



Kern River Groundwater Sustainability Agency (KRGSA)

KRGSA GSP IMPLEMENTATION ACTIVITIES WATER YEAR 2020

KRGSA BOARD MEETING
JUNE 3, 2021

Kern County Subbasin Groundwater Sustainability Plans



Second Annual Report Water Year 2020

April 1, 2021

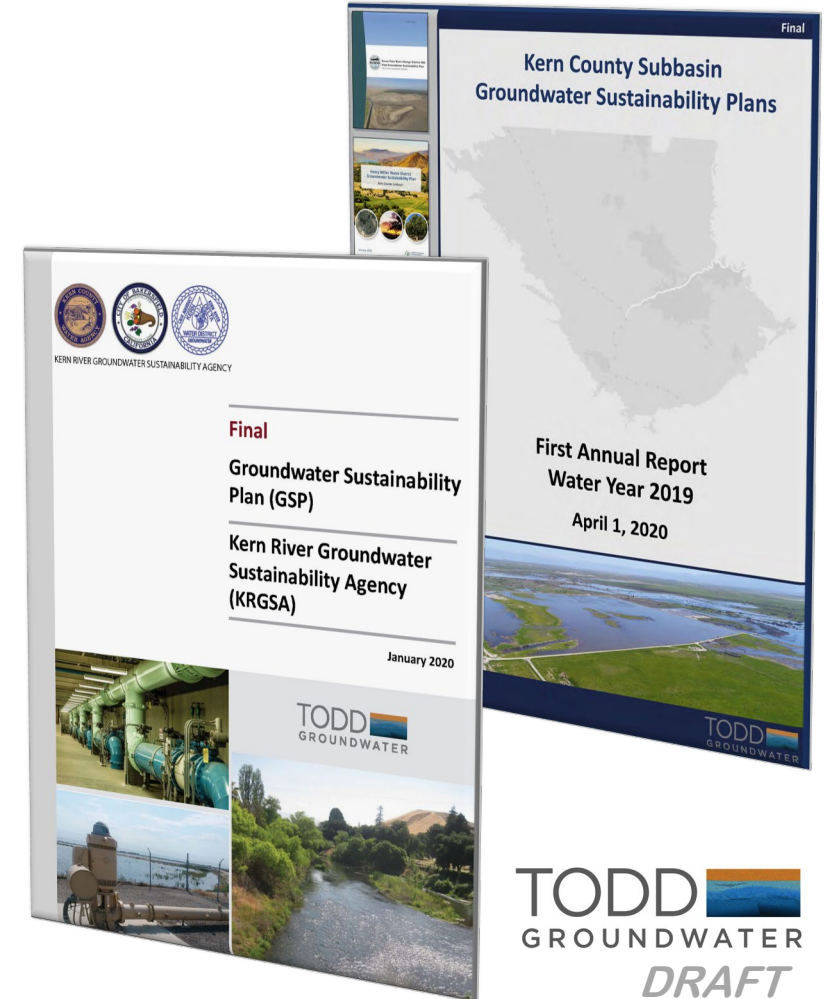


2nd GSP ANNUAL REPORT

- All GSAs in the Kern County Subbasin – including the KRGSA – coordinated on preparation of 2nd GSP Annual Report
- Submitted to DWR April 1, 2021
- First year of GSP Implementation
- Update on additional implementation activities ongoing for the KRGSA GSP

SUBBASIN-WIDE ANNUAL REPORT AND ADDITIONAL KRGSA GSP ACTIVITIES

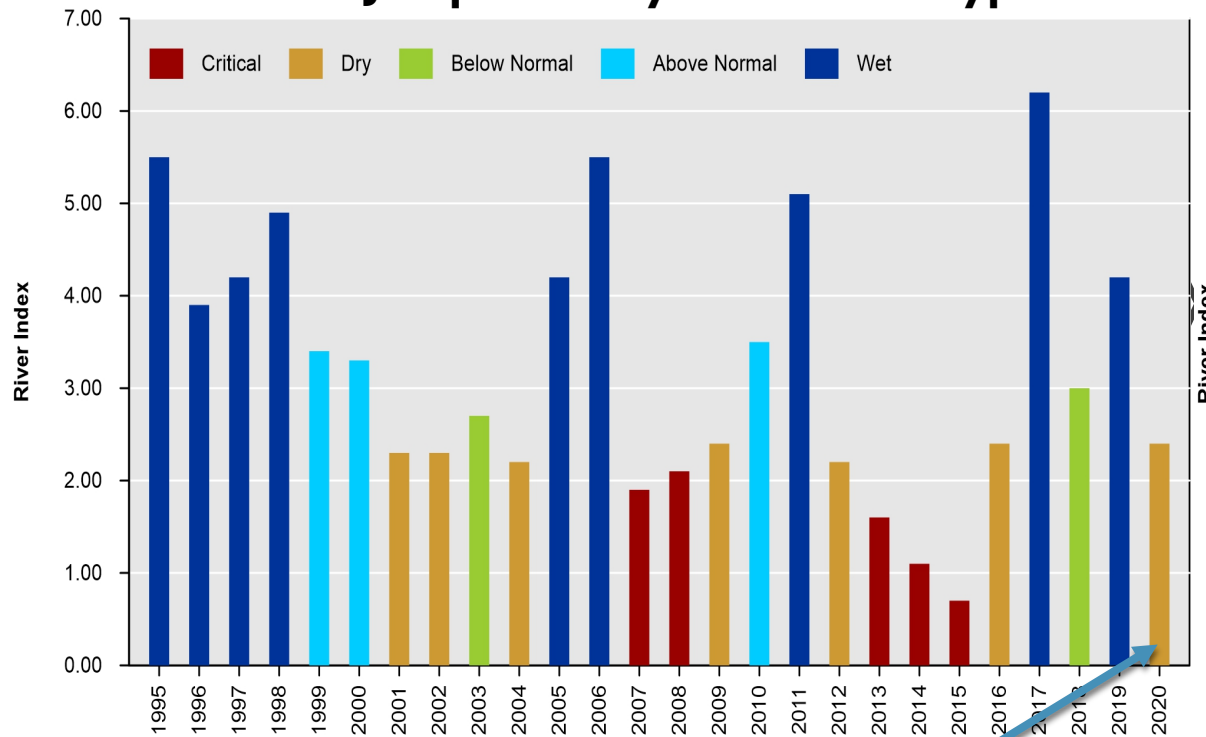
- Kern County Subbasin 2nd Annual Report WY 2020
 - Support Subbasin analysis with KRGSA data
 - Numerical model update
 - Water level mapping and hydrographs
 - Included KRGSA monitoring data and progress report
- KRGSA GSP Implementation Activities WY 2020
 - Water Level monitoring program
 - Subsidence monitoring program
 - Water Quality Management Action
 - Groundwater Budget for the KRGSA



HYDROLOGIC INDICES FOR WATER YEAR TYPE

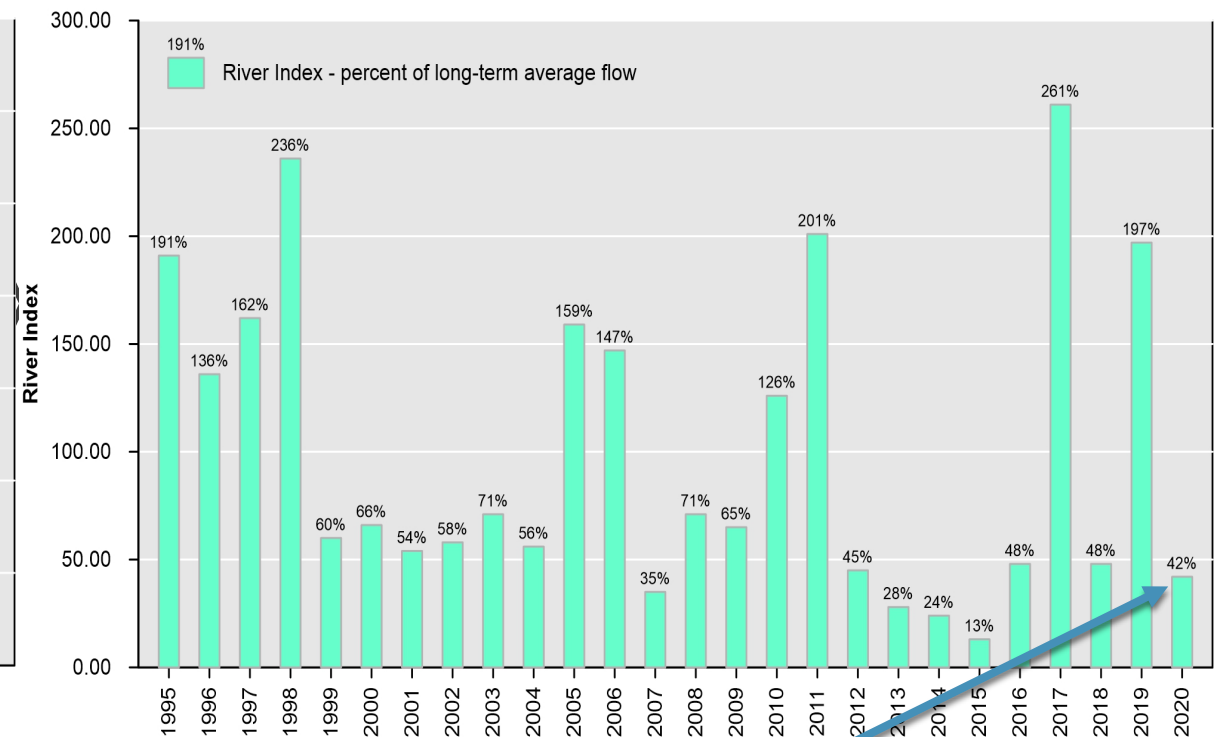
WY 2020 DROUGHT CONDITIONS

San Joaquin Valley Water Year Type



WY 2020 – Dry hydrologic index for the San Joaquin Valley (DWR indices)

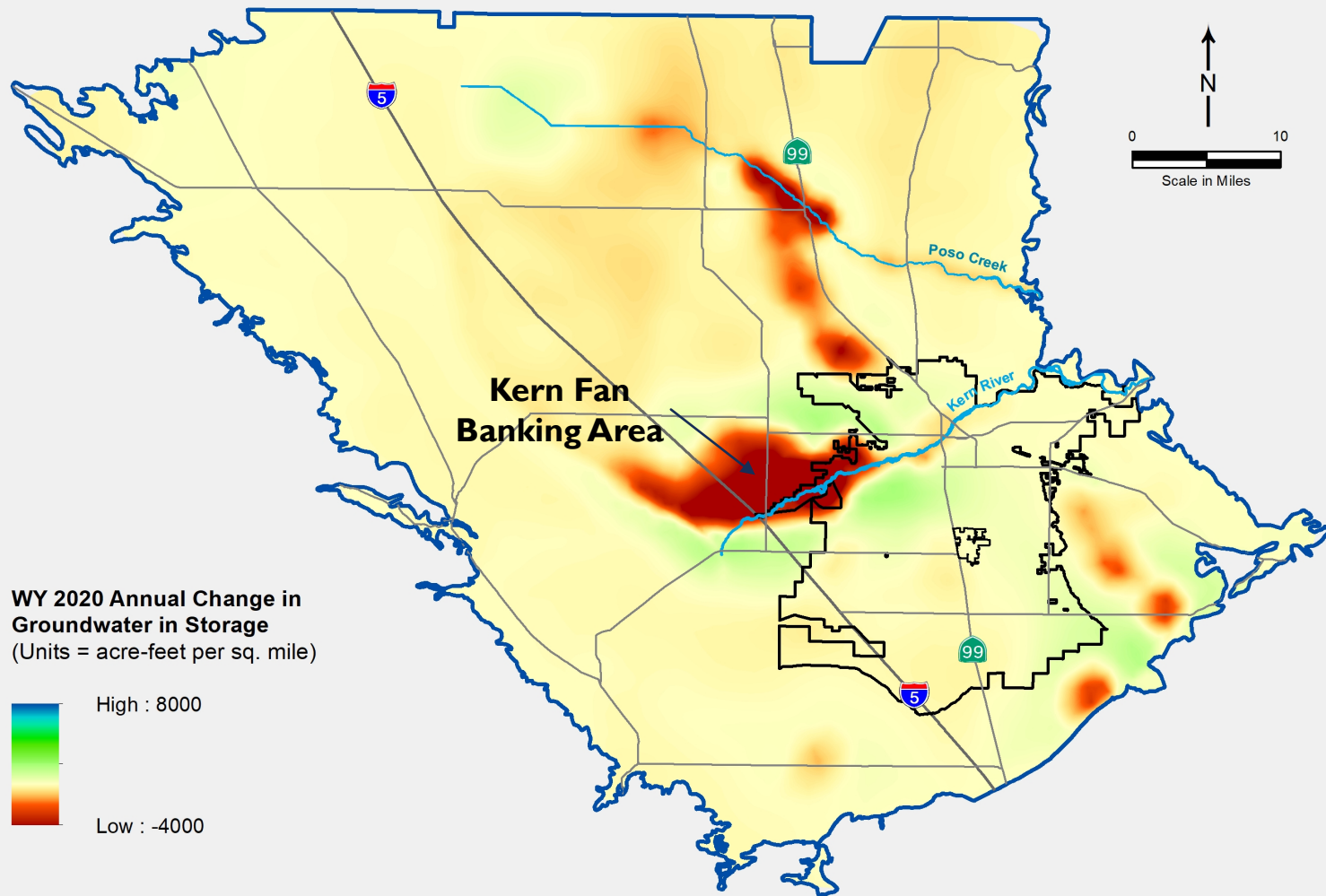
Kern River Annual Index



WY 2020 – Kern River only
42% of long-term average flow

WY 2020 ANNUAL REPORT

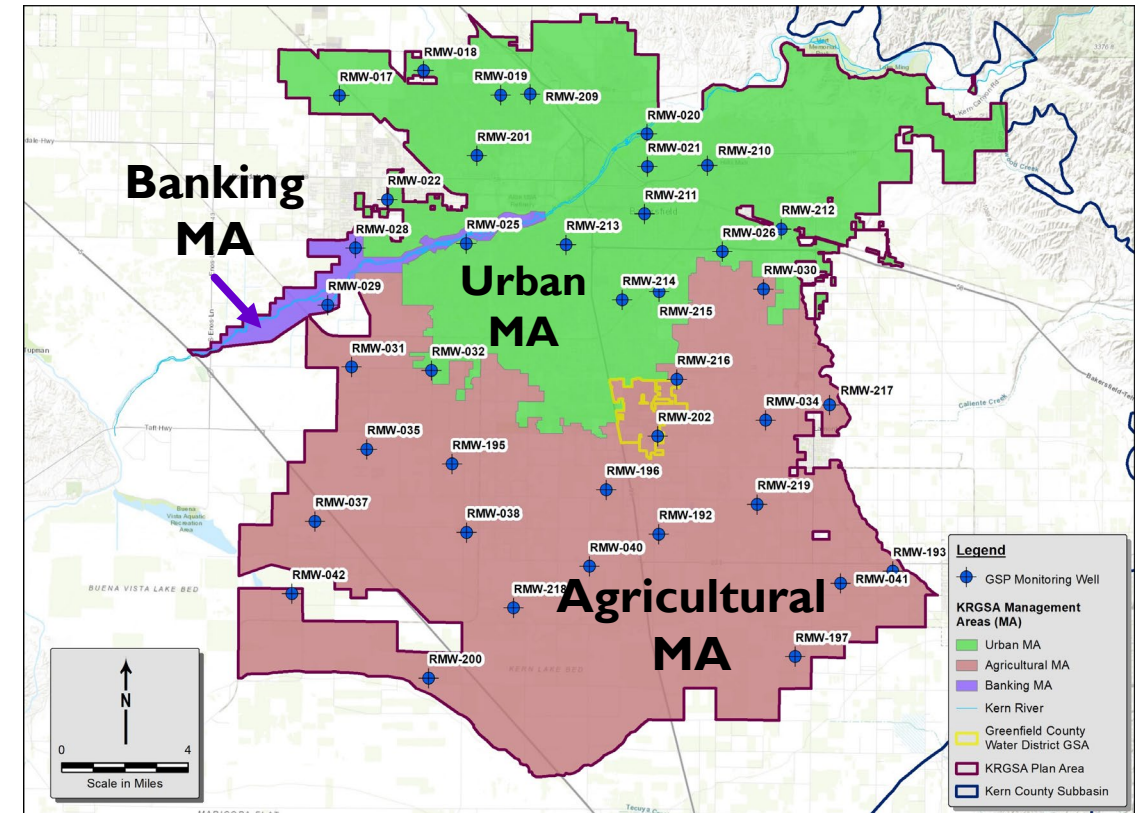
CHANGE in GROUNDWATER in STORAGE



- Change in Groundwater in Storage directly related to water level changes
- Drought conditions in WY 2020 resulted in Subbasin-wide water level declines
- Largest declines in areas of concentrated recovery pumping associated with water banking

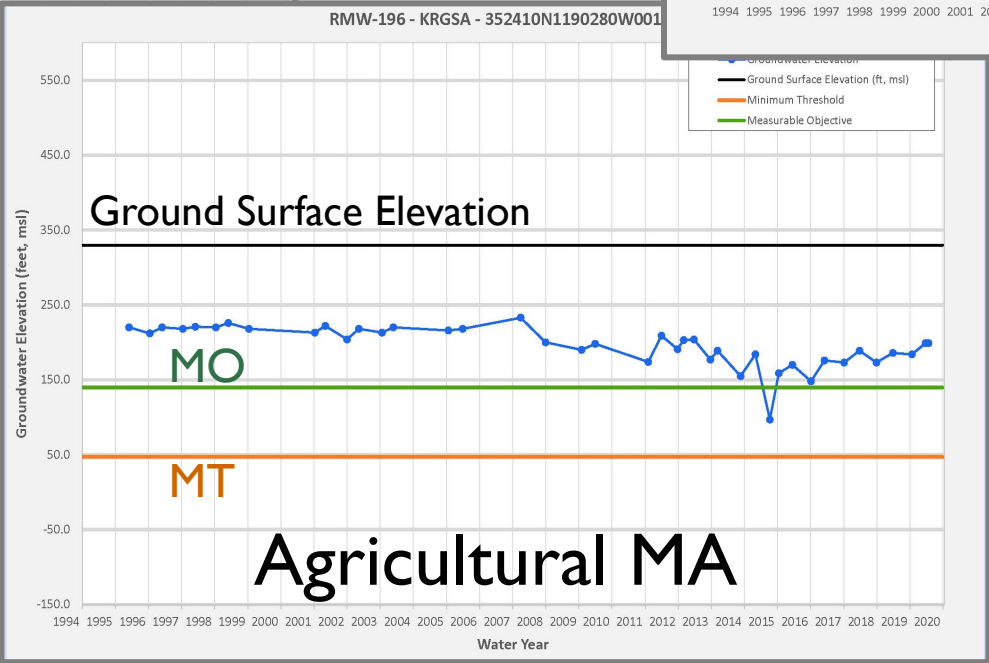
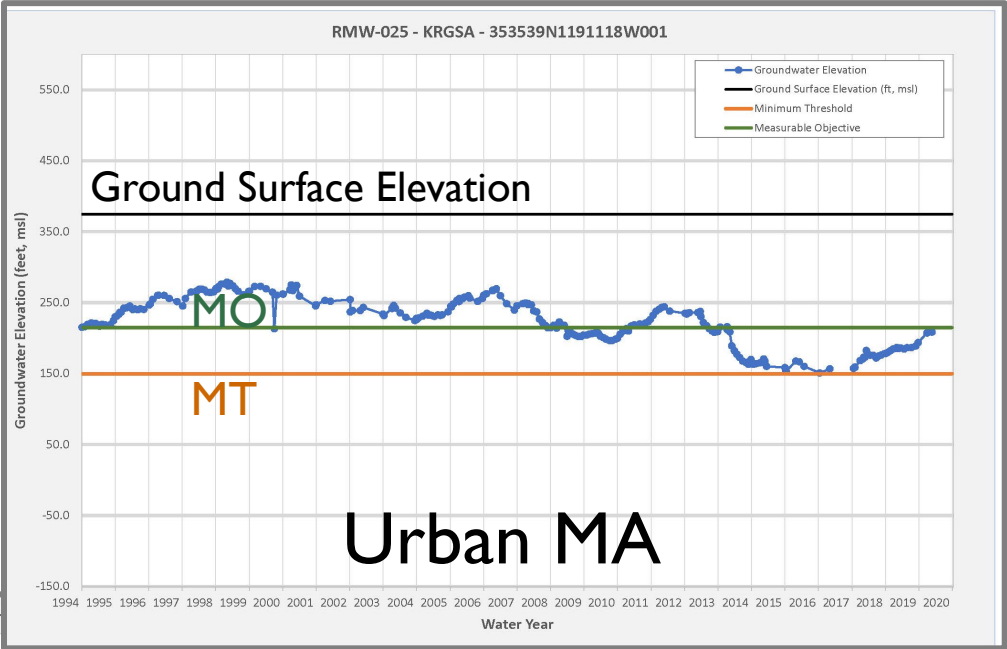
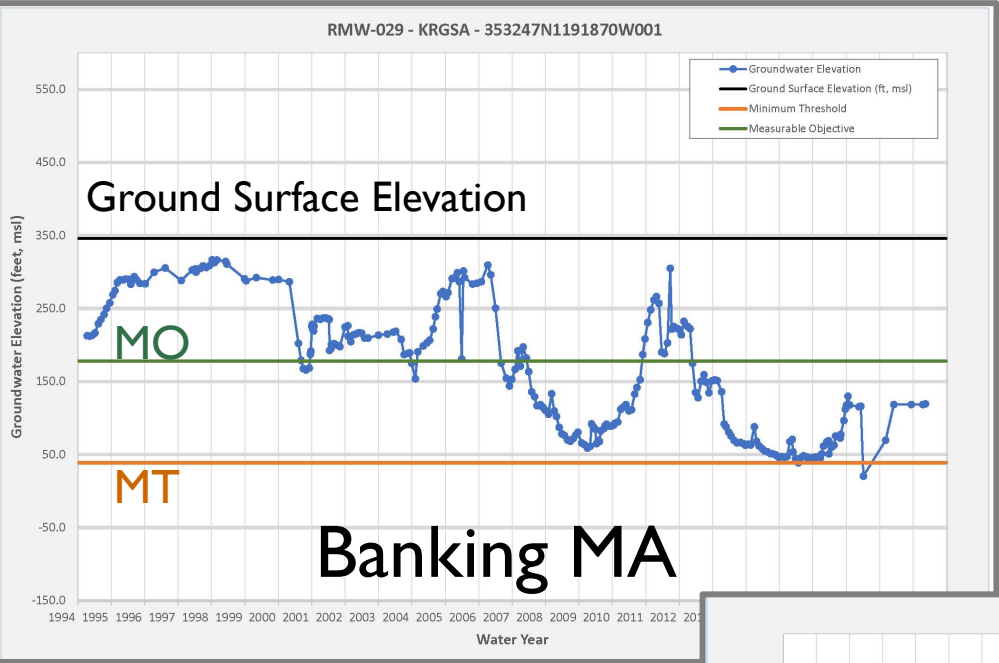
KRGSA WATER LEVEL MONITORING PROGRAM

- 3 Management Areas (MAs) based on primary land and water use
- 39 wells - original GSP Monitoring Network
- Developed minimum thresholds (MTs) and measurable objectives (MOs) for each well to track sustainable management
- Report semi-annual water level data to the DWR online SGMA portal (coordinated by the Subbasin Plan Manager)



39 wells in 3 Management Areas

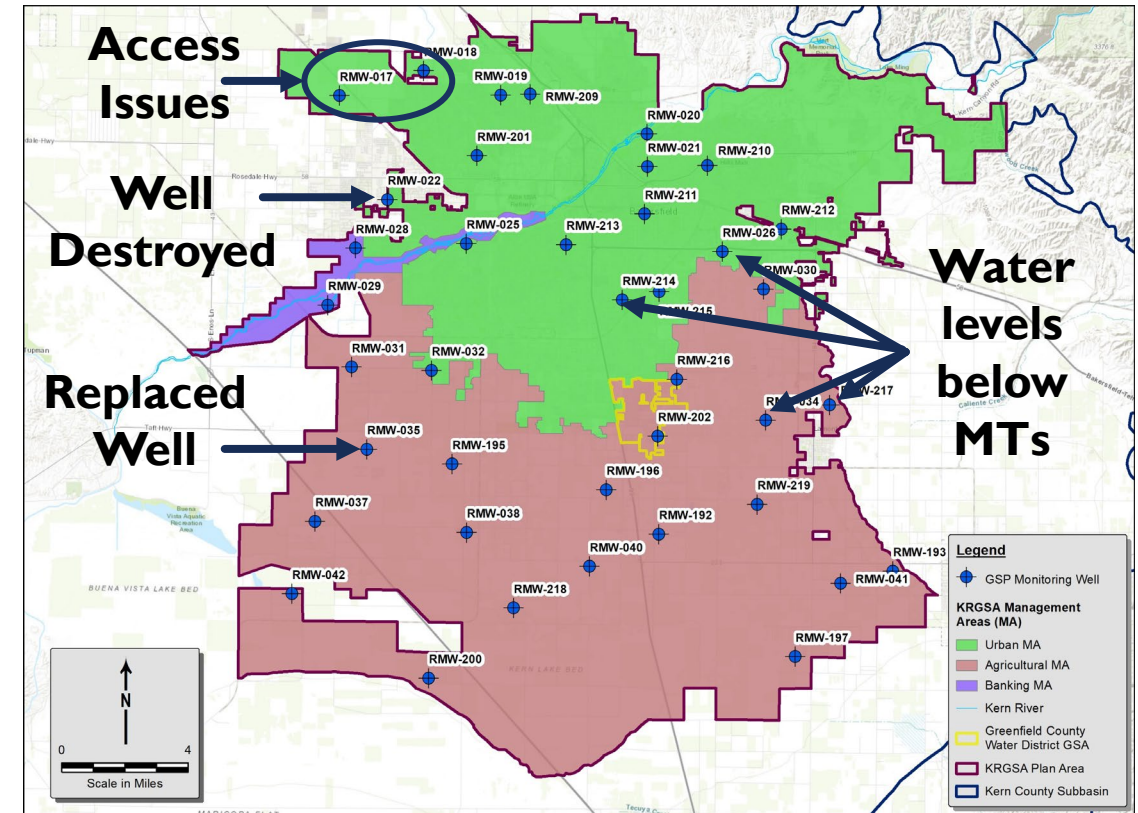
Urban (green), Banking (purple), Agricultural (red)



MO – Measurable Objective
MT – Minimum Threshold

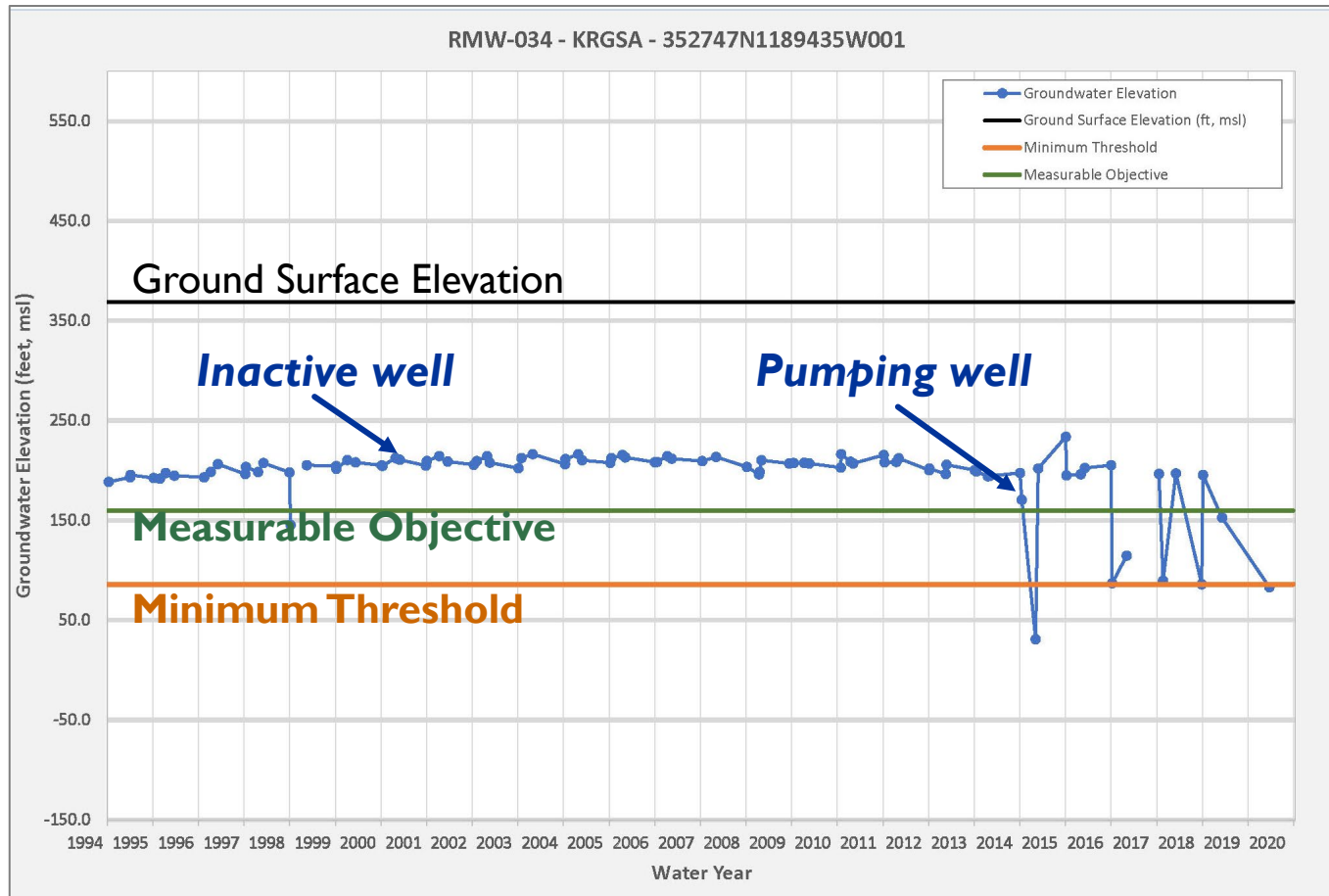
KRGSA MONITORING PROGRAM MODIFICATIONS WY 2020

- GSP Management Action to improve monitoring network over time
- Access issues with 4 wells in WY 2020
 - 2 wells in northwest; City worked with owner to restore access to one well
 - 1 additional well in northwest destroyed
 - KDWD replaced one inaccessible well (southwest)
 - Current 37 wells in program
- Minimum Threshold (MT) exceedances in 4 wells in east central KRGSA
 - Active production wells or nearby pumping wells
 - Research for inactive wells to monitor and other network improvements



37 wells in 3 Management Areas
Urban (green), Banking (purple), Agricultural (red)

KRGSA HYDROGRAPHS WITH MT EXCEEDANCES

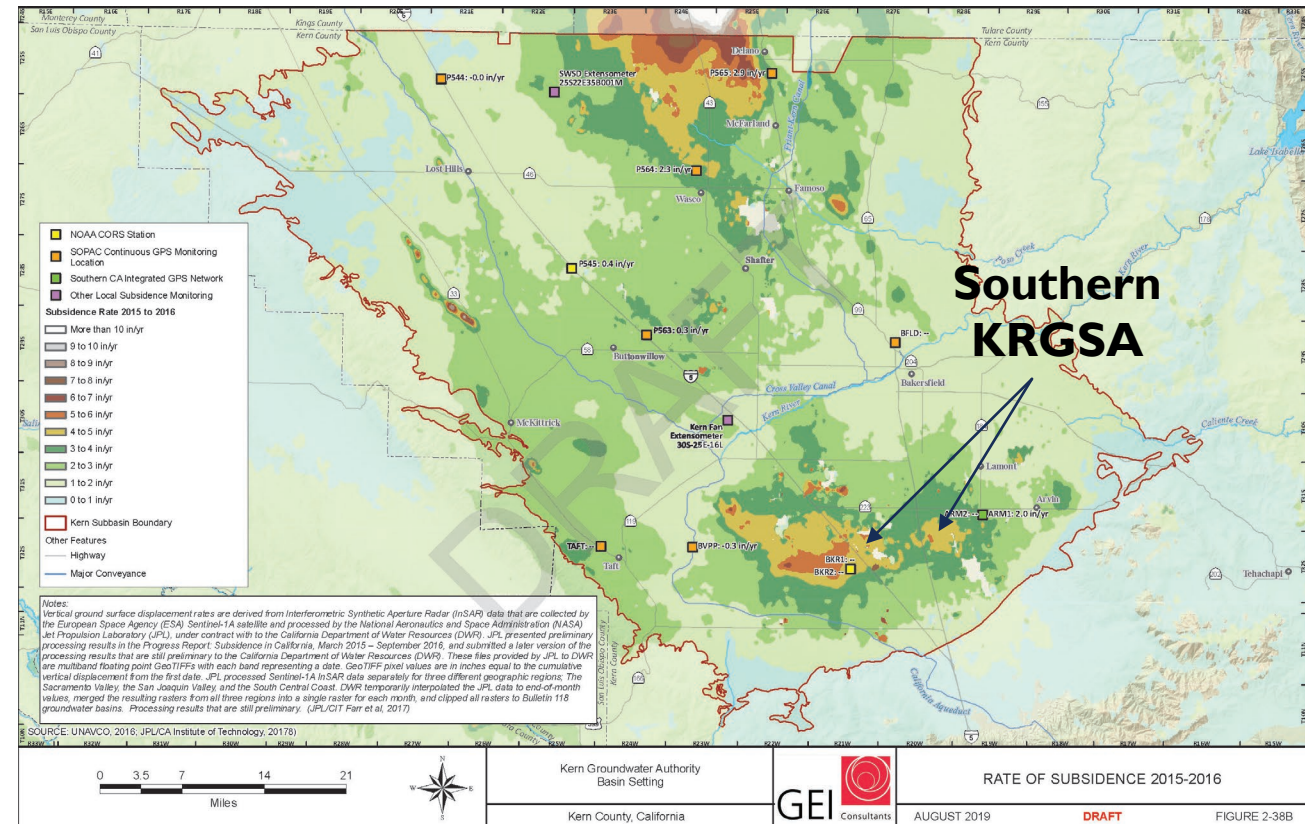


- Some exceedances due to inclusion of active pumping wells in monitoring network
- Not currently “undesirable results”
- Research for replacement wells ongoing
- May require investment in new monitoring wells for the future

MULTI-FACETED APPROACH TO SUBSIDENCE MONITORING

KRGSA GSP

- Historical land subsidence in southern KRGSA and adjacent districts
- Thick clay deposits associated with paleo-lake beds in the southern Kern County Subbasin
- Compaction beneath parts of Kern Delta Water District and adjacent areas west and southwest
- No adverse impacts to critical infrastructure in KRGSA to date – no “undesirable results”



MULTI-FACETED APPROACH TO SUBSIDENCE MONITORING

KRGSA GSP

1. 4 wells in GSP water level monitoring network

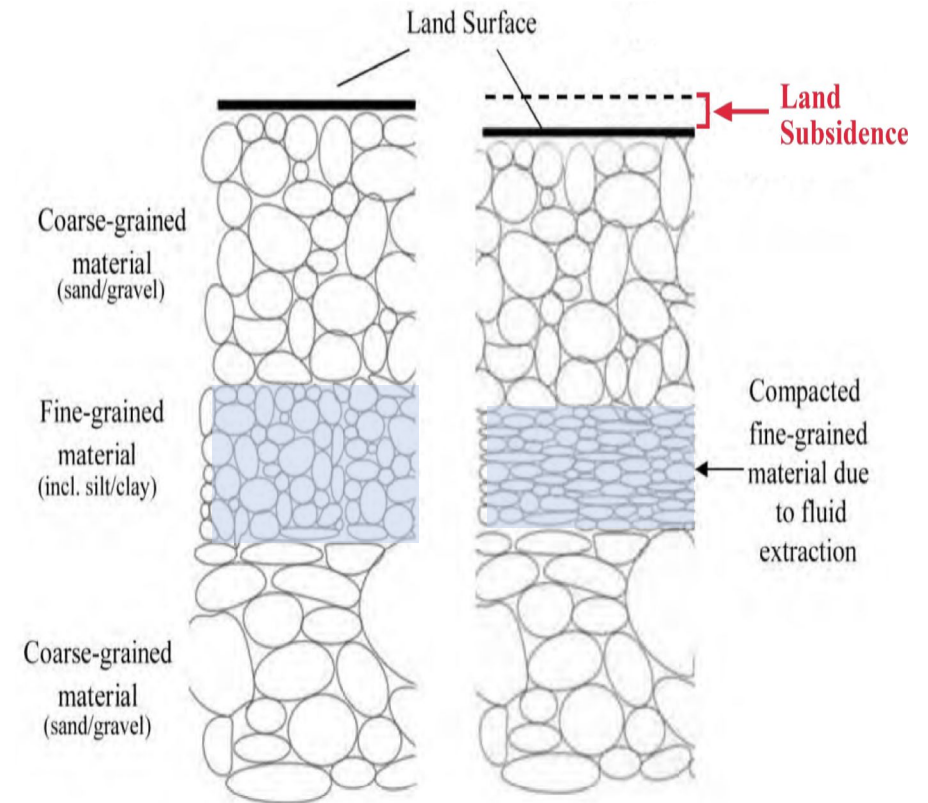
- Manage water levels near or above the historic low water level
- Mitigates future exacerbation of land subsidence
- Land subsidence associated with a time lag; land may continue to subside for some time related to previous water level declines (even if water levels are arrested)

2. DWR InSAR remote sensing data

- Published online annually to assist GSAs with subsidence monitoring
- No additional MTs associated with InSAR data; tracking only

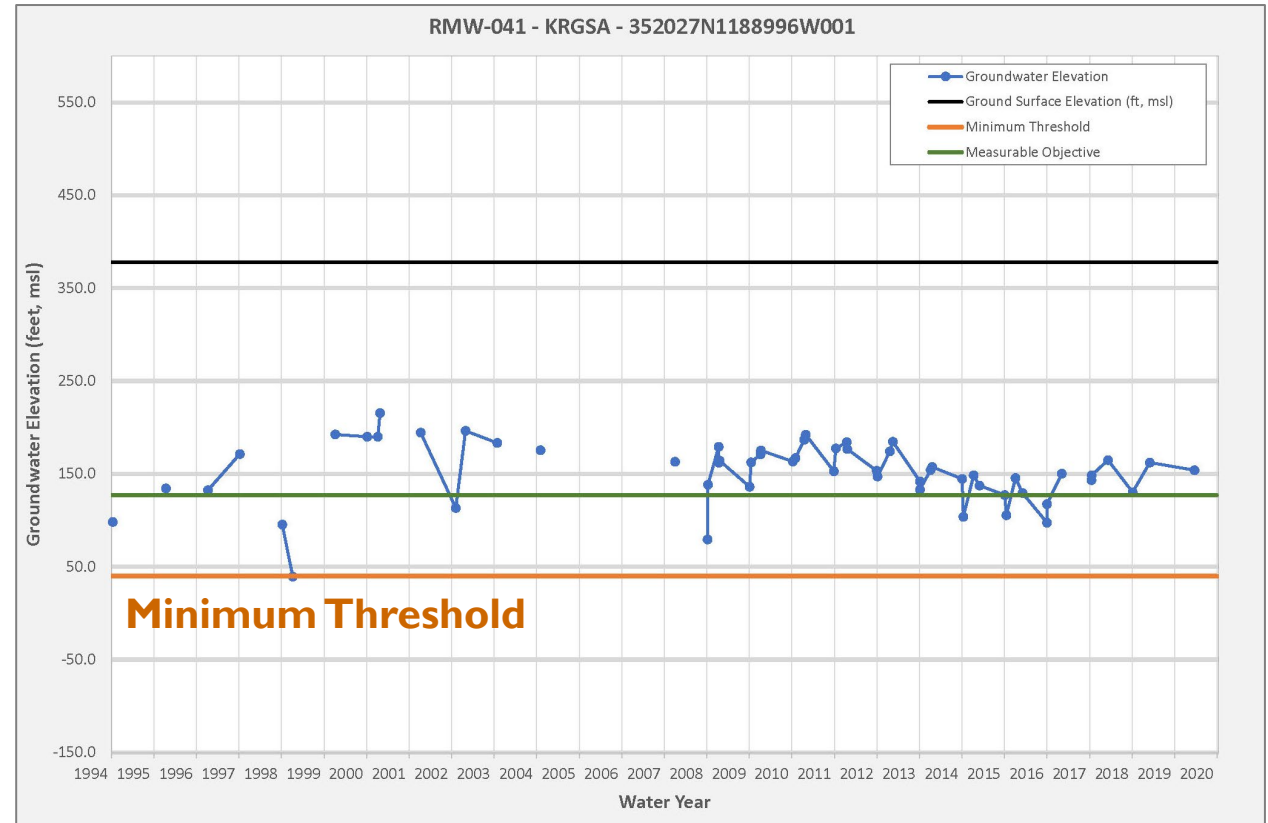
3. Existing GPS stations in the KRGSA monitored by others

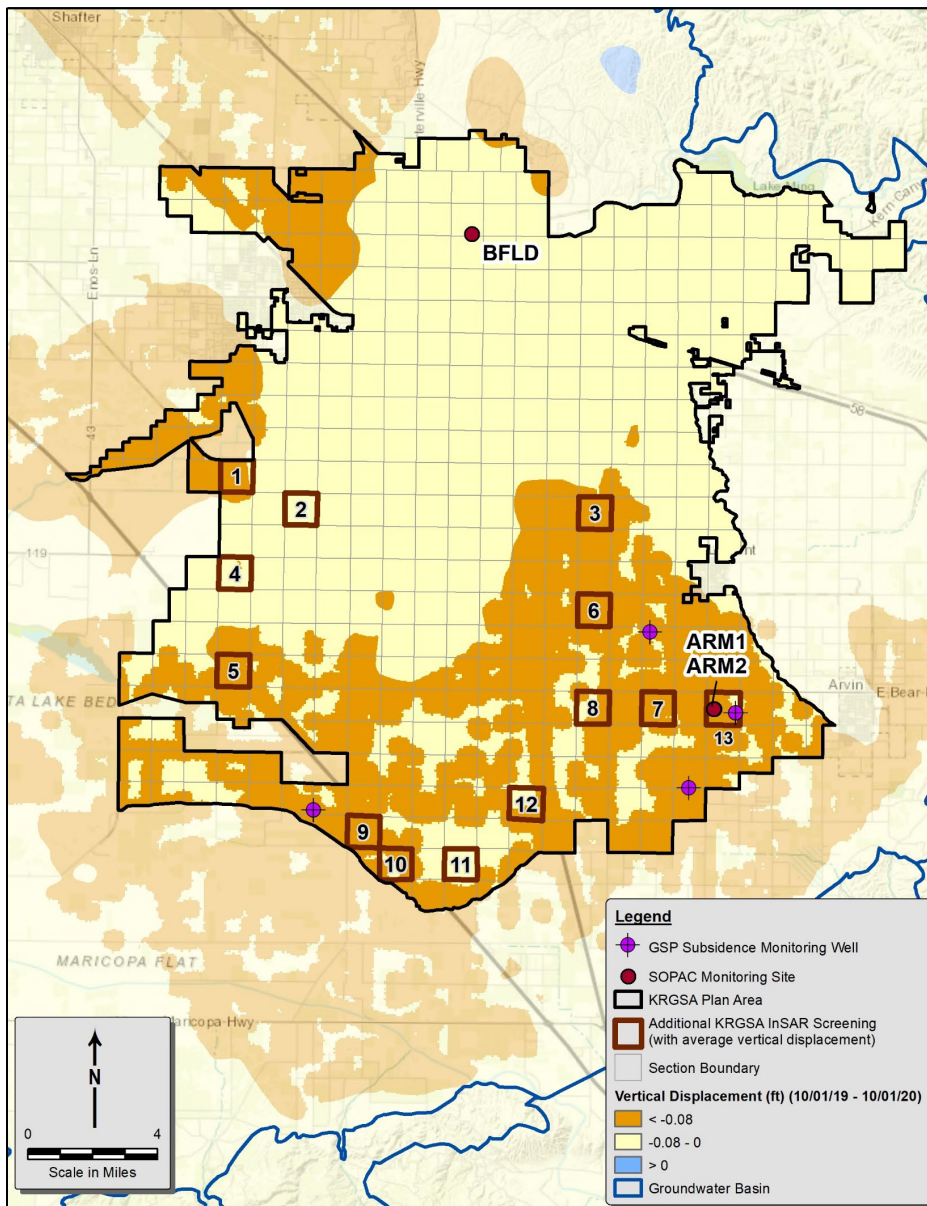
4. Participate in subbasin-wide analyses for shared critical infrastructure (e.g., California Aqueduct, Friant-Kern Canal)



KRGSA WATER LEVEL MONITORING FOR LAND SUBSIDENCE

- Maintain water levels above historical low levels to prevent exacerbation of land subsidence and to avoid “undesirable results”
- Water levels in all KRGSA Subsidence Monitoring Wells above Minimum Thresholds (MTs)
- Time lag between groundwater withdrawals and land subsidence; recent drought of record triggered increase in subsidence
- Some subsidence expected to continue into the future





DWR InSAR DATA WY 2020

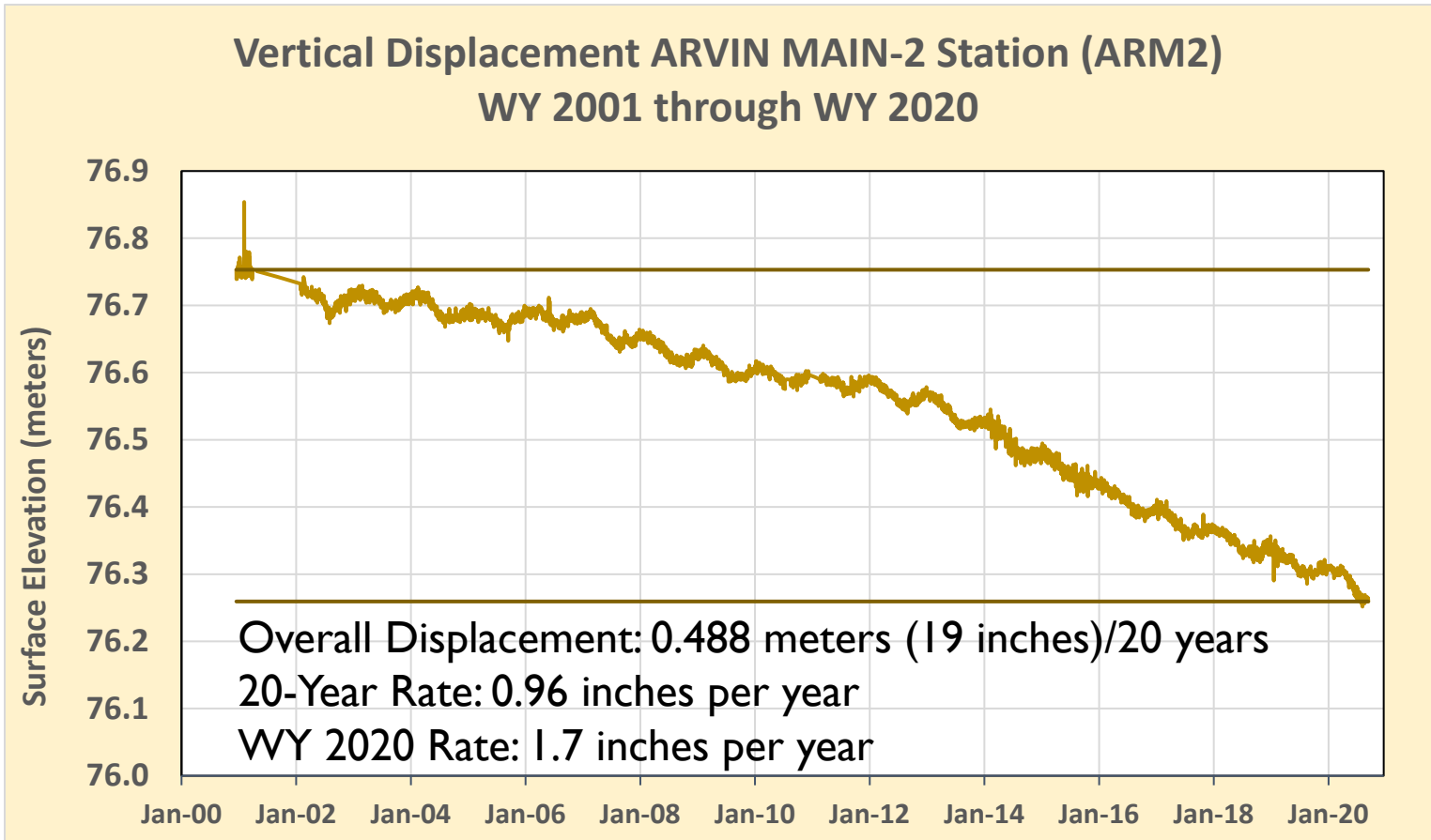
- Supplemental Subsidence Monitoring – 13 locations
- Current subsidence rates consistent with historical

ID	X	Y	INSAR Screening	MTRS	Average Vertical Displacement (feet)
1	6211872.23	2298816.08	Y	M30S26E22	-0.090
2	6222349.37	2293430.06	Y	M30S26E25	-0.060
3	6270255.91	2292771.32	Y	M30S28E28	-0.104
4	6211580.98	2282949.26	Y	M31S26E03	-0.042
5	6211315.11	2267034.10	Y	M31S26E22	-0.094
6	6270087.44	2276907.27	Y	M31S28E09	-0.130
7	6280535.44	2260877.53	Y	M31S28E26	-0.198
8	6269914.71	2260987.09	Y	M31S28E28	-0.107
9	6232525.46	2240770.84	Y	M32S27E17	-0.239
10	6237761.94	2235507.00	Y	M32S27E21	-0.113
11	6248375.29	2235450.84	Y	M32S27E23	-0.001
12	6259073.32	2245324.13	Y	M32S28E07	-0.088
13	6291178.05	2260817.97	Y	M31S29E30	-0.152

Monitored locations range from 0.001 ft (.01 in) to 0.239 ft (2.9 in)

GPS STATION MONITORED BY SOPAC

AREA OF HISTORICAL MAXIMUM LAND SUBSIDENCE

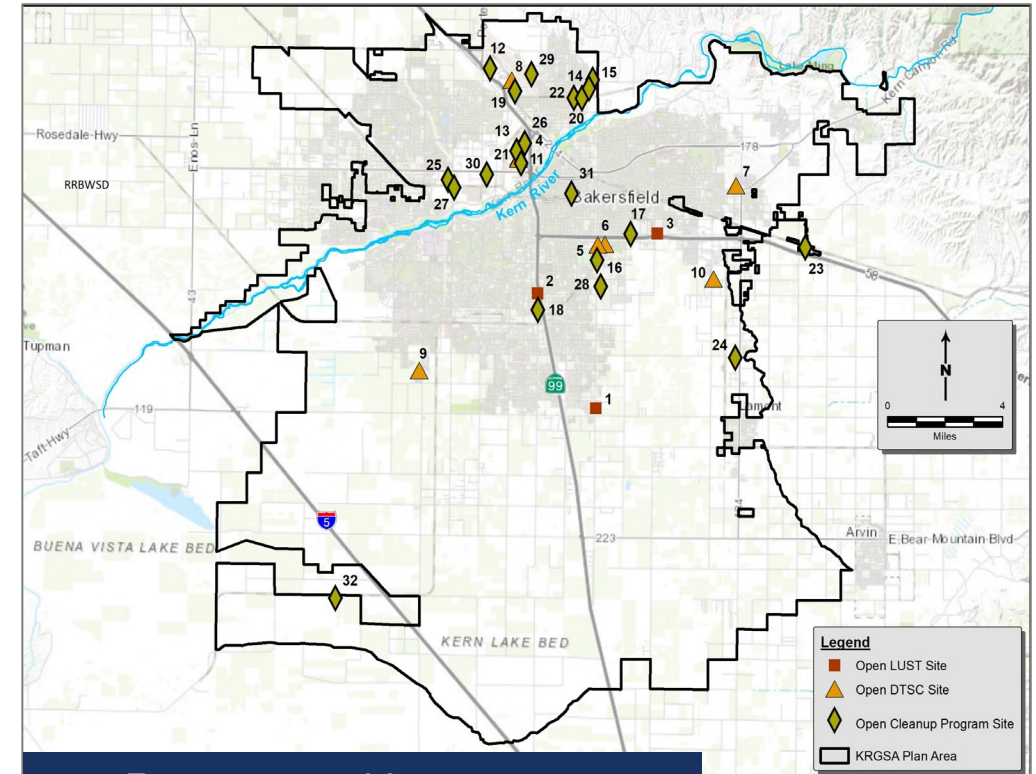


Source: DWR SGMA Data Viewer ([ca.gov](https://data.dwr.ca.gov/)), Land Subsidence, SOPAC GPS Stations

- Fluctuations show both declines and recovery (elastic)
- Rate increase during recent drought conditions
- Rates are consistent with historical subsidence rates

KRGSA GSP APPROACH FOR WATER QUALITY MONITORING AND COORDINATION

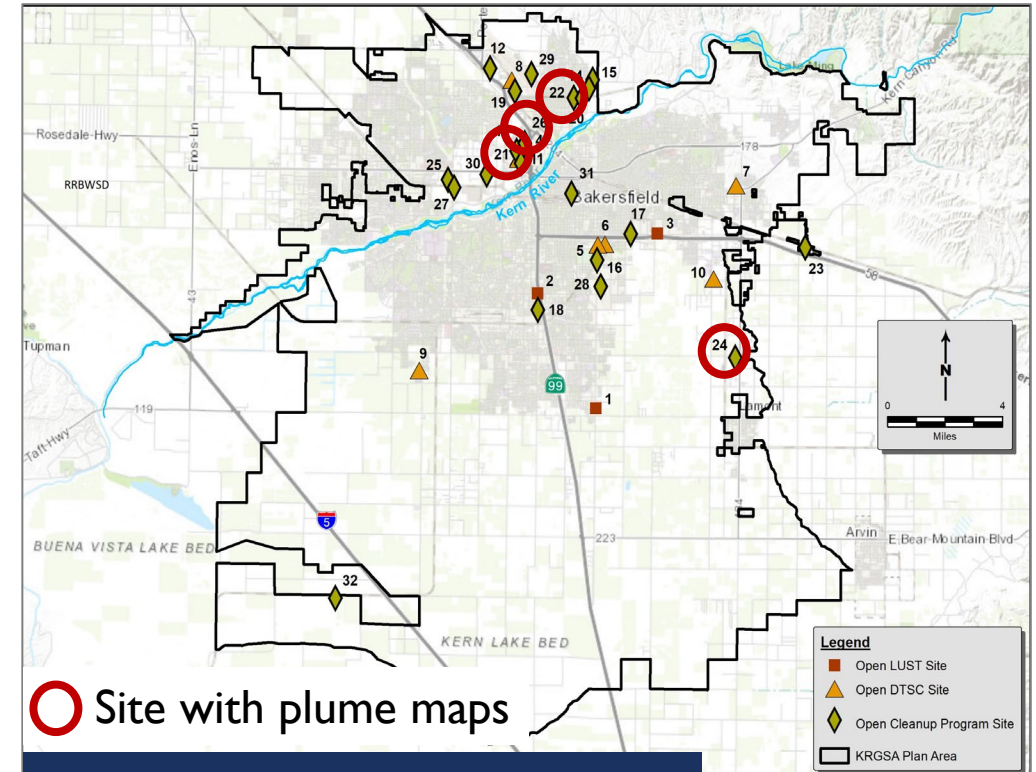
- GSP Management Action – track water quality data to ensure no exacerbation of constituents of concern due to GSP management
- Coordinate with Central Valley Regional Water Board on potential impacts to drinking water from 32 regulated facilities (see *map at right*)
- Review facilities to better understand groundwater conditions and potential management impacts



Environmental Investigation
and Cleanup Sites in the KRGSA

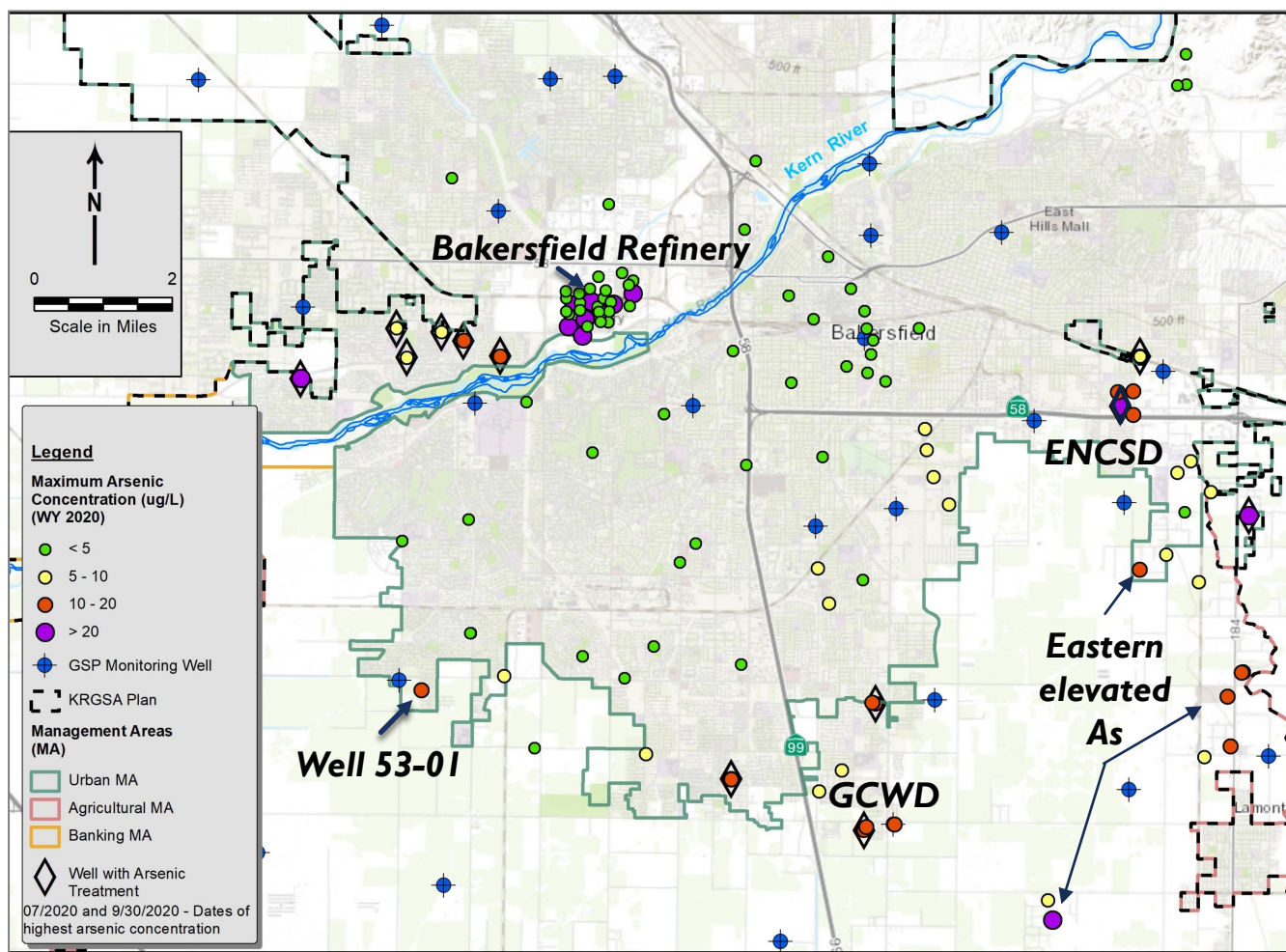
SITES WITH DELINEATED PLUMES OF GROUNDWATER CONTAMINANTS

- Identify facilities with delineated plumes
- Avoid management actions that might spread contaminants (GSP requirement)
- Track constituents of concern from these and other water quality monitoring programs as part of a KRGSA GSP Management Action
- GSP identified arsenic as a constituent of concern in groundwater



Environmental Investigation
and Cleanup Sites in the KRGSA

ARSENIC CONCENTRATIONS IN GROUNDWATER WY 2020 NEAR KRGSA URBAN MA



- Exceedances of arsenic MCL in multiple water supply wells; all of these wells also exceeded MCL prior to WY 2020
- Some water systems already have wellhead treatment for arsenic (City, GCWD, ENCSD)
- City Well 53-01 targeted for an additional arsenic treatment system
- Highest concentrations at Bakersfield Refinery – multiple wells > 10,000 ug/L
- Arsenic concentrations in KRGSA are similar to historical data and do not appear to be exacerbated by GSP management

KRGSA GROUNDWATER BUDGET

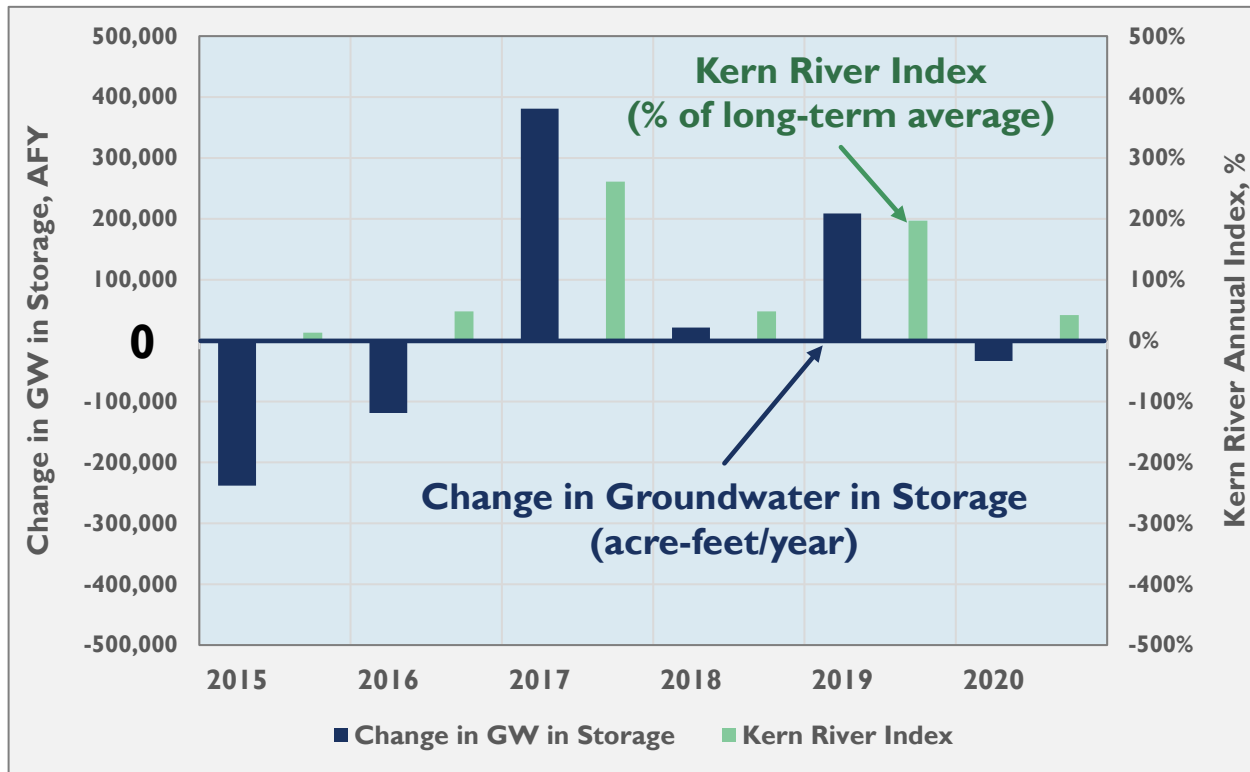
WY 2015 – WY 2020

- “Checkbook method” tabulates inflows and outflows at ground surface; excludes subsurface flows
- Includes some banking recharge and pumping recovery by others
- Decline in groundwater in storage of -33,507 AFY for WY 2020
- Deficit for WY 2020 reflects drought conditions; less than previous drought years
- Overall positive water balance for average hydrologic conditions (e.g., WY 2015 – WY 2020)

All values in acre-feet/ Water Year (AFY)	2015	2016	2017	2018	2019	2020	Average 2015-2020
INFLOWS							
Water Zone Budget 1 (Improvement District 4)	403	19,589	32,810	24,209	25,979	18,104	20,182
Water Zone Budget 2 (City of Bakersfield)	31,897	48,637	248,243	77,745	151,881	104,941	110,557
Water Zone Budget 3 (Kern Delta Water District)	91,610	121,818	208,194	165,925	187,931	130,450	150,988
Water Zone Budget 4 (Kern County Water Agency)	0	0	86,963	42,724	60,583	20,807	35,180
Water Zone Budget 5 (Additional Pumping - Return Flows)	9,839	11,750	11,129	12,179	11,425	13,548	11,645
Water Zone Budget 6 (Kern River Recharge by Others)	30,326	11,643	37,815	17,899	33,031	15,471	24,364
	164,073	213,438	625,154	340,681	470,830	303,321	352,916
OUTFLOWS							
Water Zone Budget 1 (Improvement District 4)	33,540	16,873	7,667	5,531	5,461	10,707	13,296
Water Zone Budget 2 (City of Bakersfield)	67,633	65,551	56,954	53,843	54,989	61,016	59,998
Water Zone Budget 3 (Kern Delta Water District)	216,745	183,527	137,921	201,423	160,590	152,261	175,411
Water Zone Budget 4 (Kern County Water Agency)	38,798	26,345	5,634	15,512	3,505	68,240	26,339
Water Zone Budget 5 (Additional Pumping)	45,376	38,211	34,928	41,638	36,127	41,001	39,547
Water Zone Budget 6 (Kern River Losses by Others)	-	1,675	1,231	1,234	1,319	3,603	1,510
	402,092	332,182	244,335	319,181	261,991	336,828	316,102
INFLOWS - OUTFLOWS	-238,019	-118,745	380,819	21,500	208,839	-33,507	36,815
Kern River Annual Index	13%	48%	261%	48%	197%	42%	102%

Water budget zones were established to facilitate data collection and prevention of double-counting and do not reflect all local flows within agency boundaries.

KRGSA GROUNDWATER BUDGET KERN RIVER INDICES



- KRGSA groundwater budget correlates closely with Kern River hydrology
- Increase of groundwater in storage when Kern River Index is at or above long-term average (100%)
- Groundwater deficits occur when Kern River Index is 50% or below the long-term average

KRGSA GSP IMPLEMENTATION PROGRESS IN WY 2020

- The **City** recharged 65,726 AF to meet urban demand, expanded recharge capacity in Truxtun Lakes, implemented Kern River Channel Maintenance Program, and conserved more than 26,000 AF of recycled water.
- **KDWD** expanded capacity for groundwater recharge, purchased about 7,000 AF from the Kern Water Bank “overdraft correction”, and is coordinating with AEWSO on a joint recharge project including 157-acre recharge facility. In addition, KDWD used about 13,000 AF of Kern River water would have been unavailable without its Water Allocation Project.
- **ID4** continued its groundwater banking operations in WY 2020, including increasing recharge capacity from excess water in the CA Aqueduct. Urban Bakersfield AC recommended that ID4 support the Delta Conveyance Project planning and design for 82,946 AF, a critical water supply for the KRGSA and a GSP Management Action.
- **ENCSD** completed environmental documents and water system agreements for a consolidation project to provide high-quality water supply for disadvantaged communities in the KRGSA.



KRGSA GSP ADAPTIVE MANAGEMENT

- *KRGSA Plan Managers also recognize the need for flexibility in the GSP. Numerous minimum thresholds (MTs) and other sustainability criteria were selected in the absence of undesirable results; several were selected at conservative levels to ensure that the future potential for undesirable results can be mitigated. Actual MTs may be lower (or higher) than those selected. (KRGSA GSP Management Action 7.2.9)*
- Re-evaluations to be provided in the Five-Year GSP Evaluation
- Ongoing analyses summarized in Annual Reports



QUESTIONS?

