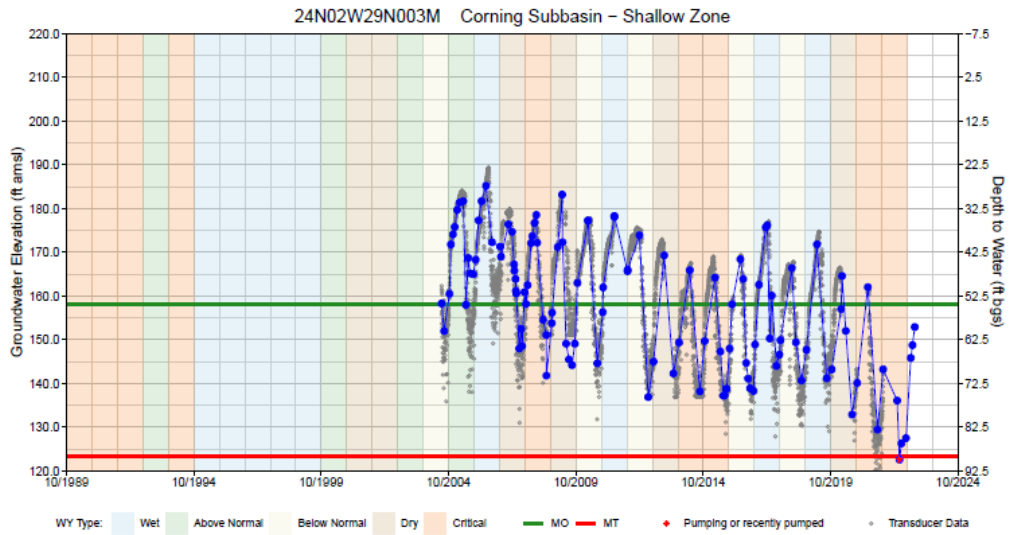
Site Code: 399274N1221123W001 Well Type: Residential

Total Depth (ft):120 GSE (ft amsl): 222.4

Perf. Top (ft bgs): 100 Sustainable Management Criteria

Perf. Bottom (ft bgs): 120 MO: 173.4 ft amsl (49 ft bgs)

MT: 150.3 ft amsl (72.1 ft bgs)



Site Code: 398996N1221227W001 Well Type: Observation

Total Depth (ft):388 GSE (ft amsl): 212.5

Perf. Top (ft bgs): 200 Sustainable Management Criteria

Perf. Bottom (ft bgs): 290 MO: 158.1 ft amsl (54.4 ft bgs)

MT: 123.2 ft amsl (89.3 ft bgs)

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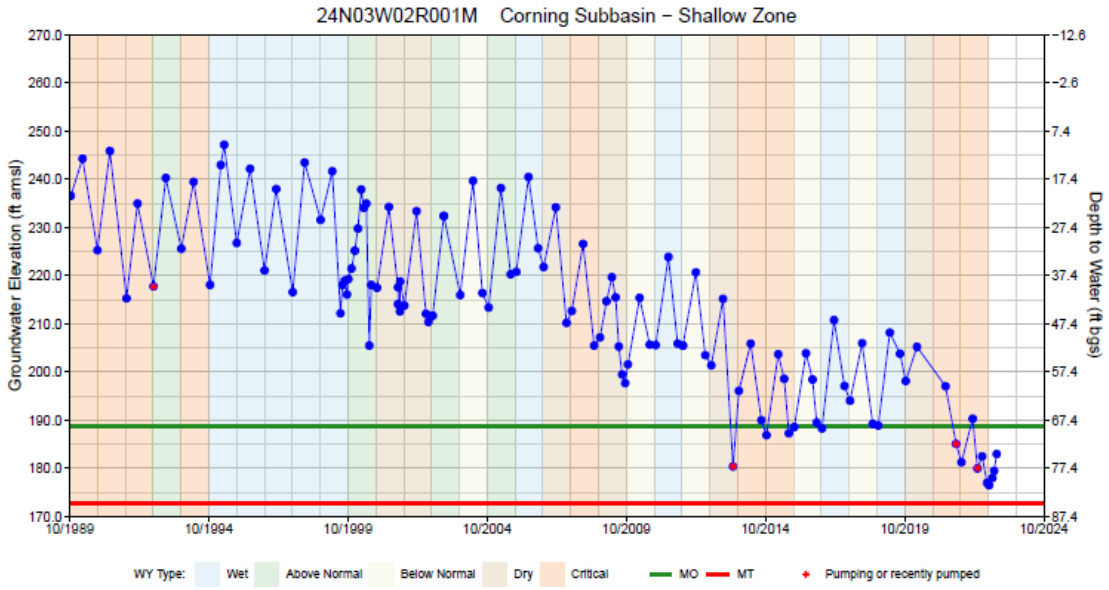
Groundwater Conditions – Groundwater Elevations



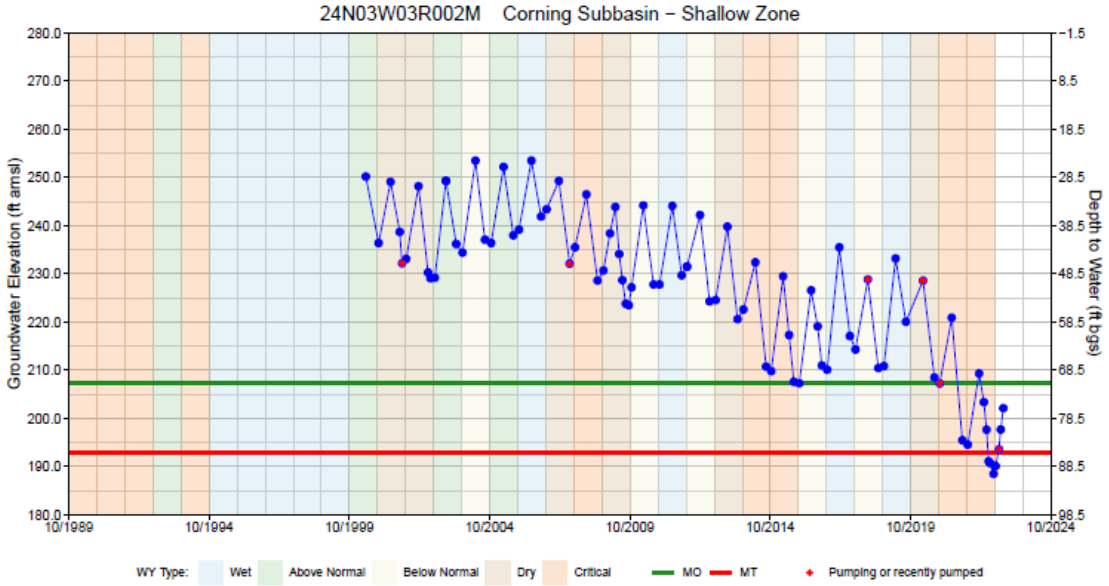
Site Code: 399666N1221647W001 Well Type: Residential

Total Depth (ft):270 GSE (ft amsl): 257.4

Perf. Top (ft bgs): NA Sustainable Management Criteria

Perf. Bottom (ft bgs): NA MO: 188.6 ft amsl (68.8 ft bgs)

MT: 172.6 ft amsl (84.8 ft bgs)



Site Code: 399586N1221812W001 Well Type: Residential

Total Depth (ft):132 GSE (ft amsl): 278.5

Perf. Top (ft bgs): 112 Sustainable Management Criteria

Perf. Bottom (ft bgs): 132 MO: 207.3 ft amsl (71.2 ft bgs)

MT: 192.8 ft amsl (85.7 ft bgs)

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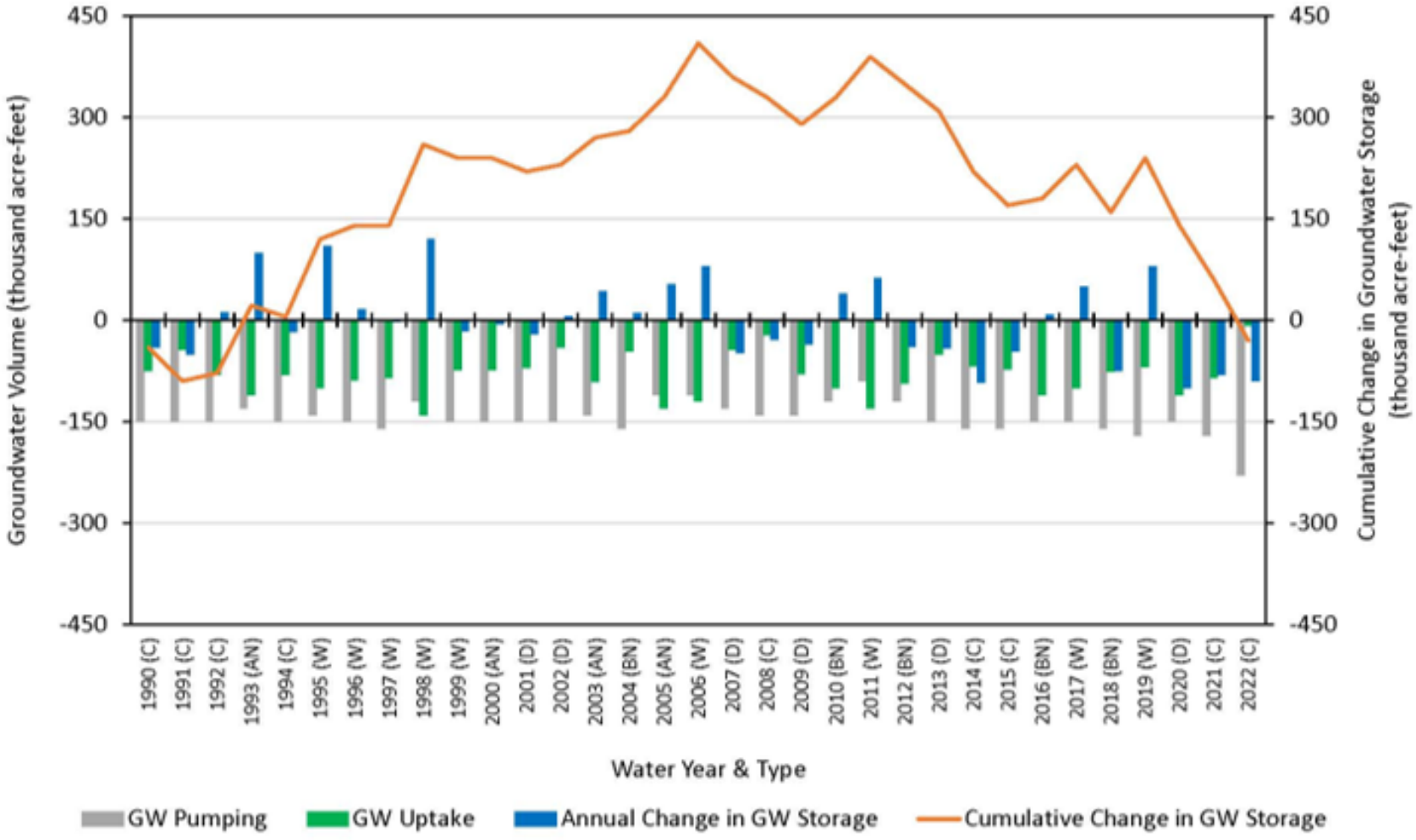
Groundwater Conditions – Groundwater Storage



Groundwater Conditions – Groundwater Storage

Table 4-1. Change in Groundwater Storage					
Water Year & Type[a]	Groundwater Pumping (af)	Groundwater Uptake (af)	Total Groundwater Pumping and Uptake (af)	Annual Groundwater Storage Change (af)	Cumulative Groundwater Storage Change (af)
2011 (W)	-90,000[b]	-130,000[b]	-220,000	63,000[b]	390,000
2012 (BN)	-120,000[b]	-93,000[b]	-210,000	-39,000[b]	350,000
2013 (D)	-150,000[b]	-51,000[b]	-200,000	-41,000[b]	310,000
2014 (C)	-160,000[b]	-68,000[b]	-230,000	-92,000[b]	220,000
2015 (C)	-160,000[b]	-72,000[b]	-230,000	-46,000[b]	170,000
2016 (BN)	-150,000[c]	-110,000[c]	-260,000	8,000[d]	180,000
2017 (W)	-150,000[c]	-100,000[c]	-250,000	50,000[d]	230,000
2018 (BN)	-160,000[c]	-76,000[c]	-240,000	-75,000[d]	160,000
2019 (W)	-170,000[c]	-69,000[c]	-240,000	80,000[d]	240,000
2020 (D)	-150,000[c]	-110,000[c]	-260,000	-100,000[d]	140,000
2021 (C)	-170,000[c]	-85,000[c]	-260,000	-80,000[e]	60,000
2022 (C)	-230,000[f]	-7,300[f]	-240,000	-90,000[e]	-30,000
Average	**-150,000**	**-81,000**	**-230,000**	**-1,000**	

All volumes are rounded to two significant digits.

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Groundwater Conditions – Groundwater Quality

Table 5-2 Most Recent Groundwater Quality RMP Data						
Program Site ID	Well Name	System Name	Most Recent TDS Measurement Date	Most Recent TDS Value (mg/L)	MO (mg/L)	MT (mg/L)
1110002-001	Well 01-01	Cal-Water Service Co – Hamilton City	6/24/2020	280	500	750
1110002-002	Well 02-01	Cal-Water Service Co – Hamilton City	4/14/2021	280	500	750
1110002-003	Well 02-02	Cal-Water Service Co – Hamilton City	6/6/2022	250	500	750
5200255-001	Well 01	Corning RV Park	9/12/2018	228	500	750
5200516-001	Well 01	Lazy Corral Mobile Home Park	7/12/2017	262	500	750
5200551-001	Well 01	Woodson Bridge Mobile Home Park	8/25/2010	220	500	750
5200556-001	Well 01	Maywood Mobile Home Park	5/23/2017	260	500	750
5210001-001	6th St Well	City of Corning	12/11/2019	196	500	750
5210001-002	Blackburn Ave Well	City of Corning	12/11/2019	214	500	750
5210001-003	Butte St Well	City of Corning	12/18/2019	209	500	750
5210001-005	Peach St Well	City of Corning	9/9/2020	230	500	750
5210001-008	Well 06 Edith Ave	City of Corning	12/18/2019	192	500	750
5210001-009	Fripp St Well	City of Corning	8/18/2021	209	500	750
5210001-010	Highway 99W Well	City of Corning	12/18/2019	165	500	750
5210001-019	Clark Park Well	City of Corning	5/16/2018	211	500	750

- Groundwater quality is measured in public supply wells by the operational entities.
- Data is made available to the GSAs through publicly available sources.
- The most recent available total dissolved solids (TDS) concentrations from the water quality monitoring network are below the measurable objective (MO) (**Table 5-2**).
- If concentrations remain below the MO. The GSA is on track to stay below the MT for water quality.

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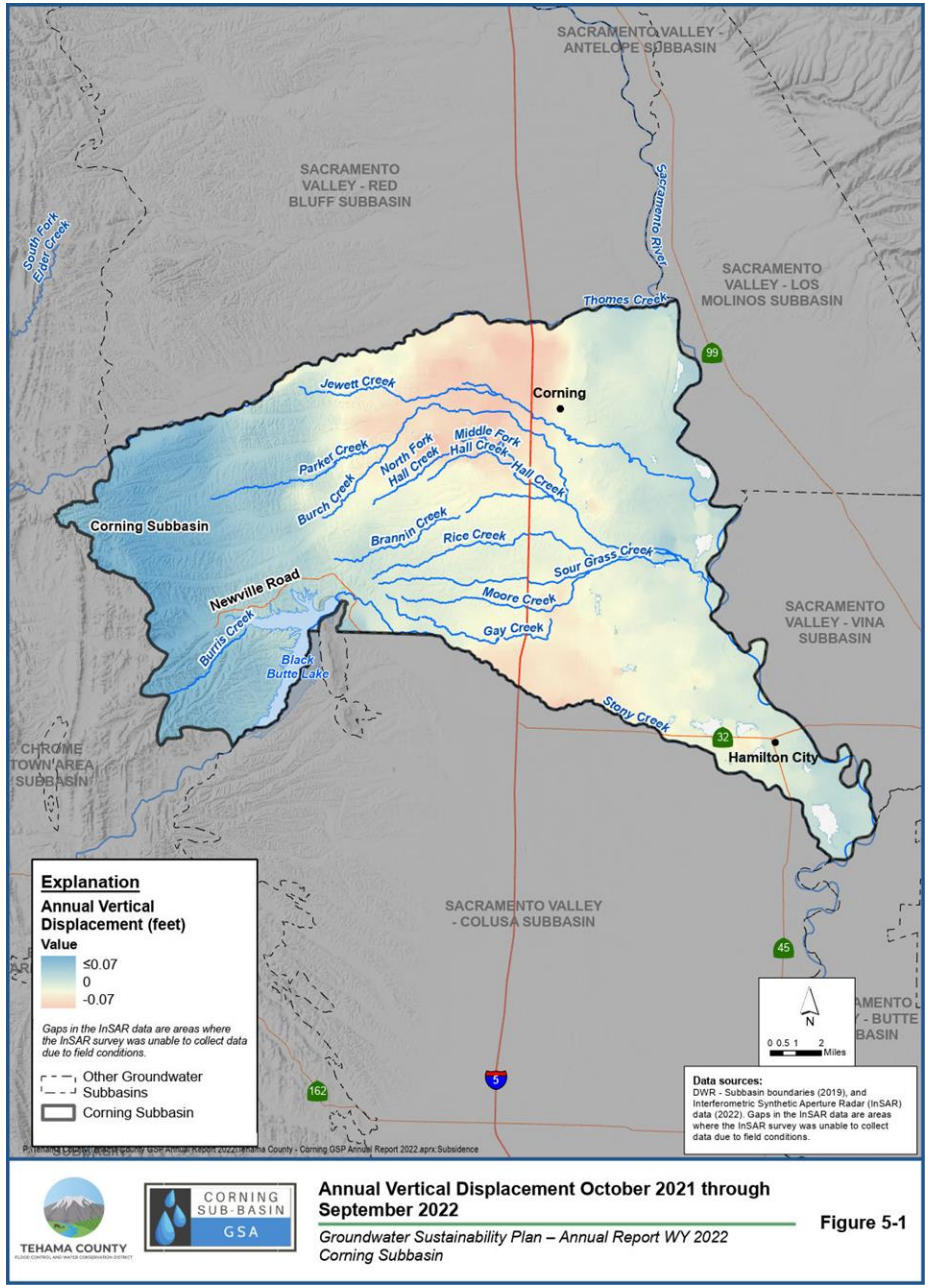
Groundwater Conditions – Land Subsidence

- Land Subsidence
  - Utilizing Interferometric Synthetic Aperture Radar (InSAR)
- Minimum Threshold (MT) = 0.5 feet per five years (0.1 foot per year)
- Measurable Objective = Zero Subsidence



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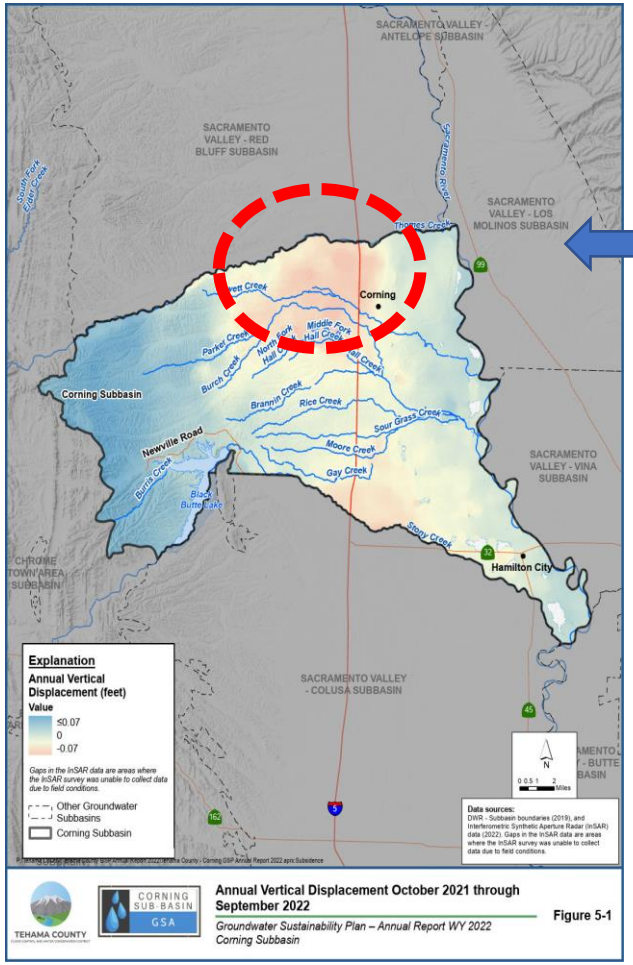
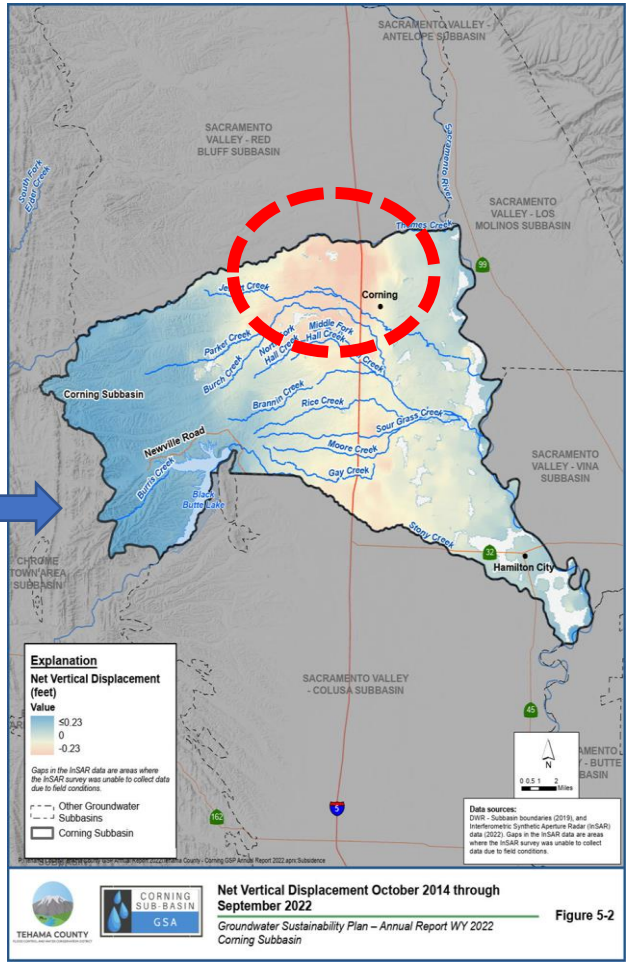
Groundwater Conditions – Land Subsidence



- WY 2022 (InSAR) = -0.07 to 0.07
- WY2015 – WY2022 (InSAR) = -0.23 to 0.23
- Highest Subsidence West of Corning



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Groundwater Conditions – Surface Water Depletion

Table 5-3 Depletion of Interconnected Surface Water Data and SMC							
Well ID	MT (ft NAVD88)	MO (ft NAVD88)	2027 Interim Milestone (ft NAVD88)	Fall Maximum Groundwater Elevations		Fall 2022 MT Exceedance	Two Consecutive WY MT Exceedances
				2021	2022		
22N01W29N003M	91.7	123.4	123.2	115.07	106.19	-	-
22N02W01N003M	99.3	136.5	133.2	123.48	110.7	-	-
22N02W15C004M	84.0	144.1	135.4	114.54	109.72	-	-
22N02W18C003M	131.6	148.4	147.6	125.48	115.94	Yes	Yes
22N03W01R002M	123.6	143.9	143.9	125.37	115.43	Yes	No
23N02W28N004M	104.3	142.7	139.3	124.58	114.69	-	-
24N02W29N003M	123.2	158.1	146.9	143.21	127.46	-	-
Glenn TSS Well	237.5	262.8	262.8	302.48	305.38	-	-

- Fall 2022, most groundwater elevations were above the established MT
- Two Wells had groundwater elevations below the MT
- Undesirable results occur when water levels in 20% of the RMP wells fall below the MT in two consecutive years
- 13% (1 out of 8 wells) have measurements (over a two-year period below the MT)

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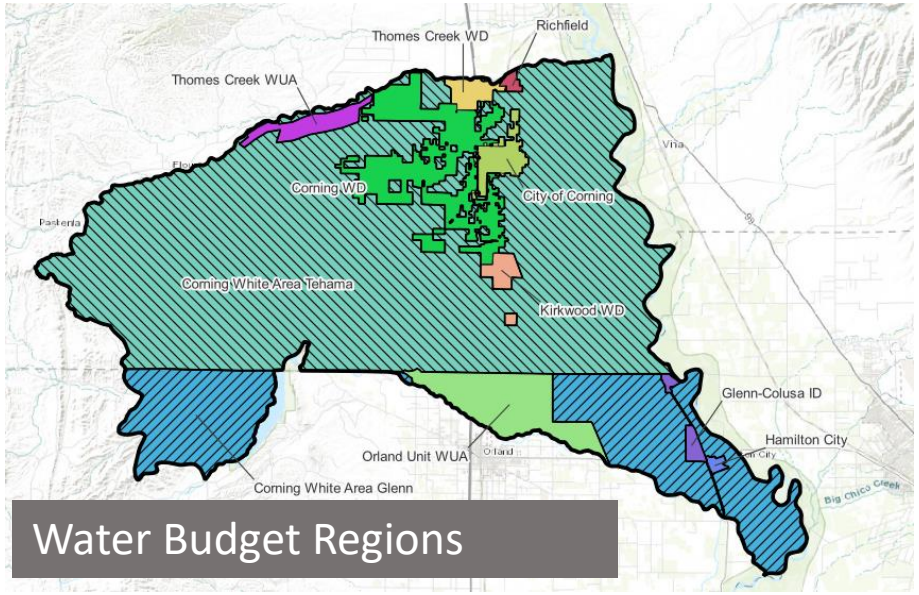
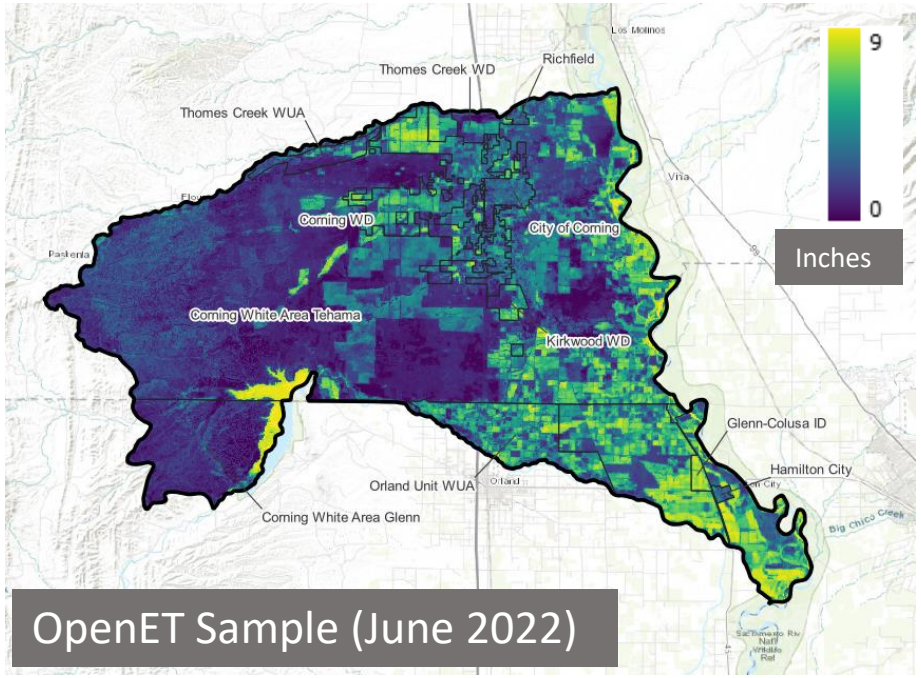
Water Supply and Water Use (Water Budget)

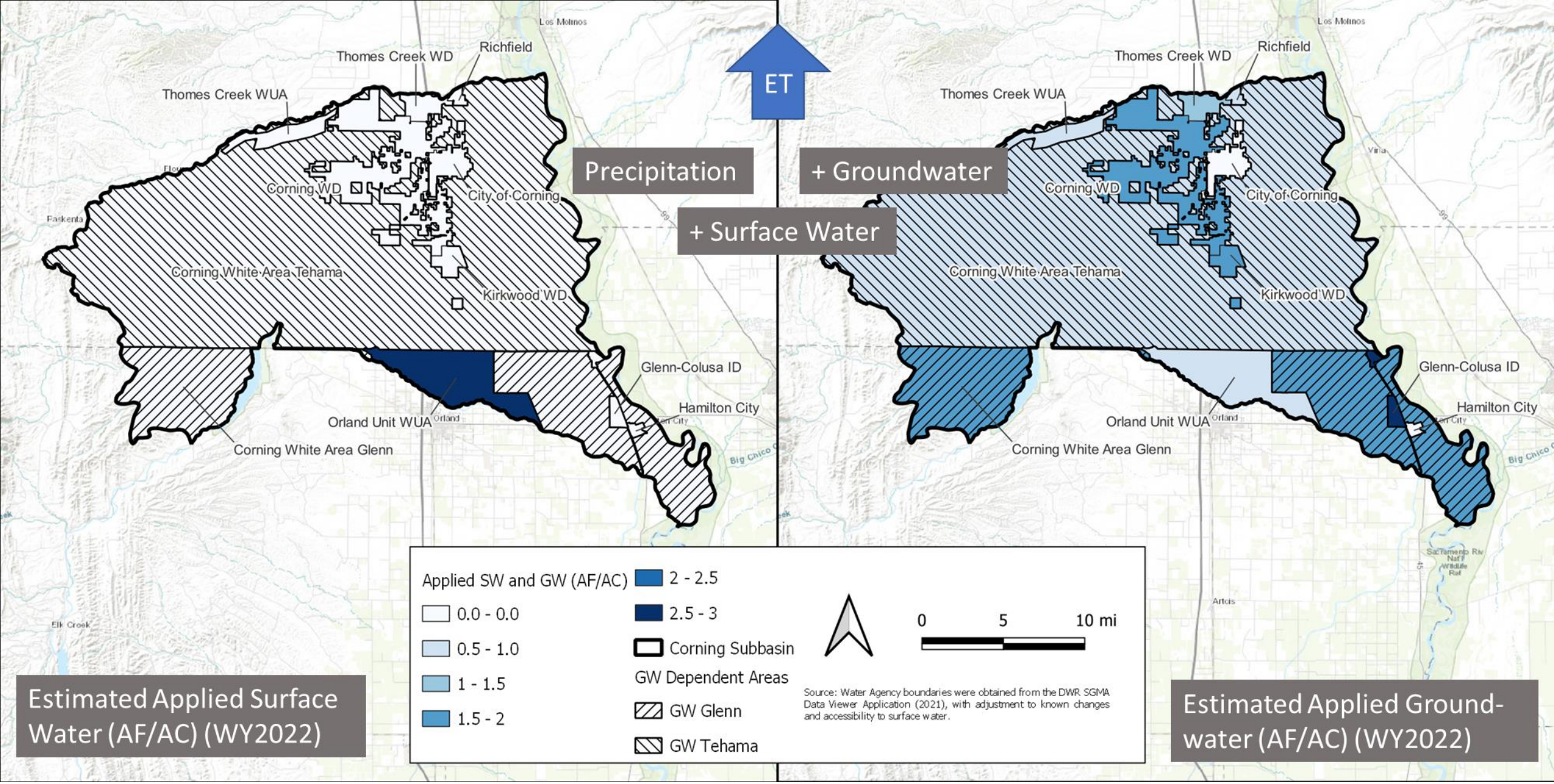
- Monthly timestep
- Based on Evapotranspiration (ET) from OpenET and Precipitation from PRISM
- Aggregated by with land use (DWR 2020 and CropScape 2022)
- Reported USBR Central Valley Operations (CVO) Reported SW Deliveries
- Measured Groundwater Extraction (Municipal)
- Domestic estimated from Urban Water Management Plans (UWMPs)
- Results summarized by water budget regions and land use
- Can be refined to field scale application



Water Budget Regions



OpenET Sample (June 2022)



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

Estimated Applied Ground-water (AF/AC) (WY2022)

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Water Supply and Water Use (Water Budget)

Table 3-5 Estimated Uncertainty in Water Use Estimates			
Water Budget Component	**Data Source**	**Estimated Uncertainty (%)**	**Source**
Groundwater Water			
Agricultural	Measurement	20%	Typical uncertainty from water balance calculation.
Urban	Measurement/Estimate	5%	Typical accuracy of urban water system reporting.
Rural Residential	Calculation	15%	Estimated from per capita water use and Census information.
Native Vegetation (Plant groundwater uptake)	Calculation	25%	Estimated based on land use classification, precipitation, and ET.
Surface Water			
Agricultural	Calculation	10%[1]	Estimated from Senate Bill 88 (SB 88) measurement accuracy standards.

[1] Higher uncertainty of 10%-20% is typical for estimated surface water inflows, including un-gaged inflows from small watersheds into creeks that enter the Basin.

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Water Supply and Water Use (Water Budget)

Table 3-4 Total Water Use by Water Use Sector			
Sector	2022 (af)		
	Groundwater	Surface Water	Total
Agricultural	230,000	26,000	256,000
Urban	4,600	0	4,600
Rural Residential	220	0	220
Native Vegetation (Plant groundwater uptake)	7,300	0	7,300
Total	**242,120**	**26,000**	**268,120**
Total (excluding Native Vegetation[1])	**234,820**	**26,000**	**260,820**

[1] *Excludes native vegetation which involves only natural plant uptake of shallow groundwater, not direct pumping, and extraction.*

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Water Budget Results by Water Budget Region

Water Budget Region	Area (AC)	Estimated Groundwater Extraction (AF)	Estimated Groundwater Extraction (AF/AC)
Corning WD	13,614	25,900	1.9
Kirkwood WD	1,273	2,400	1.9
Orland Unit WUA	8,592	4,300	0.5
Thomes Creek WD	1,407	1,700	1.2
Thomes Creek WUA	2,212	1,900	0.9
Glenn-Colusa ID	920	2,600	2.8
City of Corning	2,239	1,100	0.5
Hamilton City	282	0	0.0
Richfield	348	300	0.9
Corning White Area Glenn	36,091	58,500	1.6
Corning White Area Tehama	140,436	126,600	0.9
Totals	**207,414**	**233,000**	**1.1**

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Water Budget Results by Land Use

Land Use Classification	Area (AC)	Estimated Groundwater Extraction (AF)	Estimated Groundwater Extraction (AF/AC)
Citrus and Subtropical	18,250	40,000	2.2
Almonds	17,537	55,000	3.1
Miscellaneous Deciduous	16,108	37,000	2.3
Walnuts	13,466	48,000	3.6
Miscellaneous Pasture	7,504	19,000	2.5
Grain and Hay	6,083	12,000	2.0
Idle	5,864	0	0.0
Urban	5,243	0	0.0
Open Urban	4,964	0	0.0
Native Vegetation	99,256	0	0.0
Riparian Vegetation	2,525	7,000	2.8
Others	10,612	14,000	1.3
Totals	**207,414**	**233,000**	**1.1**

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GSP Implementation

- Updates discussed in the annual report (Section 5.2)
- Highlights in 2022:
  - Submitted SGMA Implementation Round 2 grant application in December 2022
    - GSP Implementation Outreach and Compliance Activities
    - Ongoing Monitoring, Data Gaps, and Enhancements
    - Project and Management Action Implementation – Regional Conjunctive Use Projects
    - Project and Management Action Implementation – Recharge Focused

GSP Implementation (Continued)

The Corning Subbasin GSAs have also supported a proposal for a project to be submitted for funding through the **United States Bureau of Reclamation's WaterSMART Environmental Water Resources Projects grant opportunity**. The proposed project is to enhance the Corning Water District's (CWD) Supervisory Control and Data Acquisition (SCADA) system and provide infrastructure and outreach to promote in-lieu and direct recharge. The objectives of the program are to:

- Upgrade CWD's SCADA system in accordance with their 2020 Water Management Plan,
- Configure a new water information system to collect meter readings and provide landowners access to water use,
- Provide required infrastructure to conduct groundwater recharge in accordance with the Corning Subbasin Groundwater Sustainability Plan (GSP), and
- Conduct landowner and stakeholder outreach to promote in-lieu and direct groundwater recharge.
- Tehama County is making progress with a Well Registration Program (well inventory) and Glenn County is updating its well permitting process.

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