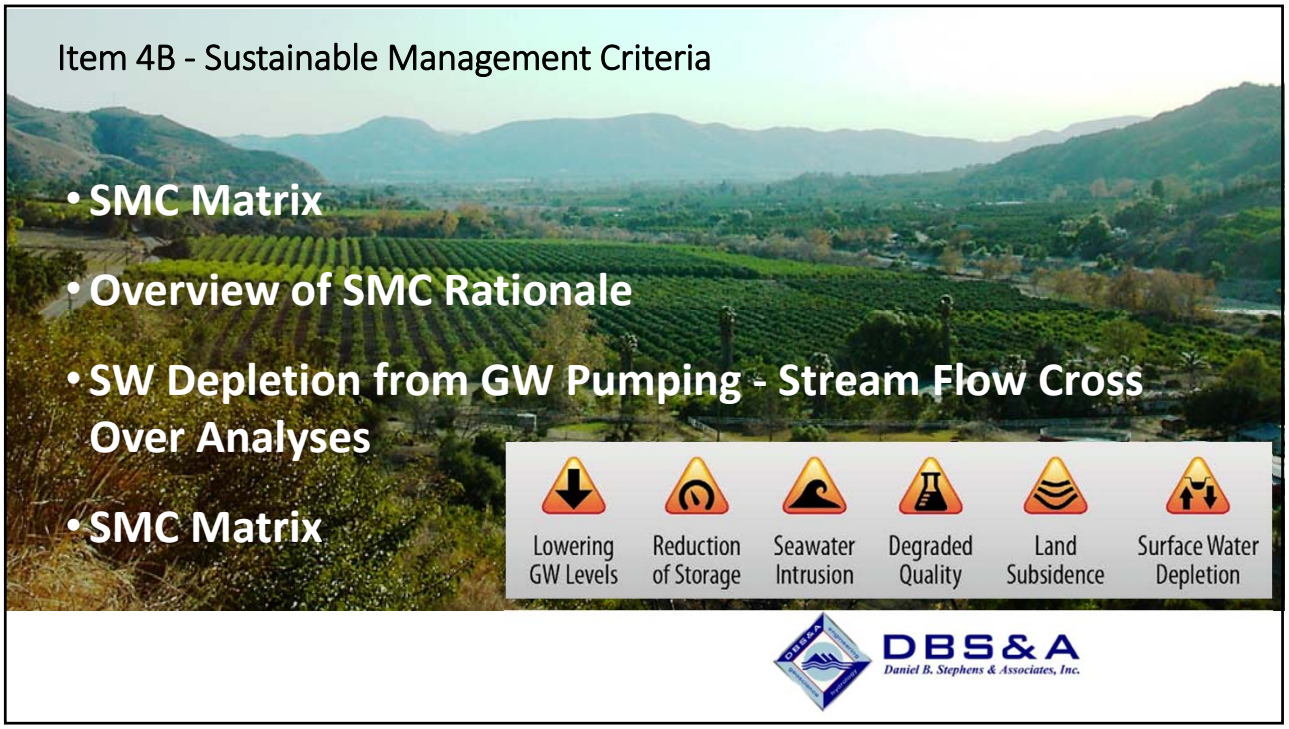

SMC	Undesirable Results	Metric	MT	MO	Comments
GW Elevation	Loss of ability to pump GW	GW elevation	WL declines below the base of well screens in more than 25% of representative wells	GW levels at 2011 high WL	maximizes range between MT and MO
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Land Subsidence	Land subsidence amounts that interfere with infrastructure operations	Subsidence rates	Total inelastic subsidence of 1ft/yr or 1ft over 5 yrs	Inelastic subsidence rates within +/- 0.05 ft/yr as determined by InSAR	Monitor subsidence amount - InSAR data from DWR; trigger at GW elevation lower than the estimated historical low
Degraded WQ	Water quality degradation that impairs the beneficial use of the resource	WQ values	Water quality parameters established in existing or future regulations	FPBGSA is not a water purveyor and lacks regulatory authority for WQ compliance, but will cooperate with appropriately empowered entities	
Seawater Intrusion	NA	NA	NA	NA	

Sea Water Intrusion

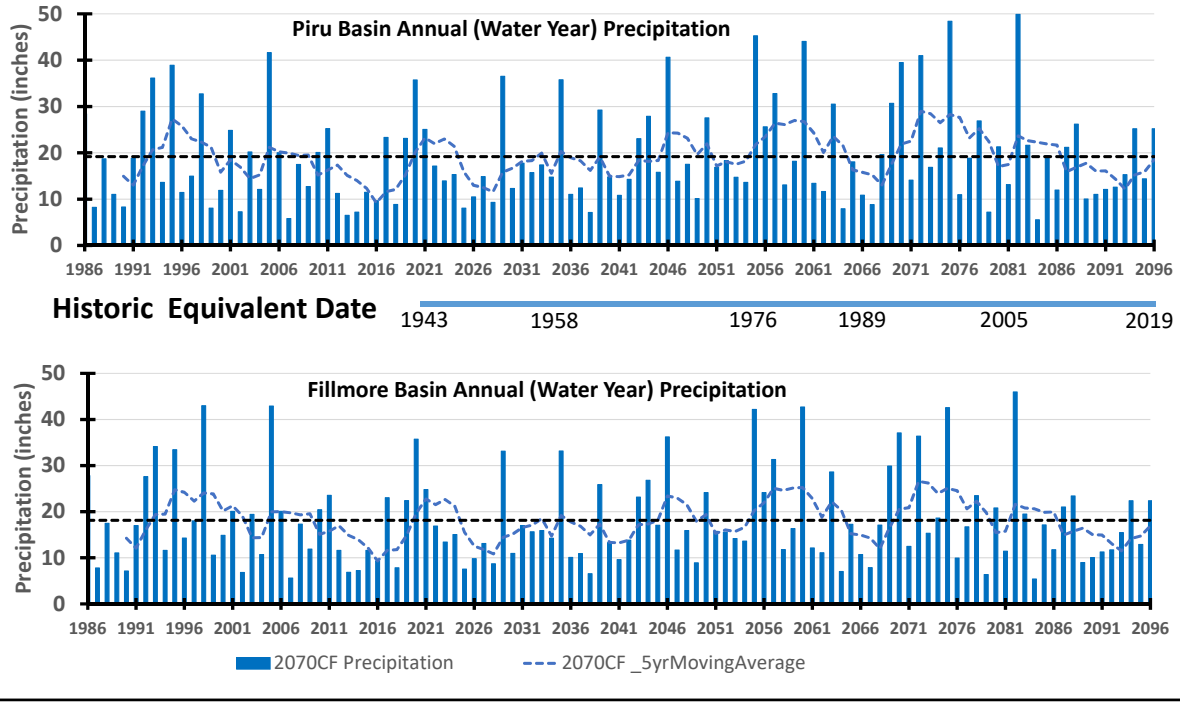
- Not a realistic concern for Fillmore or Piru basins
- Western edge of Fillmore basin is approx. 16 miles from coastline
- Western edge of Fillmore basin elevation is approx. 300 ft above msl

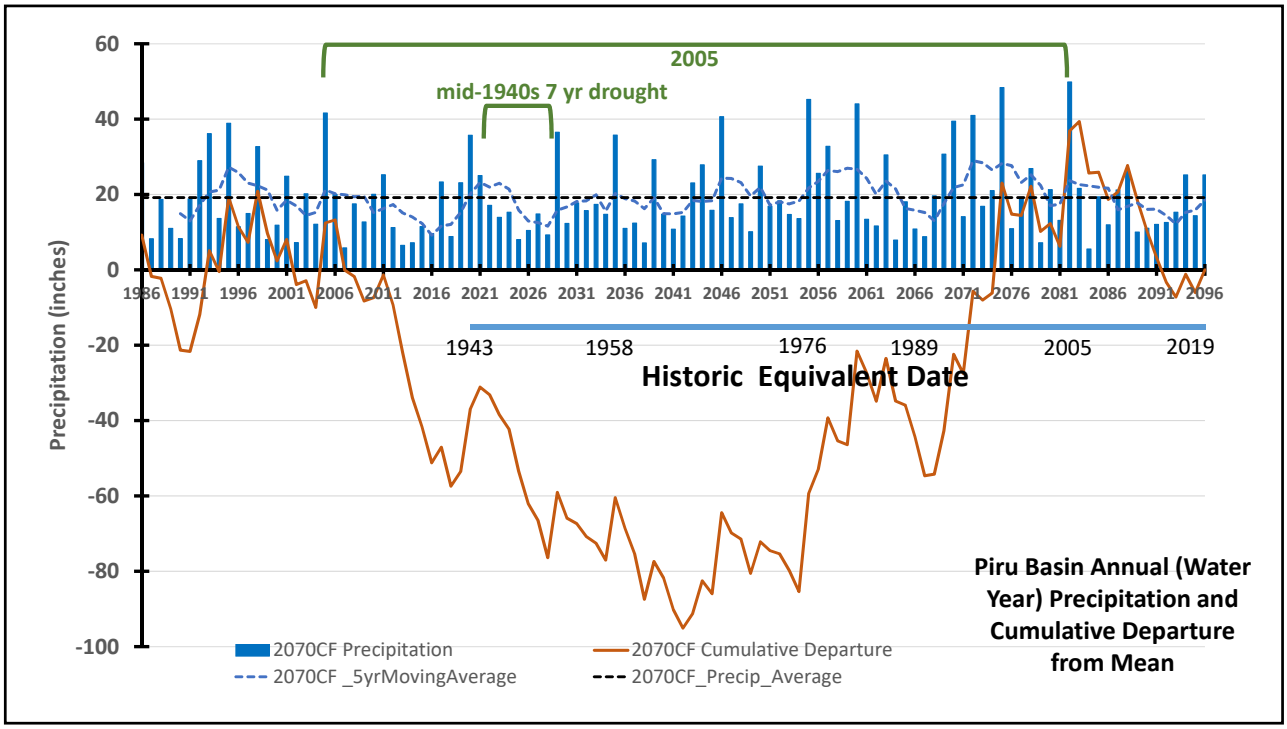
Water Quality Degradation

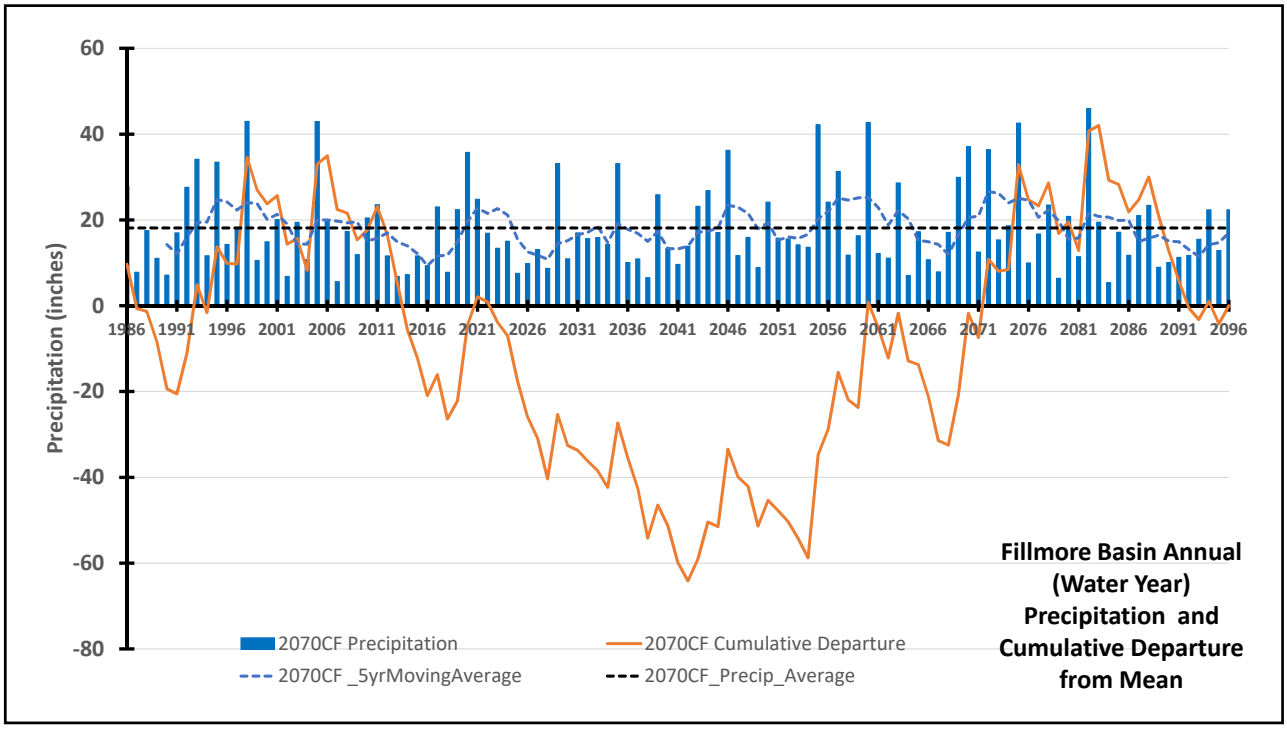
- Concerned with water quality degradation caused by the implementation of the GSP
- Generally, no major water quality issues in the basins
  - Chloride concentrations in waste water treatment plant effluent discharged to SCR
- Continue with monitoring program (GW and SW)
- FPBGSA lacks regulatory authority to enforce water quality regulations, but can be a cooperative agency to County of Ventura, RWQCB, DTSC, etc.

Groundwater Levels

- Long-term, chronic water level decline
- Impacts of water level declines in beneficial uses and users
  - o GW extractions by MUNI, IRRIG, DOM users
  - o Related to surface water depletion
- Examined long-term future GW conditions including climate change



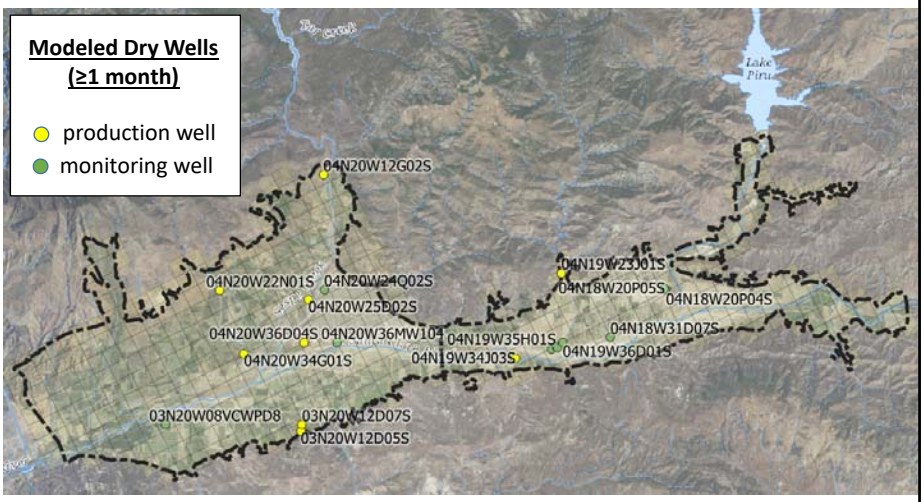

2005
mid-1940s 7 yr drought
Precipitation (inches)
1943
1958
1976
1989
2005
2019
Historic Equivalent Date
2070CF Precipitation
2070CF Cumulative Departure
2070CF _5yrMovingAverage
2070CF_Precip_Average
Piru Basin Annual (Water Year) Precipitation and Cumulative Departure from Mean


Precipitation (inches)
2070CF Precipitation
2070CF Cumulative Departure
2070CF _5yrMovingAverage
2070CF_Precip_Average
Fillmore Basin Annual (Water Year) Precipitation and Cumulative Departure from Mean

Dry Well Evaluation

No production wells are expected to go dry

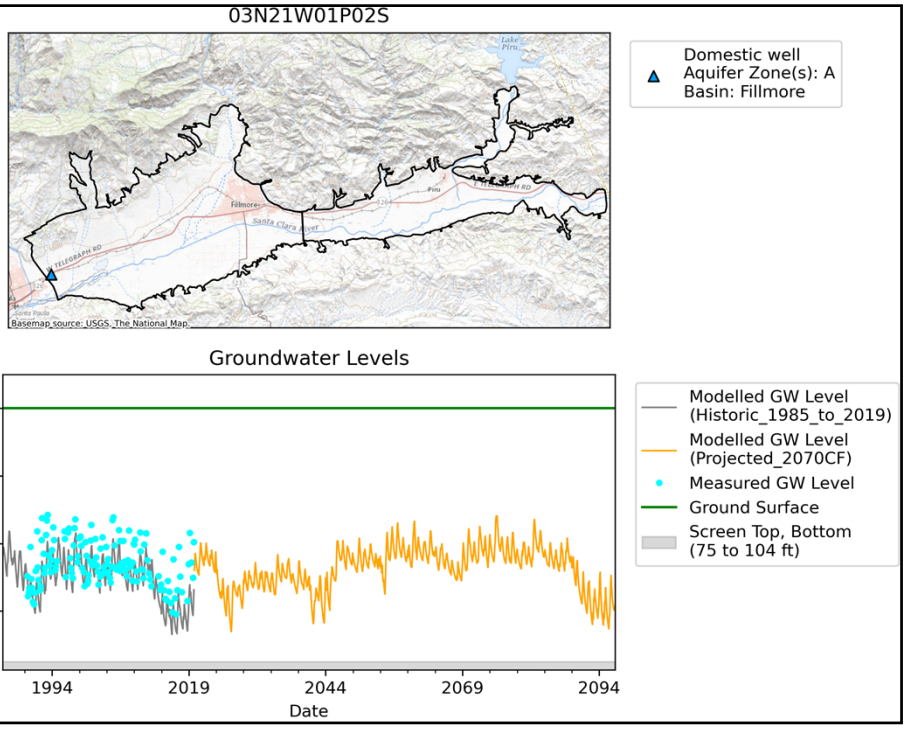
- Nine (9) shallow production wells that went "dry" at various months, according to the model, were evaluated and determined to not be dry based on measurements.
- Wells most susceptible to getting close to dry conditions are <100 ft deep, on average.
- Shallow monitoring wells are expected to go (and have gone) dry periodically.
- Based on UWCD model (Projected 2070CF) results



Sample Hydrographs

Conclusions

- **No evidence of chronic decline in GW levels.**
- Based on UWCD model results.



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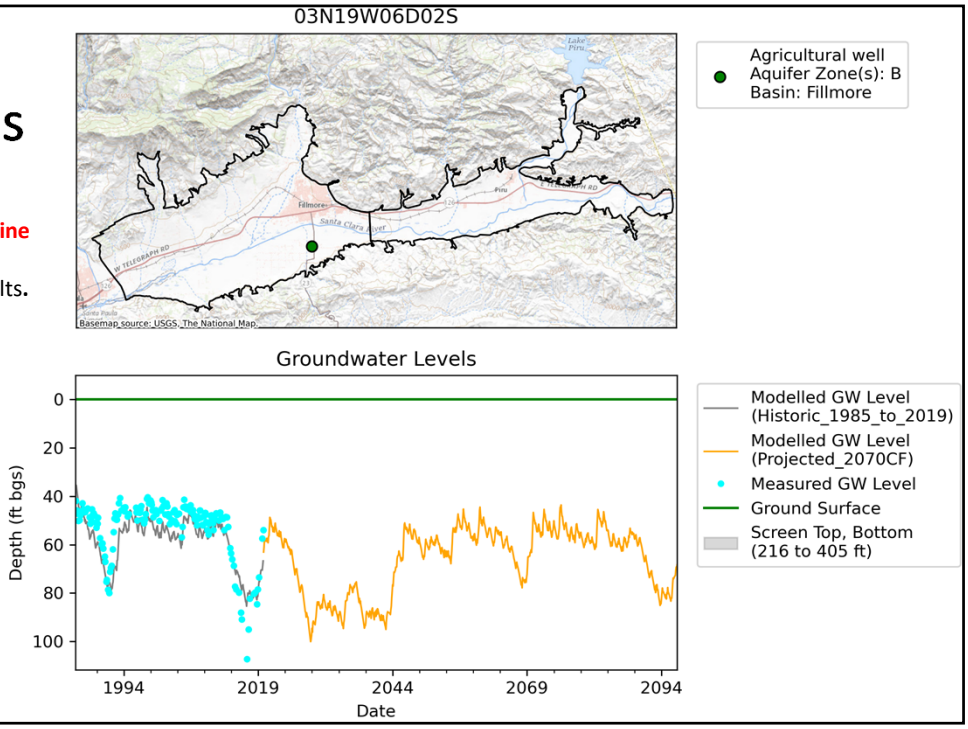

Sample Hydrographs

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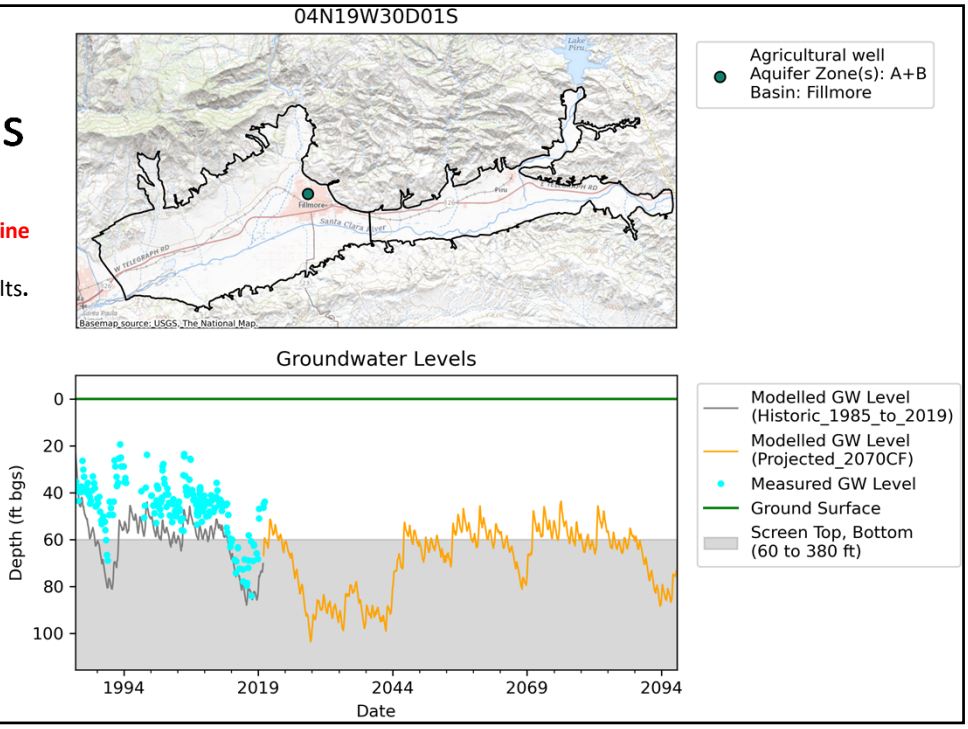

Sample Hydrographs

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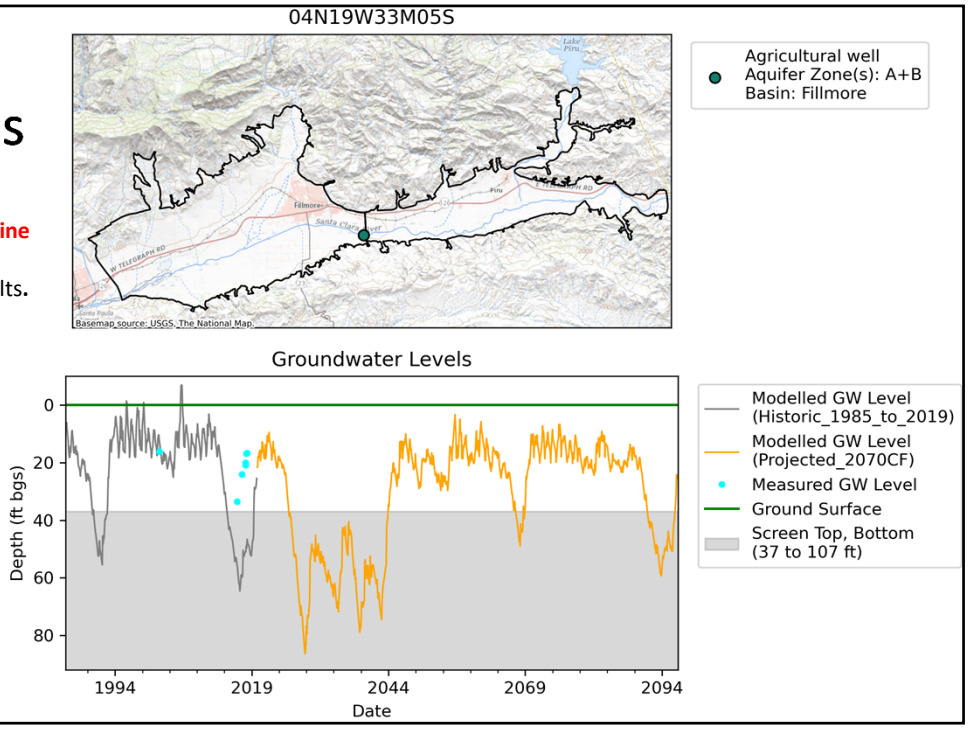

Sample Hydrographs

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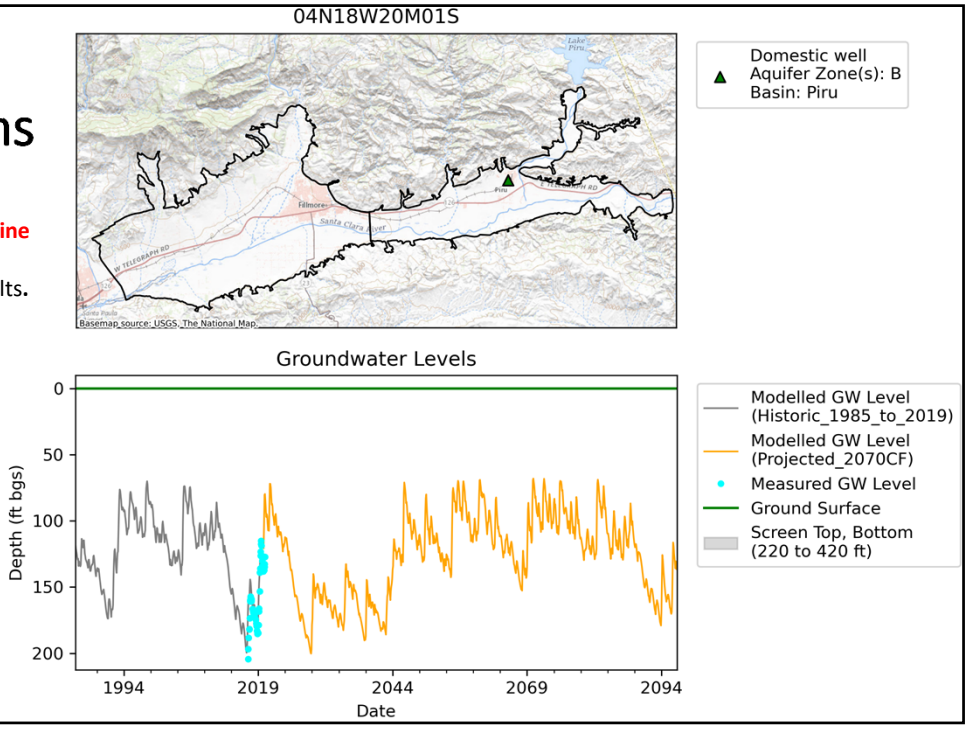
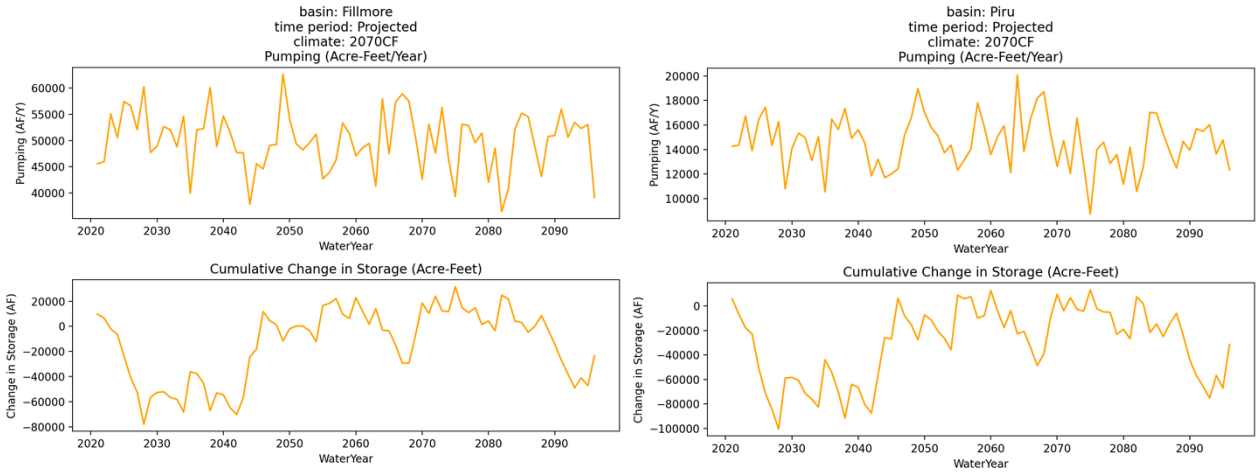


Groundwater Storage

- GW in storage to last through future droughts
- Storage is critical element for these basins - dependent on GW

Forecasted Annual Pumping & Cumulative Change in Storage

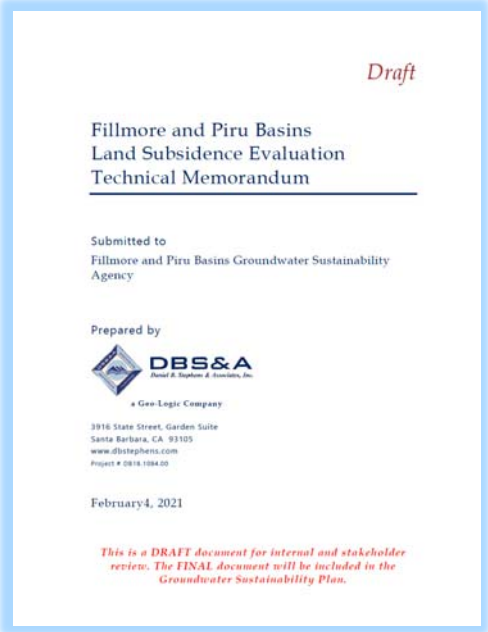


Subsidence

- Ground subsidence due to groundwater extractions, only
- Other potential subsidence factors
  - Oil and gas extraction
  - Tectonic activity
- No anecdotal evidence of historical subsidence even with drought-induced low water levels
- Future GW conditions not likely low enough to trigger subsidence

Land Subsidence Evaluation

- Previous investigations and reports;
- Geodetic surveys;
- Interferometric Synthetic Aperture Radar (InSAR) data;
- Subsidence evaluations / potentials.


Draft

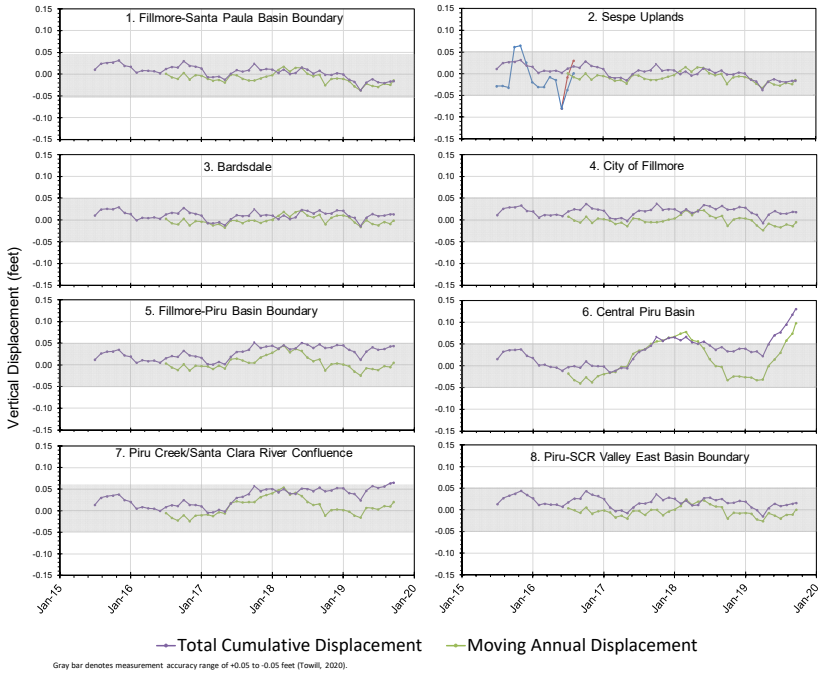
Fillmore and Piru Basins
Land Subsidence Evaluation
Technical Memorandum

Submitted to
Fillmore and Piru Basins Groundwater Sustainability Agency

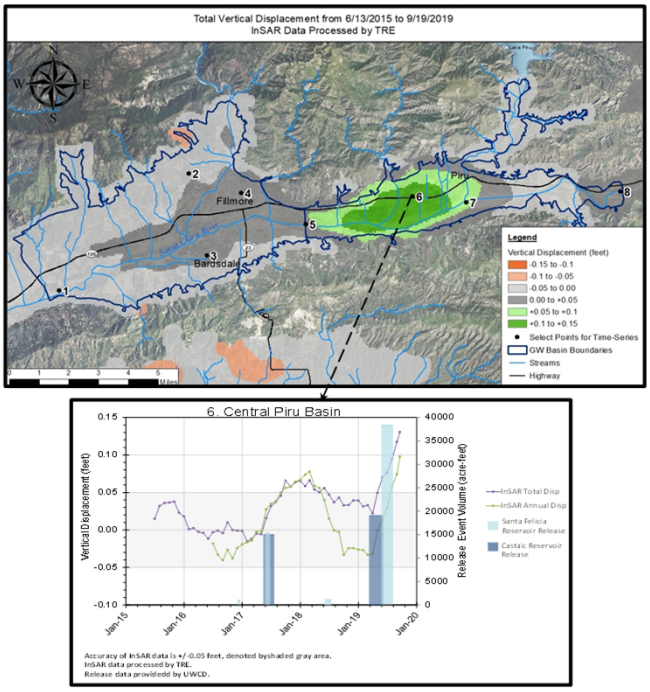
Prepared by
DBS&A
a Geo-Logic Company
3916 State Street, Garden Suite
Santa Barbara, CA 93105
www.dbstephens.com

February4, 2021

This is a DRAFT document for internal and stakeholder review. The FINAL document will be included in the Groundwater Sustainability Plan.

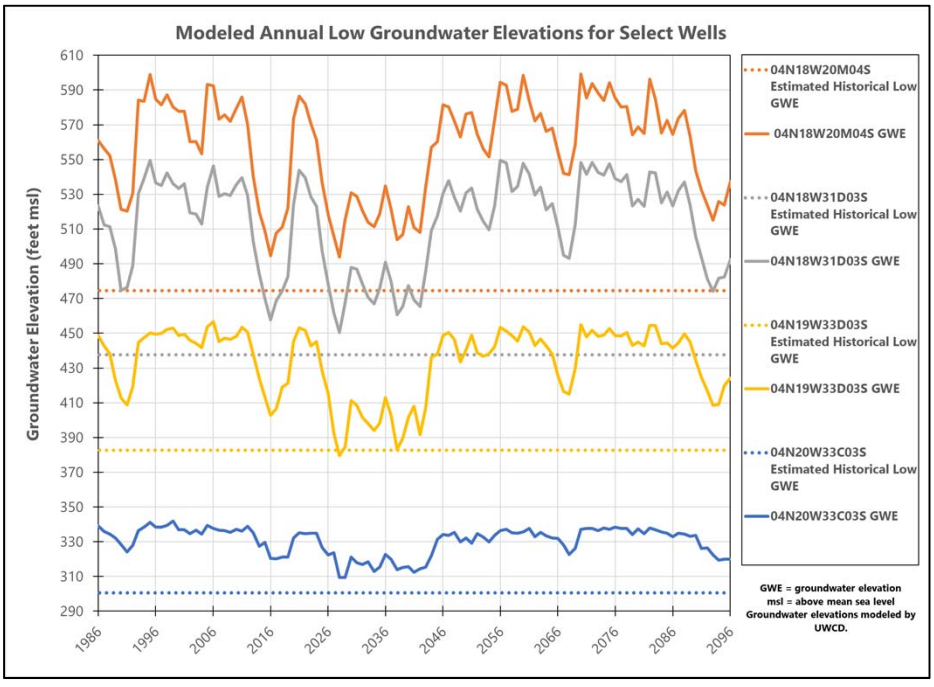


Time-Series Graphs of Annual and Total Land Surface Elevation Changes derived from InSAR

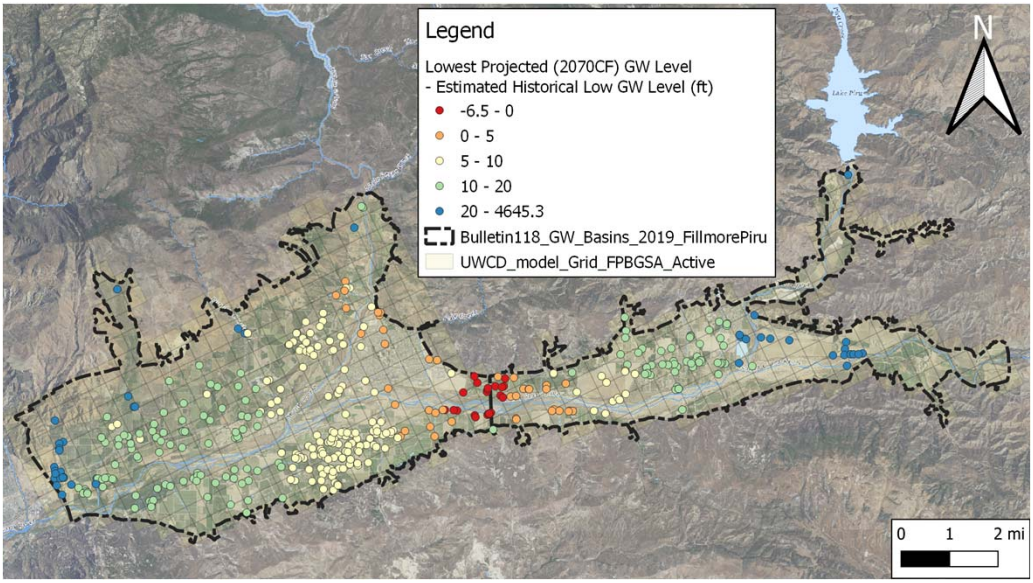


InSAR Data showing Total Vertical Displacement within the Basins.

Future Subsidence Potential - Representative Wells



2070CF Modeled Water Levels v. Estimated Historical Low Water Level at Representative Wells



Projected (2070CF) - Estimated Historical Low (2016 low -20 ft) GW level

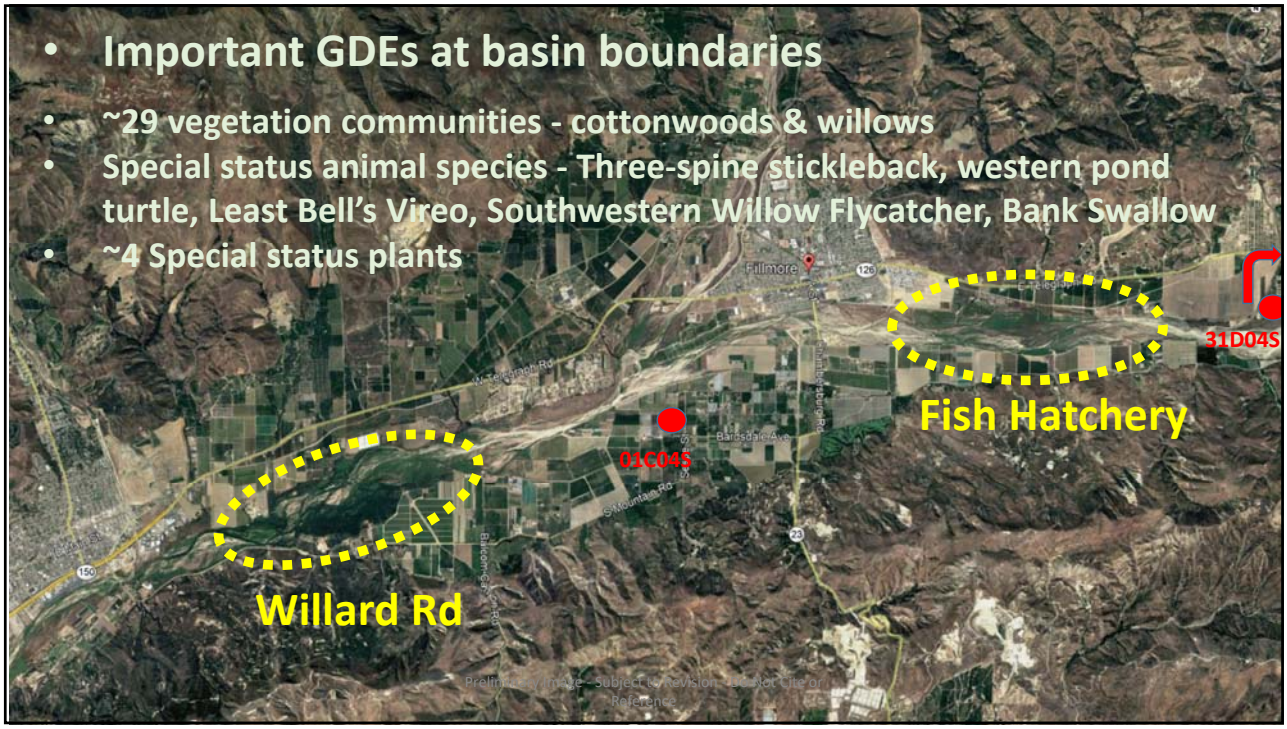
Summary of (Inelastic) Subsidence Potential

Basin	Hydro-stratigraphic Setting Susceptibility*	Chronic Declines in Groundwater Levels	Geodetic / Extensometer / Tiltmeter Evidence of Subsidence	InSAR Evidence of Subsidence	Subsidence Susceptibility Ranking
Fillmore	Low to Moderate	No	No	No	Low
Piru	Low	No	No	No	Very Low

* Low - thinner, possibly discontinuous fine-grained layers
Moderate - fine grained layer typically a few 10s of feet thick

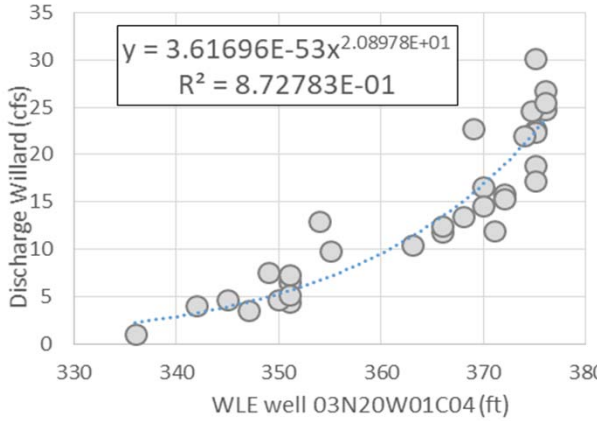
Surface Water - Groundwater Interaction

- Surface water depletion due to GW extractions
- Impacts of water level declines on beneficial uses and users
  - o GDEs
  - o Surface water diversions

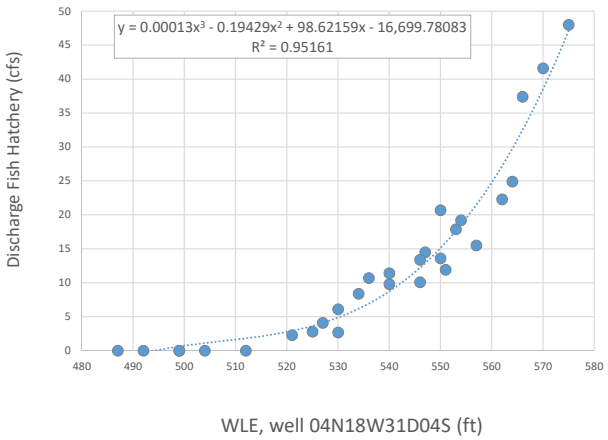


Water Level - Stream Flow Cross Over Analyses

Willard Road

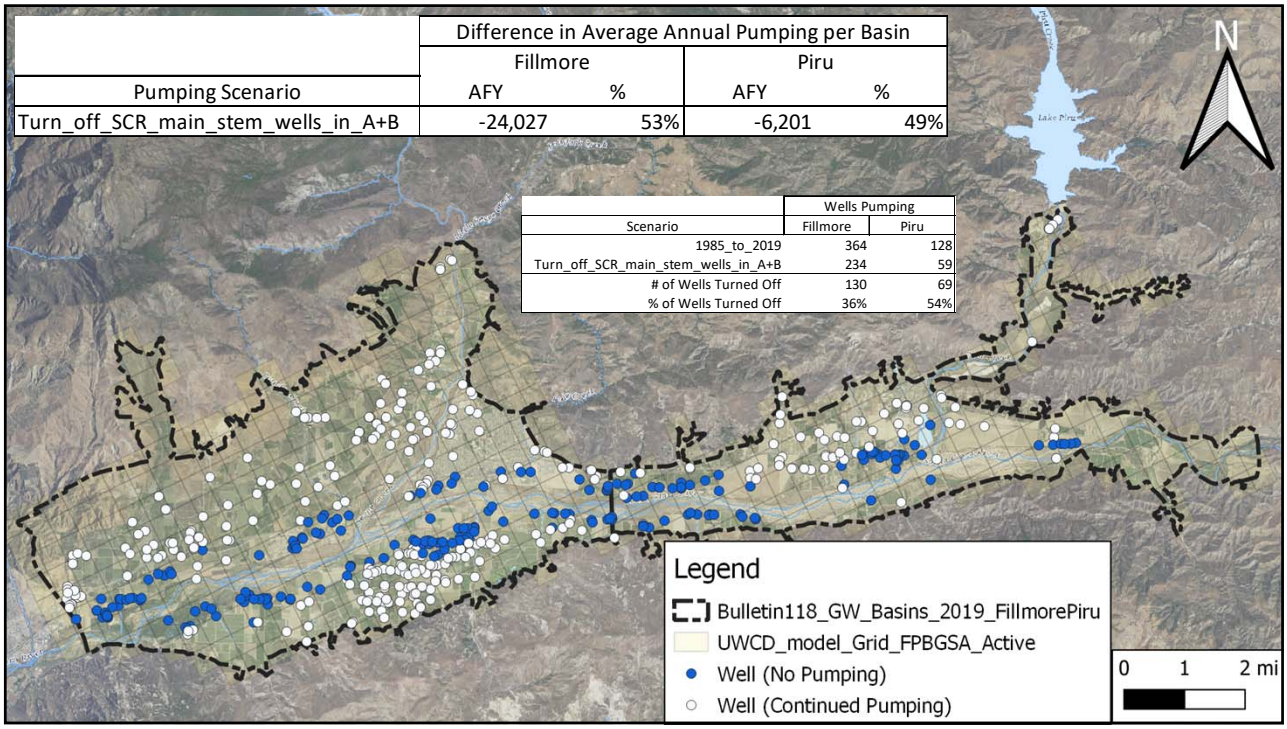


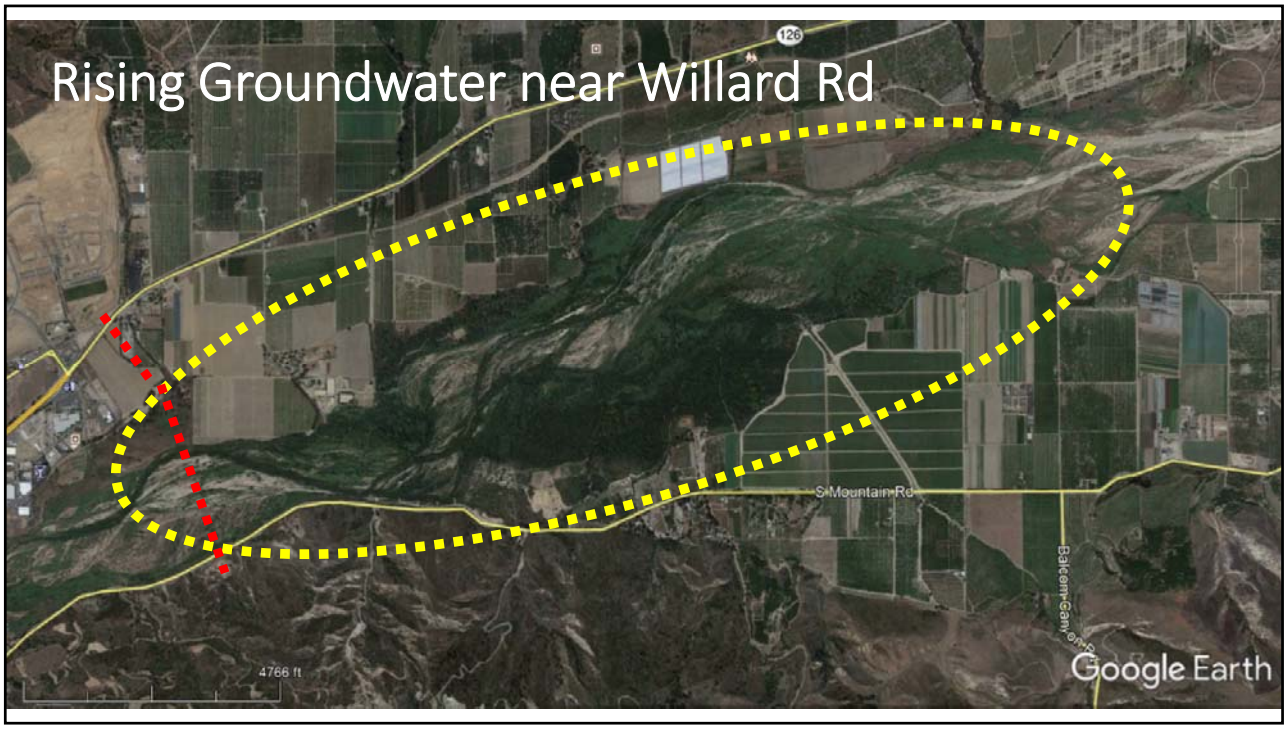
Fish Hatchery

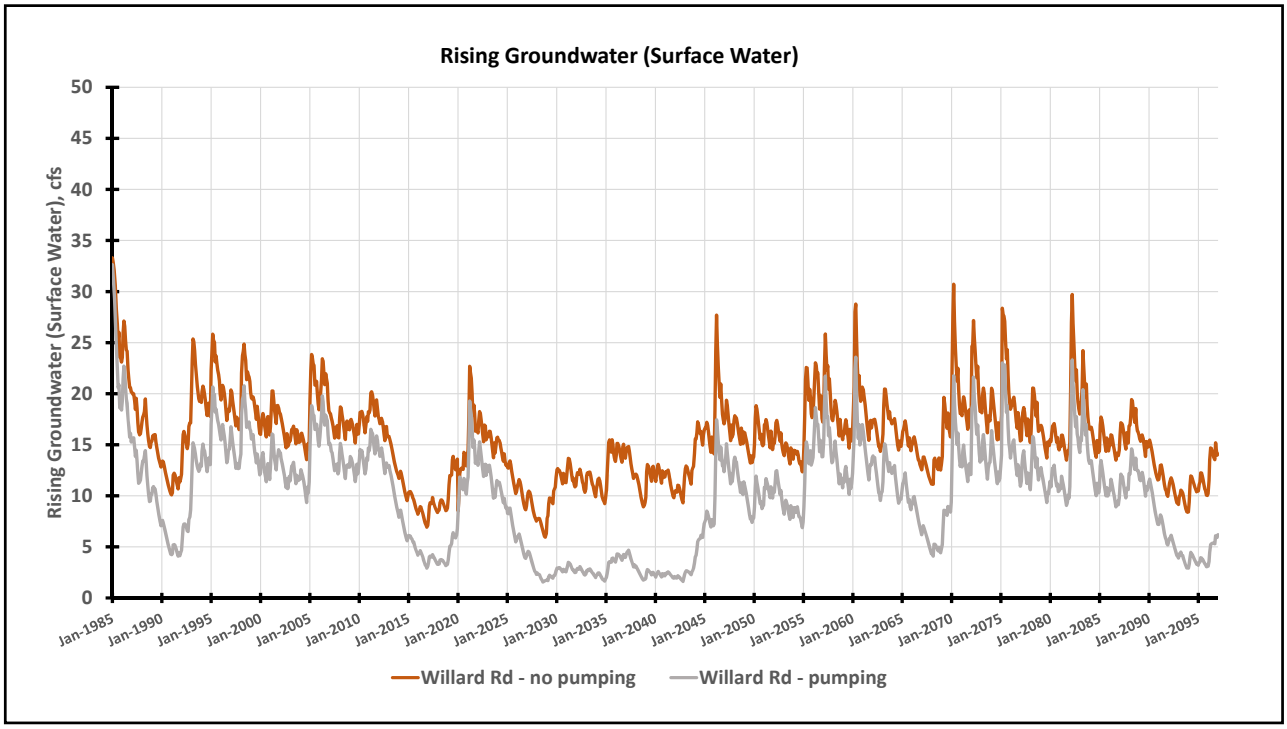


	Difference in Average Annual Pumping per Basin			
	Fillmore		Piru	
Pumping Scenario	AFY	%	AFY	%
Turn_off_SCR_main_stem_wells_in_A+B	-24,027	53%	-6,201	49%

	Wells Pumping	
Scenario	Fillmore	Piru
1985_to_2019	364	128
Turn_off_SCR_main_stem_wells_in_A+B	234	59
# of Wells Turned Off	130	69
% of Wells Turned Off	36%	54%

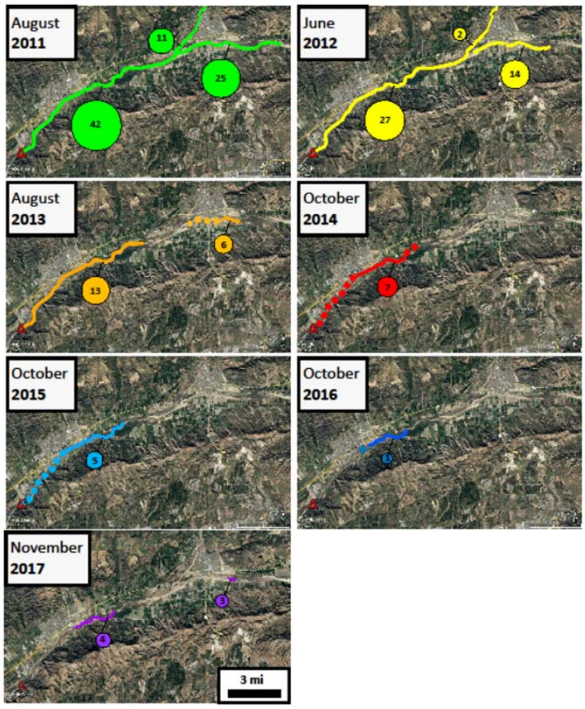


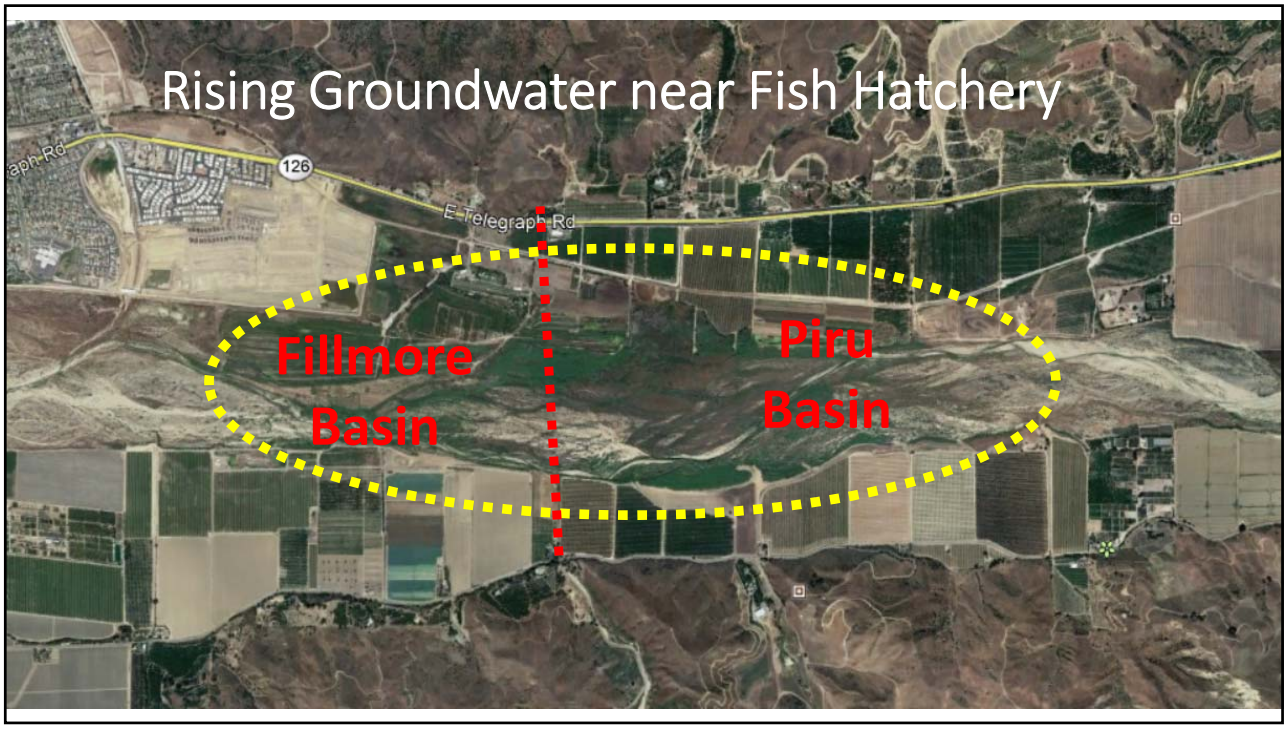

Rising Groundwater near Willard Rd
126
S Mountain Rd
4766 ft
Google Earth

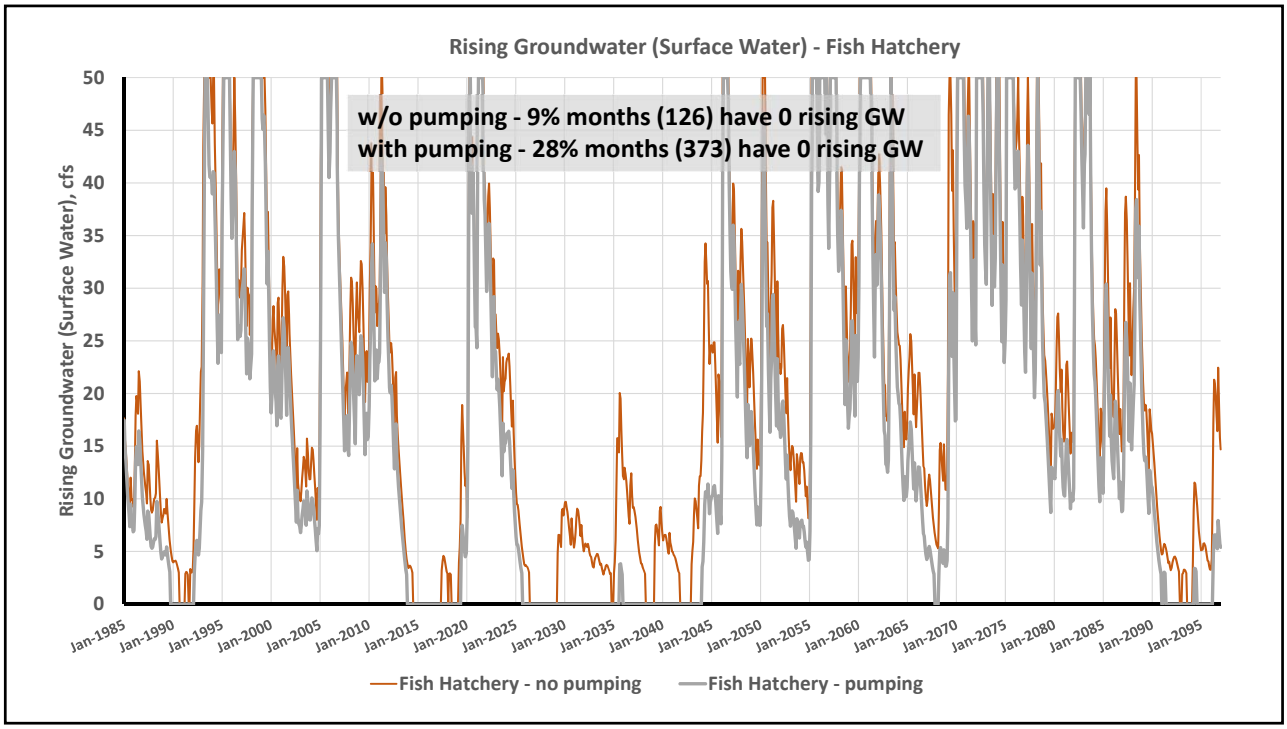

Rising Groundwater (Surface Water)
Rising Groundwater (Surface Water), cfs
50
45
40
35
30
25
20
15
10
5
0
Jan-1985
Jan-1990
Jan-1995
Jan-2000
Jan-2005
Jan-2010
Jan-2015
Jan-2020
Jan-2025
Jan-2030
Jan-2035
Jan-2040
Jan-2045
Jan-2050
Jan-2055
Jan-2060
Jan-2065
Jan-2070
Jan-2075
Jan-2080
Jan-2085
Jan-2090
Jan-2095
Willard Rd - no pumping
Willard Rd - pumping

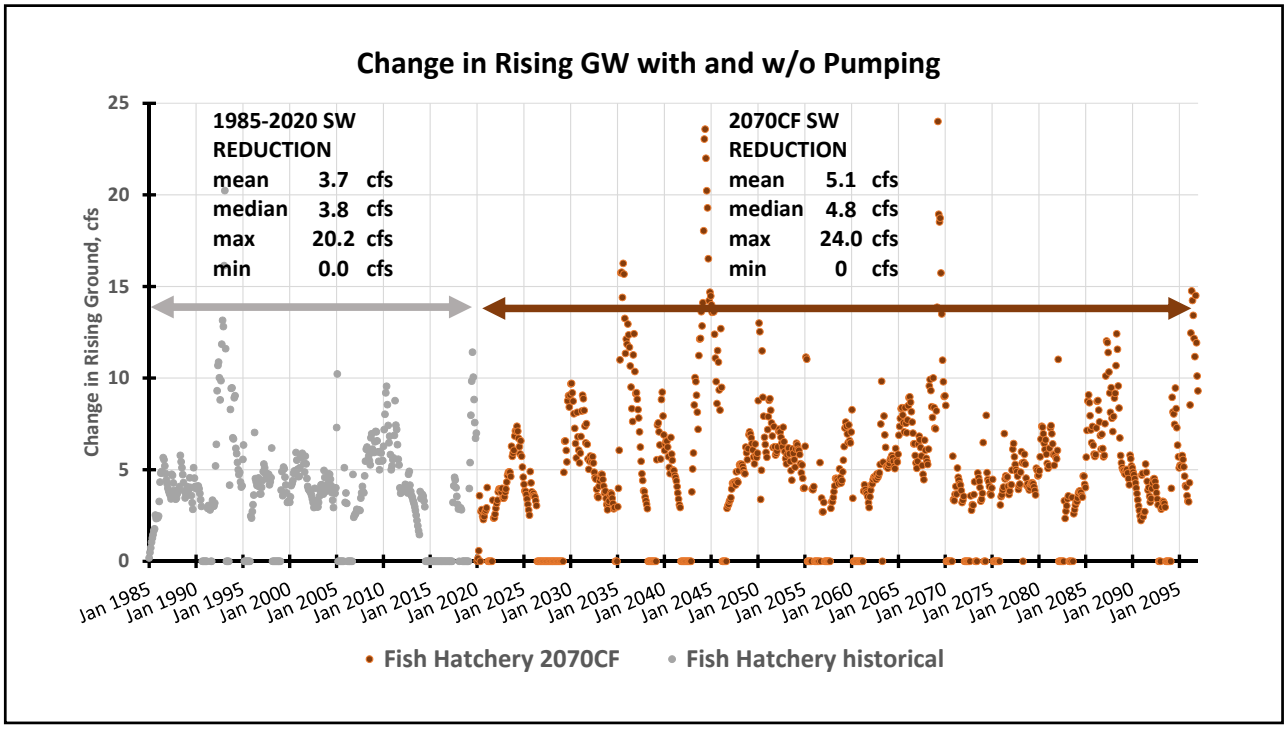
How quickly does Willard Road reach of SCR go dry?

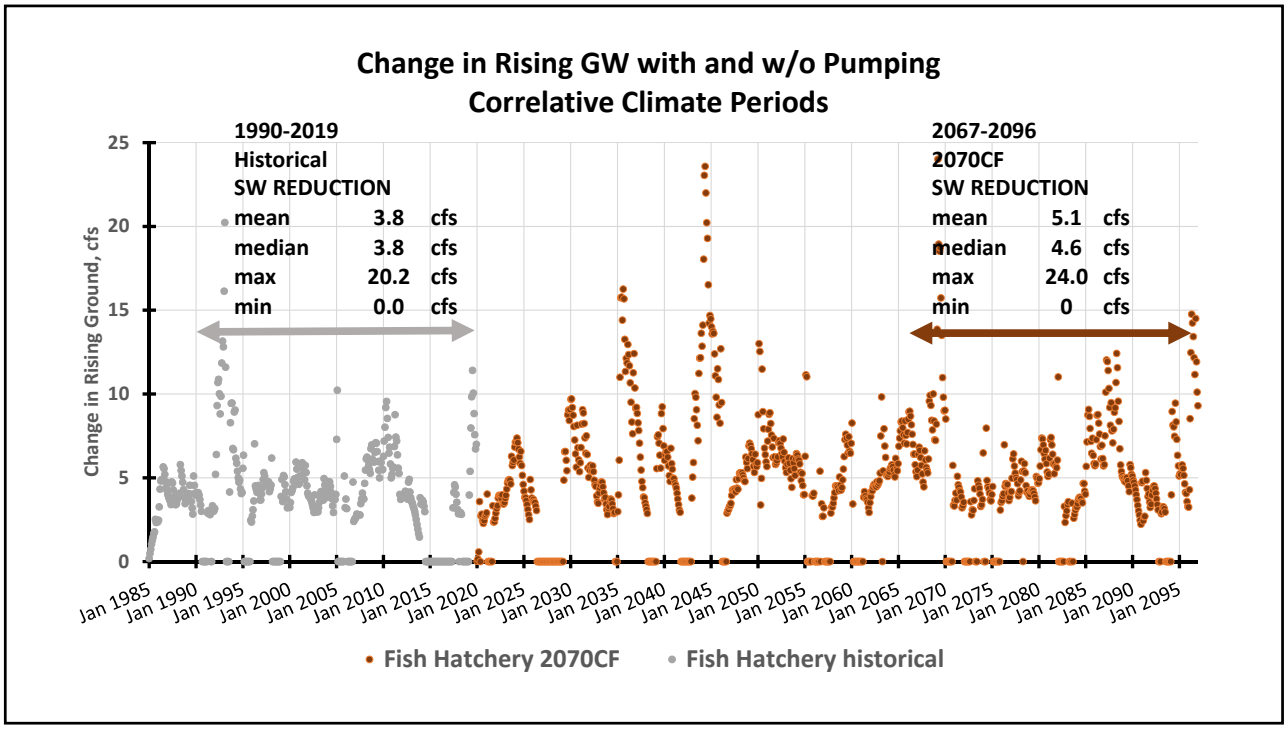
- **Wetted reach begins to shrink within 2-3 years**
- **Probably dry within 5-6 years**

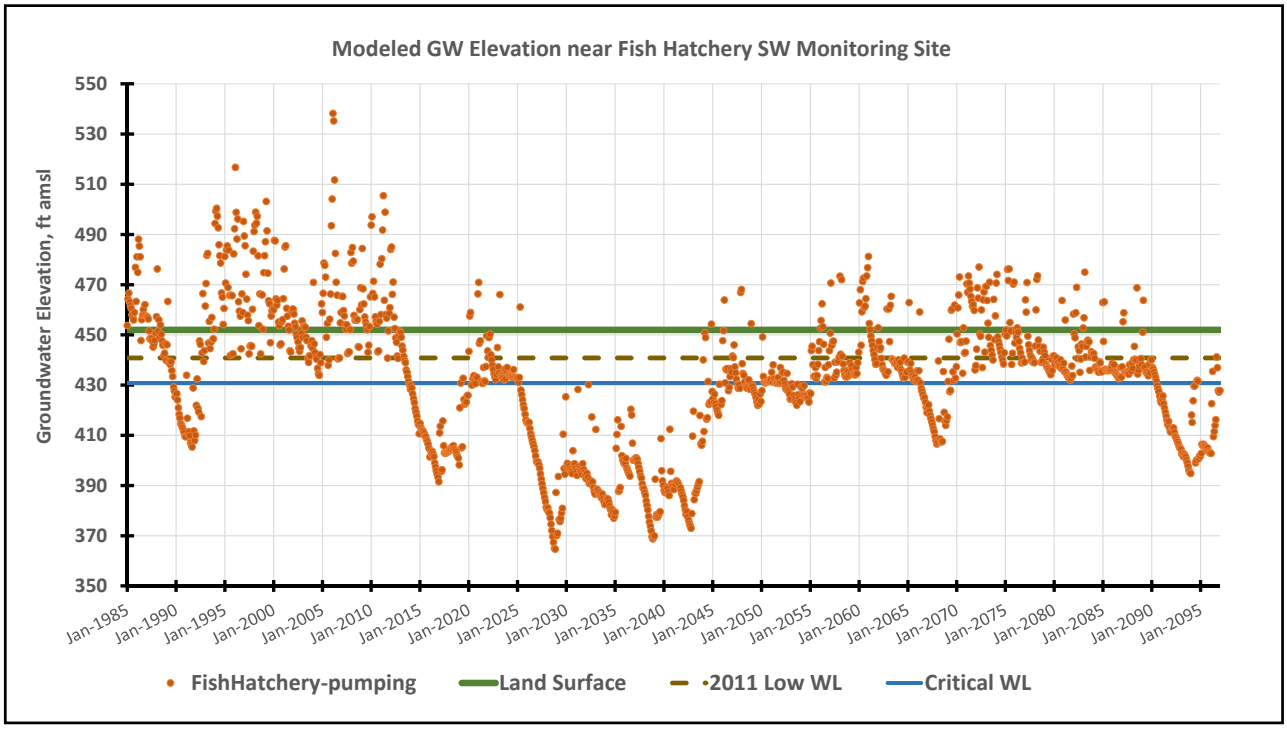


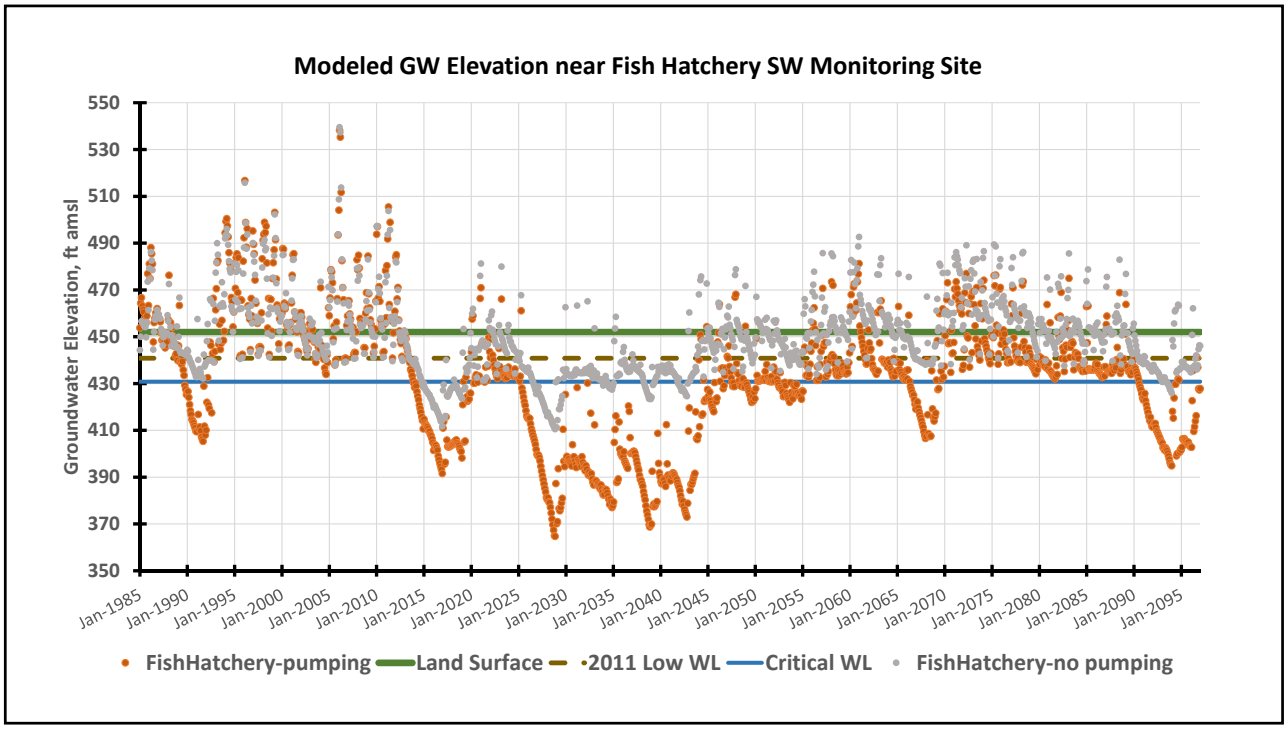



Rising Groundwater (Surface Water) - Fish Hatchery
w/o pumping - 9% months (126) have 0 rising GW
with pumping - 28% months (373) have 0 rising GW
Rising Groundwater (Surface Water), cfs
50
45
40
35
30
25
20
15
10
5
0
Jan-1985
Jan-1990
Jan-1995
Jan-2000
Jan-2005
Jan-2010
Jan-2015
Jan-2020
Jan-2025
Jan-2030
Jan-2035
Jan-2040
Jan-2045
Jan-2050
Jan-2055
Jan-2060
Jan-2065
Jan-2070
Jan-2075
Jan-2080
Jan-2085
Jan-2090
Jan-2095
Fish Hatchery - no pumping
Fish Hatchery - pumping


Change in Rising GW with and w/o Pumping
1985-2020 SW REDUCTION
mean 3.7 cfs
median 3.8 cfs
max 20.2 cfs
min 0.0 cfs
2070CF SW REDUCTION
mean 5.1 cfs
median 4.8 cfs
max 24.0 cfs
min 0 cfs
Change in Rising Ground, cfs
25
20
15
10
5
0
Jan 1985
Jan 1990
Jan 1995
Jan 2000
Jan 2005
Jan 2010
Jan 2015
Jan 2020
Jan 2025
Jan 2030
Jan 2035
Jan 2040
Jan 2045
Jan 2050
Jan 2055
Jan 2060
Jan 2065
Jan 2070
Jan 2075
Jan 2080
Jan 2085
Jan 2090
Jan 2095
Fish Hatchery 2070CF
Fish Hatchery historical


Change in Rising GW with and w/o Pumping
Correlative Climate Periods
1990-2019
Historical
SW REDUCTION
mean 3.8 cfs
median 3.8 cfs
max 20.2 cfs
min 0.0 cfs
2067-2096
2070CF
SW REDUCTION
mean 5.1 cfs
median 4.6 cfs
max 24.0 cfs
min 0 cfs
Change in Rising Ground, cfs
Fish Hatchery 2070CF
Fish Hatchery historical


Modeled GW Elevation near Fish Hatchery SW Monitoring Site
Groundwater Elevation, ft amsl
FishHatchery-pumping
Land Surface
2011 Low WL
Critical WL



Surface Water - Groundwater Interaction / SW Depletion

- SMC focused on reaches of the Santa Clara River at the F-P & SP-F basin boundaries with rising GW
- No or limited beneficial uses and users of the SW in these areas
- GDEs present along those reaches ⇒ Birds - Amphibians - Vegetation
  - ✓Drought periods create multi-month sequences with no rising GW with or without GW pumping
  - ✓Drought periods create multi-month sequences with GW level declines greater than the critical water level decline of ~10 ft

Does the FPBGSA have a responsibility to mitigate drought impacts if those impacts are not any more severe than pre-Jan 2015 impacts?

SMCs - General Framework

- ***Lowering GW Levels*** - no chronic decline in water levels
- ***Reduction of GW Storage*** - no chronic decline in GW storage
- ***Seawater Intrusion*** - not applicable
- ***Degraded Water Quality*** - no regulatory authority over WQ / work with existing agencies with appropriate regulatory authority
- ***Land Subsidence*** - not reported during historical past and not anticipated during future climate & pumping conditions
- ***Surface Water Depletion*** - rates of SW depletion in future not materially greater than Jan 2015 - in droughts multi-month periods with zero rising GW with or w/o pumping & GW levels below critical WL in severe droughts

SMC	Undesirable Results	Metric	MT	MO	Comments
GW Elevation	Loss of ability to pump GW	GW elevation	WL declines below the base of well screens in more than 25% of representative wells	GW levels at 2011 high WL	maximizes range between MT and MO
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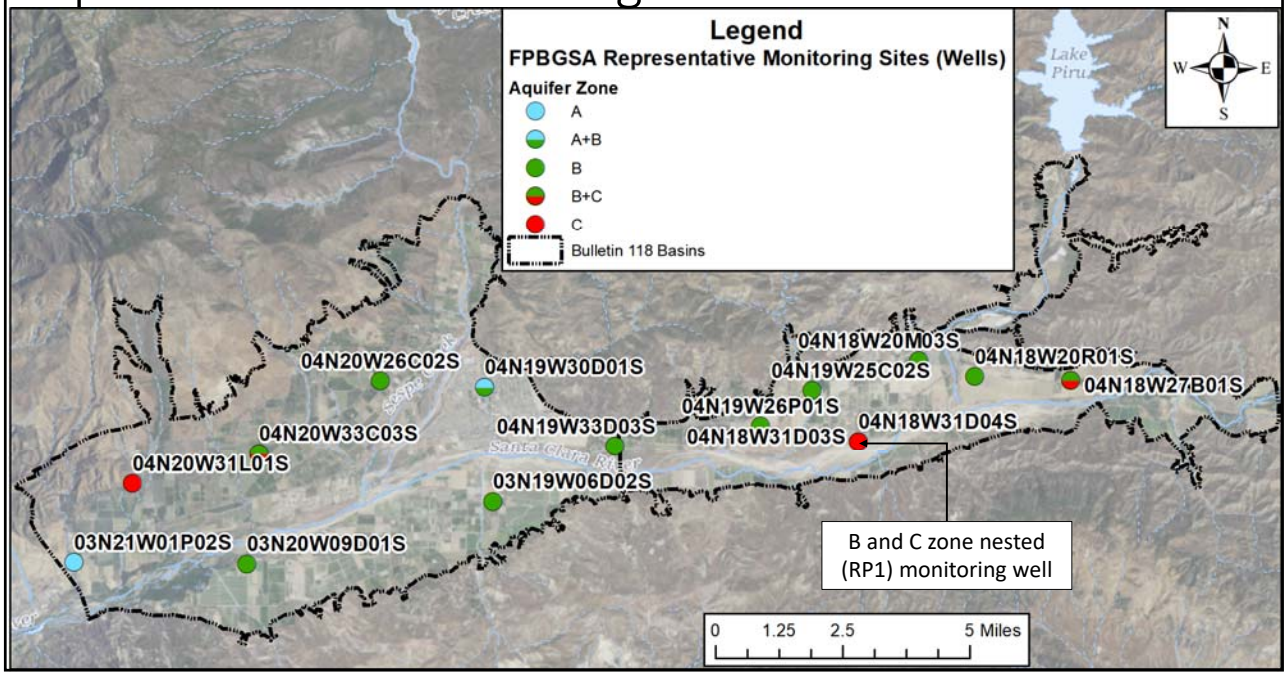
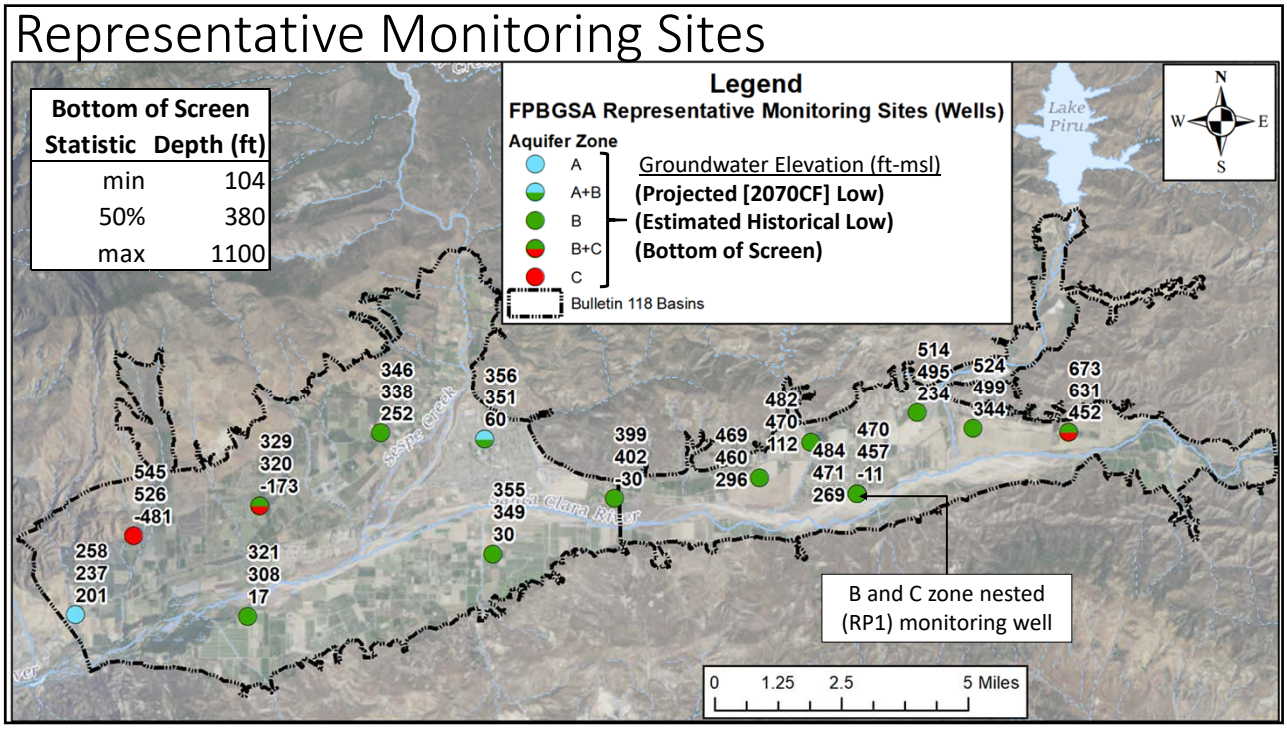
Seawater Intrusion	NA	NA	NA	NA	

Representative Monitoring Sites

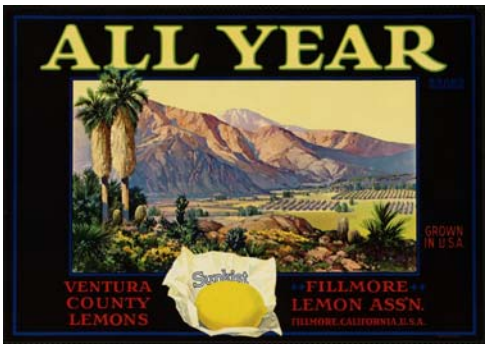


Representative Monitoring Sites




Subsidence
Groundwater Decline
Surface Water Depletion
Sea Water Intrusion
Water Quality Degradation
Groundwater Storage Decline
Subsidence
Groundwater Storage Decline
Sea Water Intrusion
Groundwater Decline
Groundwater Storage Decline
Surface Water Depletion
Subsidence
Sea Water Intrusion
Surface Water Depletion
Groundwater Decline
Groundwater Decline

Questions


ALL YEAR
VENTURA COUNTY LEMONS
FILLMORE LEMON ASSN.
FILLMORE, CALIFORNIA, U.S.A.
GROWN IN U.S.A.