



AGENDA

IDAHO WATER RESOURCE BOARD

Aquifer Stabilization Committee Meeting No. 2-22

Monday, August 1, 2022

1:00 p.m. (MT)

Water Center

Conference Rooms 602 C&D / Online Zoom Meeting

322 E. Front St.

BOISE

Brad Little

Governor

Jeff Raybould

Chairman

St. Anthony

At Large

Roger W. Chase

Vice-Chairman

Pocatello

District 4

Board Members & the Public may participate via Zoom

[Click here to join our Zoom Meeting](#)

Dial in Option: 1(253) 215-8782

Meeting ID: 860 6774 2031 Passcode: 352695

Jo Ann Cole-Hansen

Secretary

Lewiston

At Large

Dale Van Stone

Hope

District 1

Albert Barker

Boise

District 2

Dean Stevenson

Paul

District 3

Peter Van Der Meulen

Hailey

At Large

Brian Olmstead

Twin Falls

At Large

1. Introductions and Attendance
2. ESPA Aquifer Storage Update
3. ESPA Springs & Reach Gains Update
4. ESPA Aquifer Impacts
5. SWC Agreement Update
6. IWRB ESPA Recharge Program Comments from Partners
7. Other Items
8. Adjourn

Committee Members: Chair Dean Stevenson, Al Barker, Pete Van Der Meulen, and Brian Olmstead

* Action Item: A vote regarding this item may be made this meeting. Identifying an item as an action item on the agenda does not require a vote to be taken on the item.

Americans with Disabilities

The meeting will be held telephonically. If you require special accommodations to attend, participate in, or understand the meeting, please make advance arrangements by contacting Department staff by email jennifer.strange@idwr.idaho.gov or by phone at (208) 287-4800.

322 East Front Street • P.O. Box 83720 • Boise, Idaho 83720-0098

Phone: (208) 287-4800 Fax: (208) 287-6700 Website: idwr.idaho.gov/IWRB/



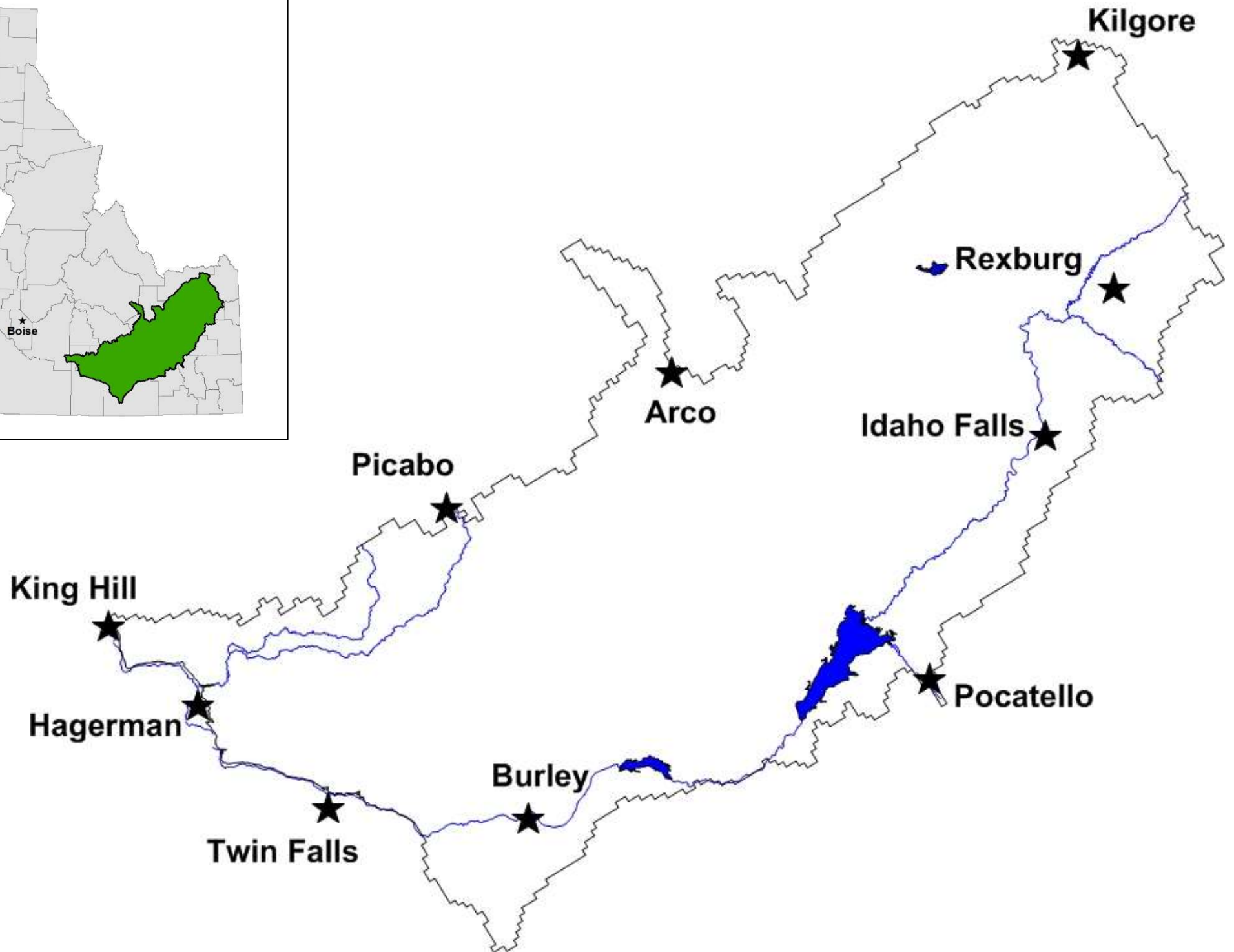
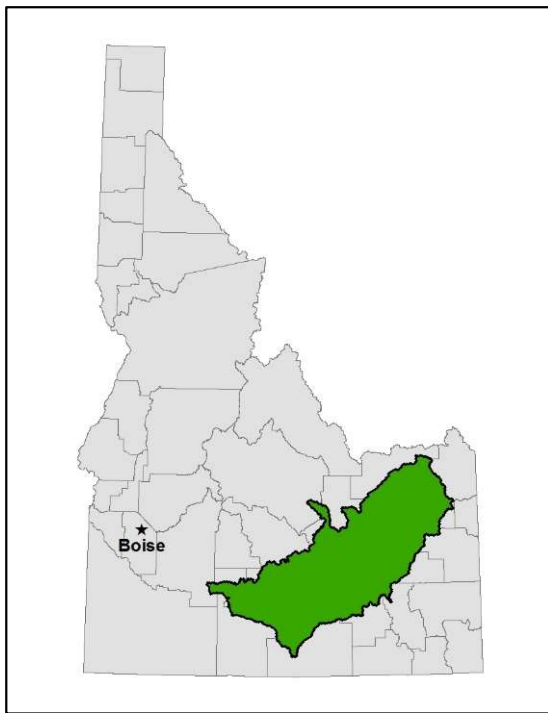
IDAHO
Water Resource Board



ESPA Storage Changes

Presented by Mike McVay, P.E., P.G.

August 1, 2022



Aquifer Water Balance

$$\text{Inflow} - \text{Outflow} = \Delta\text{Storage}$$

ESPA Inflows = Incidental recharge from SW irrigation, Canal Seepage, Perched River Seepage, Tributary Underflow, Precipitation.

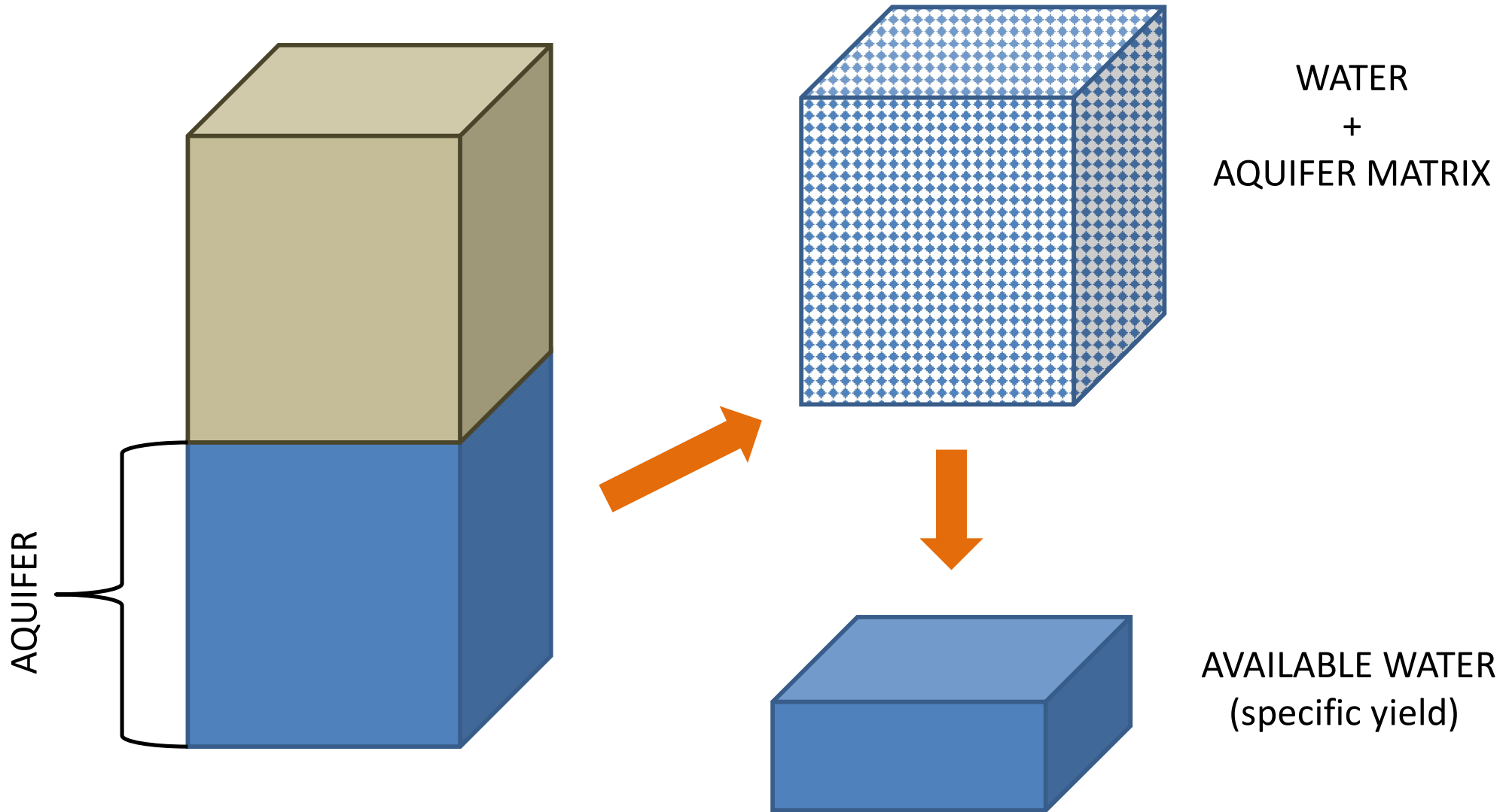
ESPA Outflows = Evapotranspiration, Spring Discharge, Well Pumping

- Requires large investment of time, money and effort.
- A more efficient method of calculating change-in-storage allows us to evaluate both aquifer conditions and aquifer management activities.
- Direct calculation of change-in-storage using water-level measurements.

Using Water-Level Data to Estimate Changes in Aquifer Storage

- Water-level changes are calculated for each of the wells.
- Changes at the wells are interpolated across the ESPAM version 2.2 (ESPAM2.2) model area to create water-level change maps.
 - The resulting volume represents water and aquifer matrix.
- The volumes calculated above are multiplied by the average, calibrated S_y from EPAM2.2 to calculate the change in volume of water.
- Specific Yield (S_y) is the ratio of the volume of water that drains from a saturated rock due to gravity to the total volume of the rock.

Specific Yield = Available Water



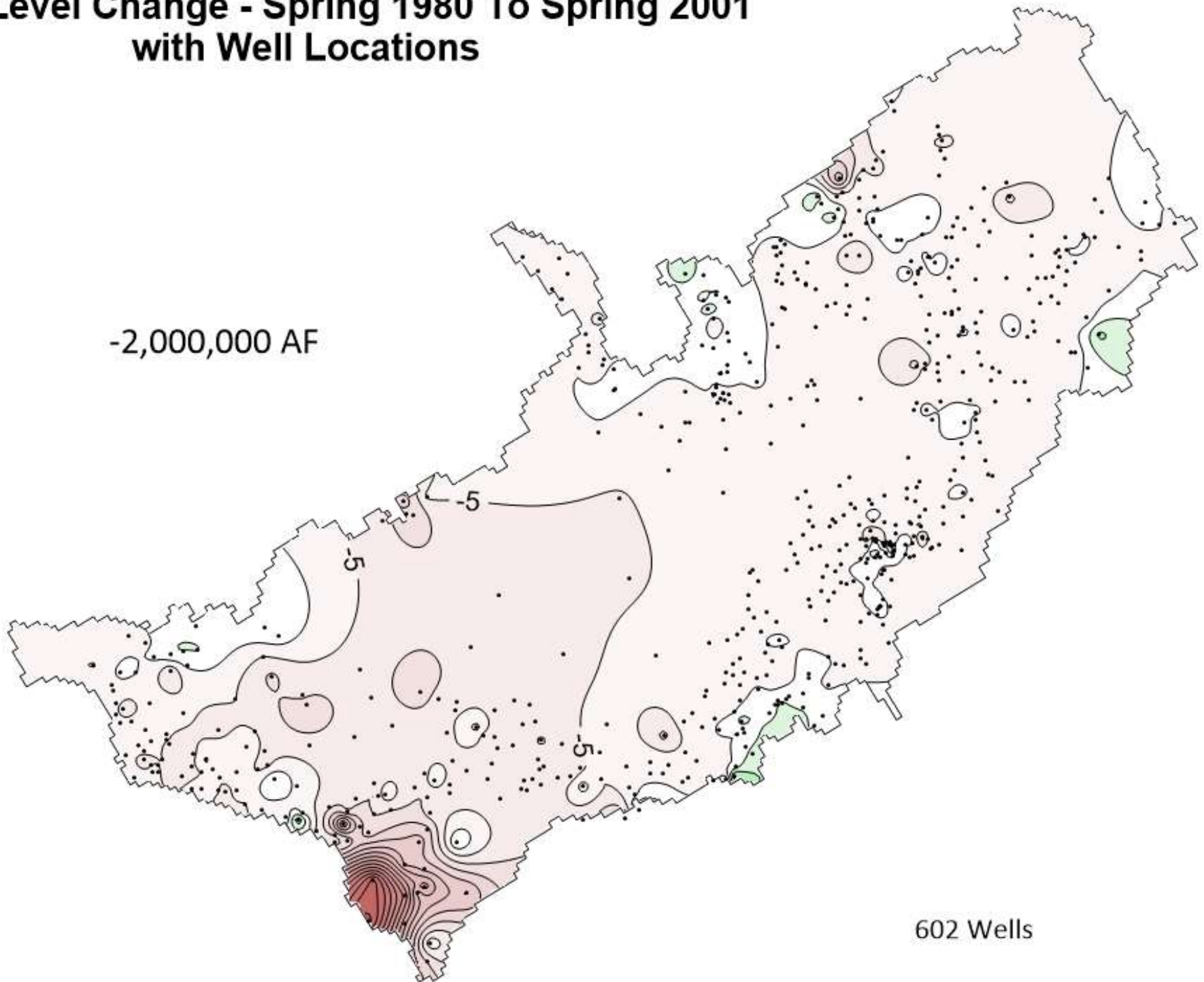
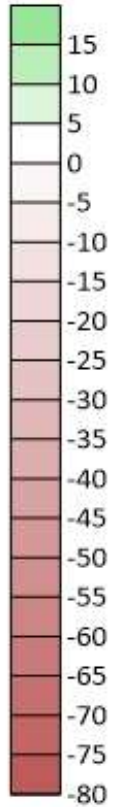
Mass Measurements and Aquifer Storage Changes

- Storage change calculations are based on data collected during mass measurement events.
- Mass measurement events are designed to collect as much data as possible during a brief window of time.
 - Provides a snapshot of the aquifer.
- Previous mass measurement events took place in the spring of 1980, 2001, 2002, 2008, 2013, 2018, and are now conducted every 5 years.

Mass Measurement Change Maps

Water Level Change - Spring 1980 To Spring 2001 with Well Locations

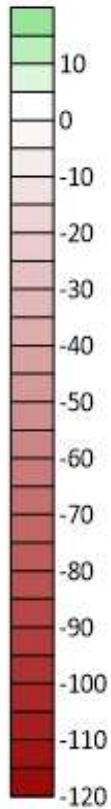
Water Level
Change (ft)



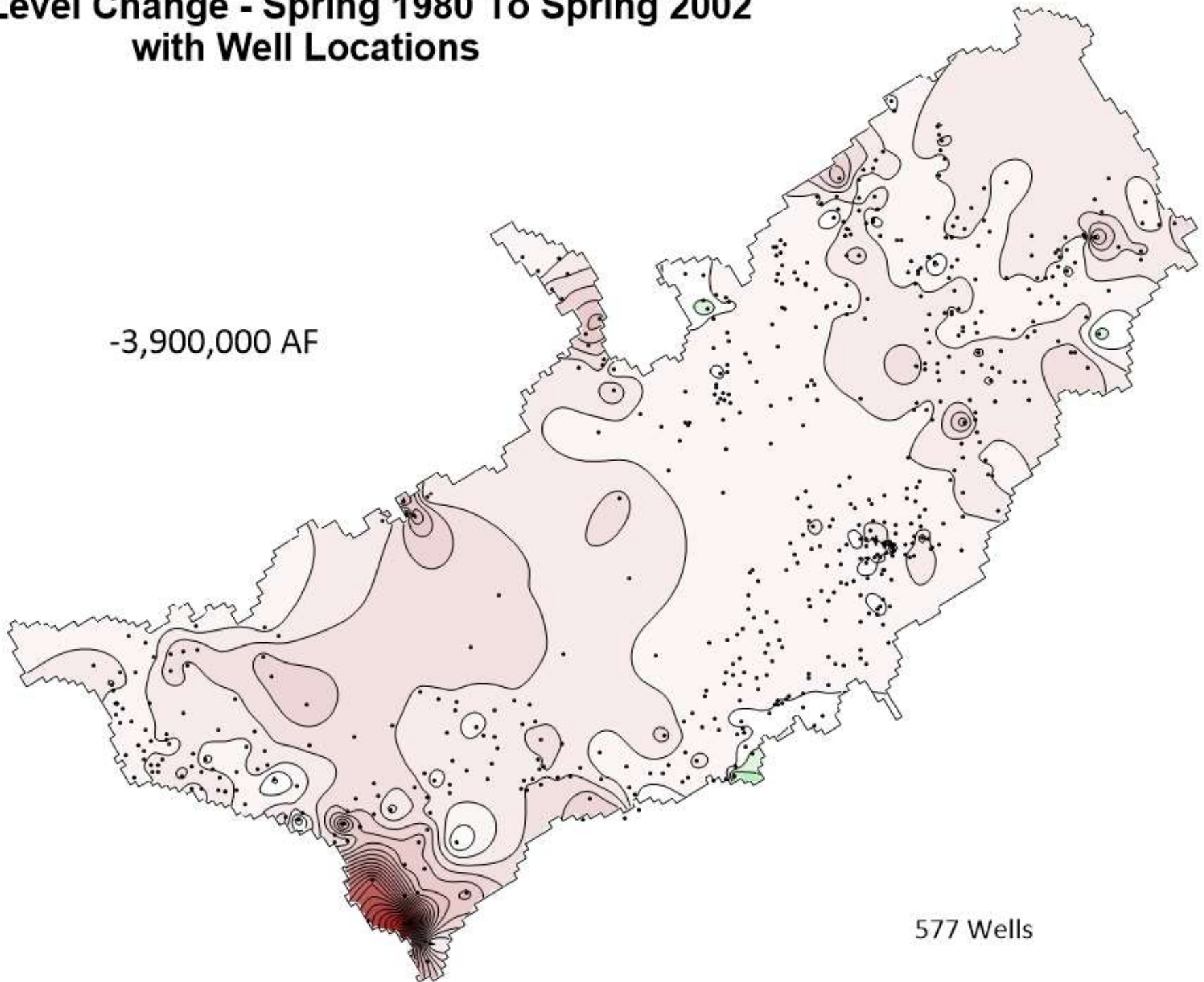
602 Wells

Water Level Change - Spring 1980 To Spring 2002 with Well Locations

Water Level
Change (ft)



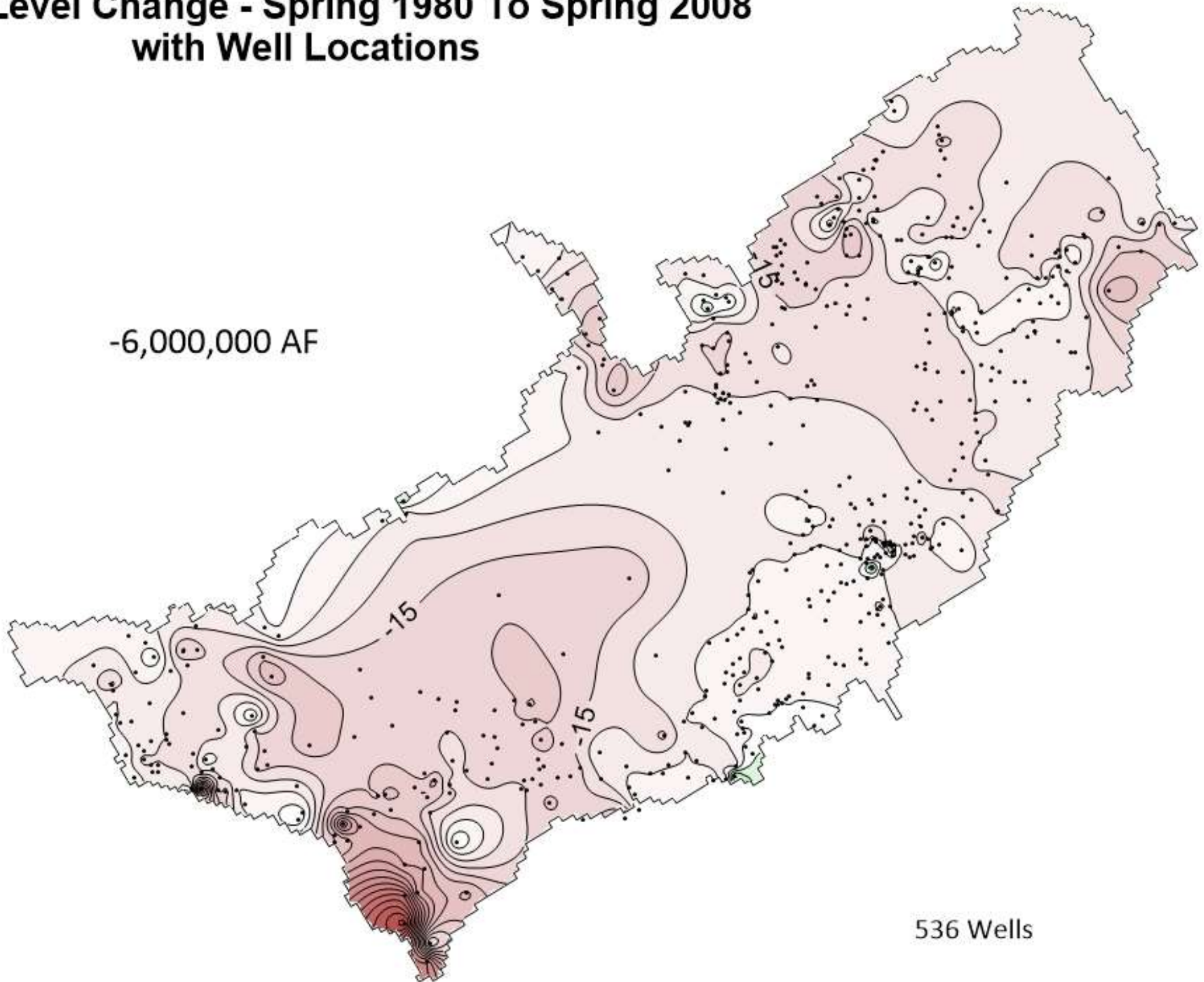
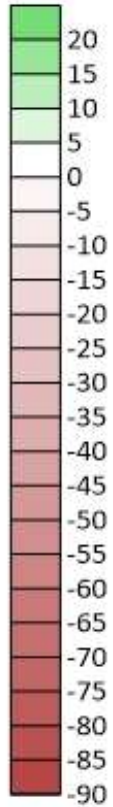
-3,900,000 AF



577 Wells

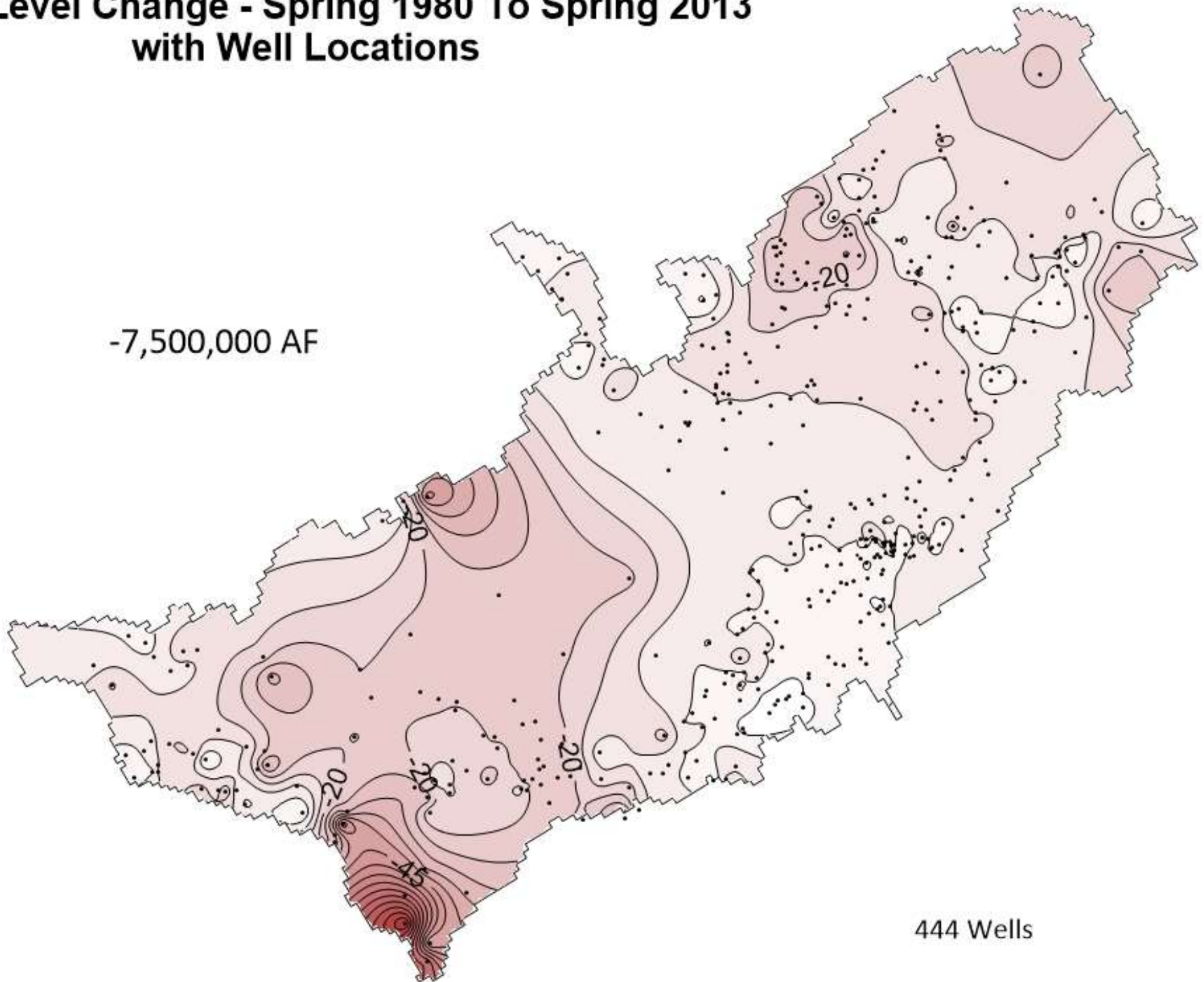
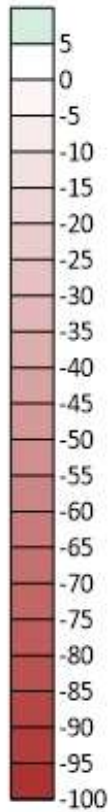
Water Level Change - Spring 1980 To Spring 2008 with Well Locations

Water Level
Change (ft)



Water Level Change - Spring 1980 To Spring 2013 with Well Locations

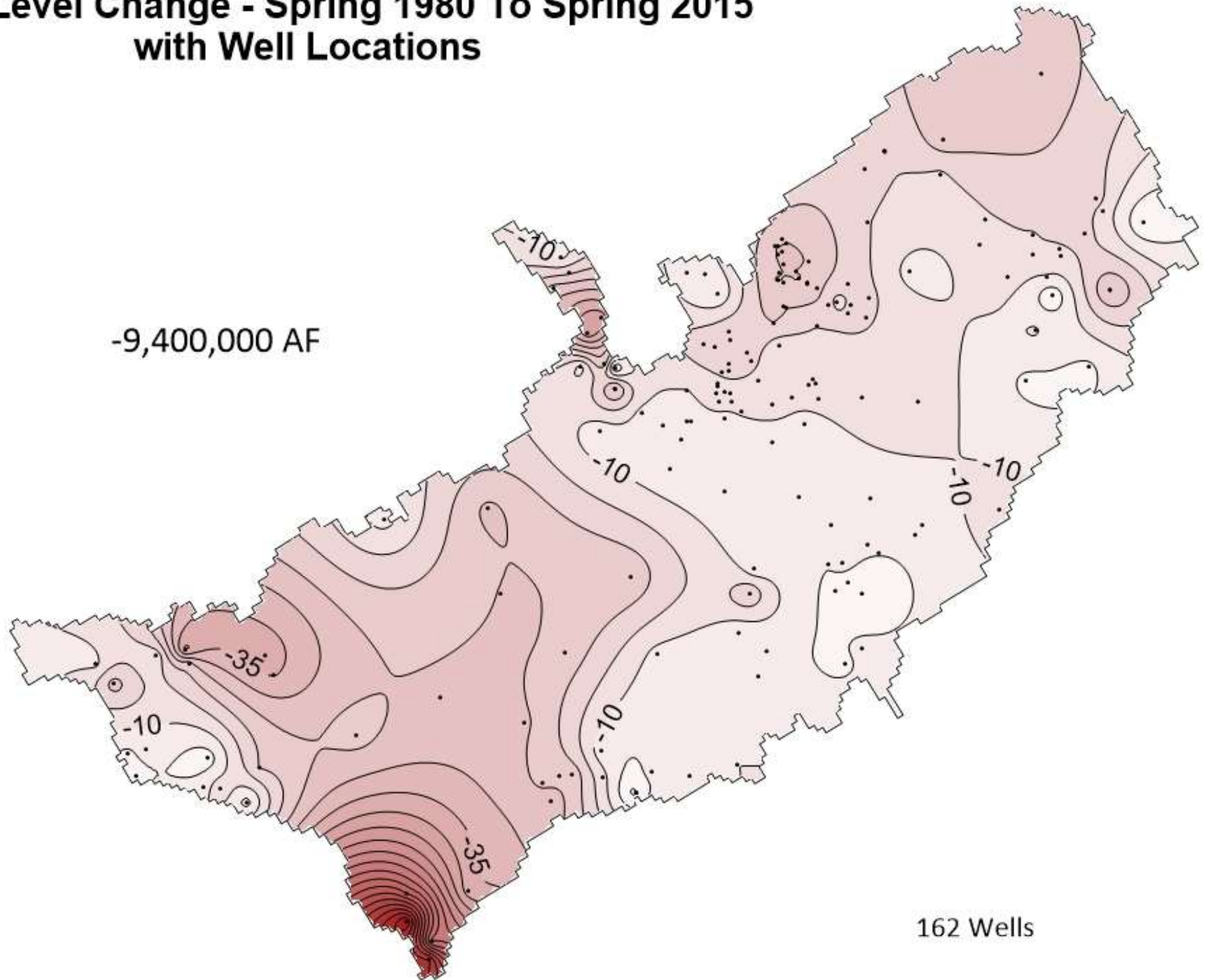
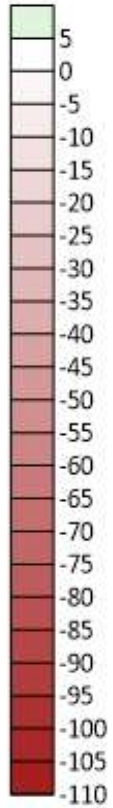
Water Level
Change (ft)



444 Wells

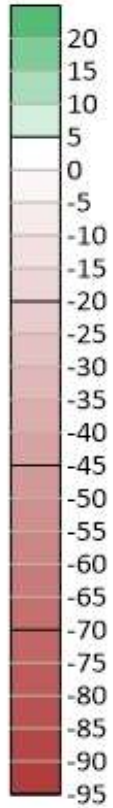
Water Level Change - Spring 1980 To Spring 2015 with Well Locations

Water Level
Change (ft)

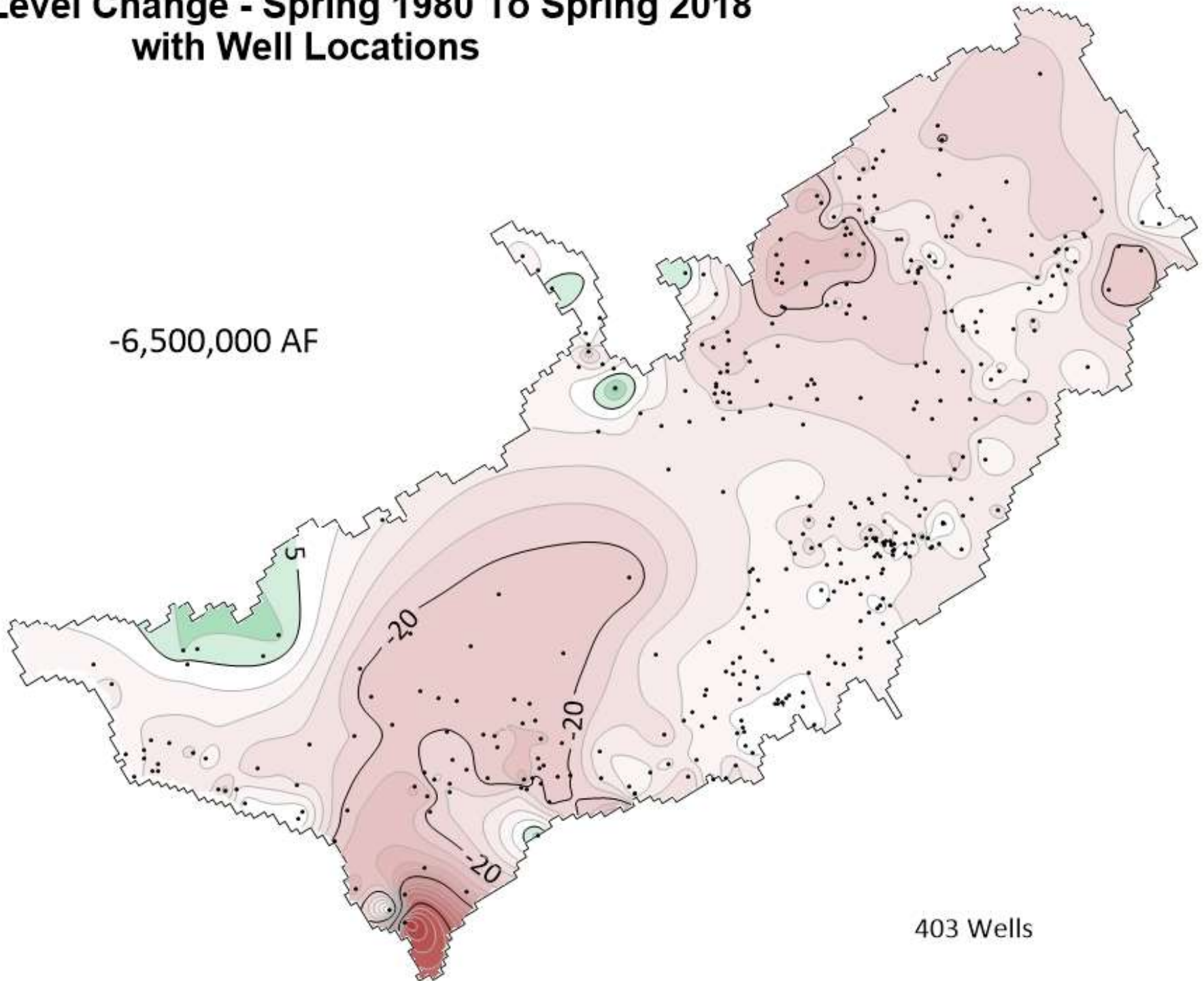


Water Level Change - Spring 1980 To Spring 2018 with Well Locations

Water Level
Change (ft)

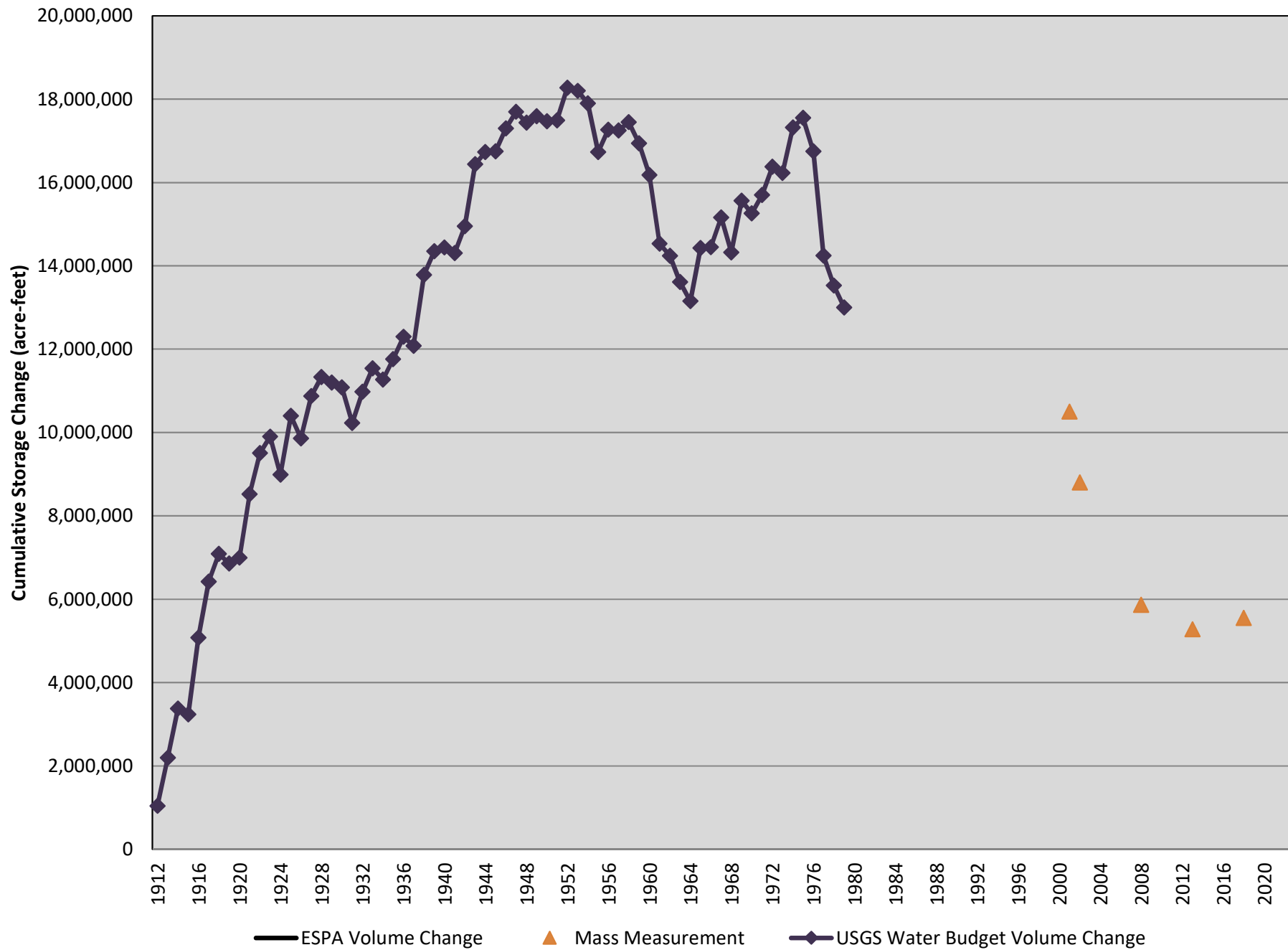


-6,500,000 AF



403 Wells

ESPA Change in Volume of Water and Thousand Springs Discharge



Storage Change between Mass Measurements

- Changes based on mass-measurement events give a general indication of the volume of water stored in the aquifer;
 - However, it is difficult to make management decisions with only this information.
- Hundreds of wells are measured in the spring each year.
 - Historically, these measurements were taken as time and conditions allowed.
- Since the spring of 2016, IDWR has been conducting coordinated measurement of the ESPA well network every spring to facilitate storage-change calculations.

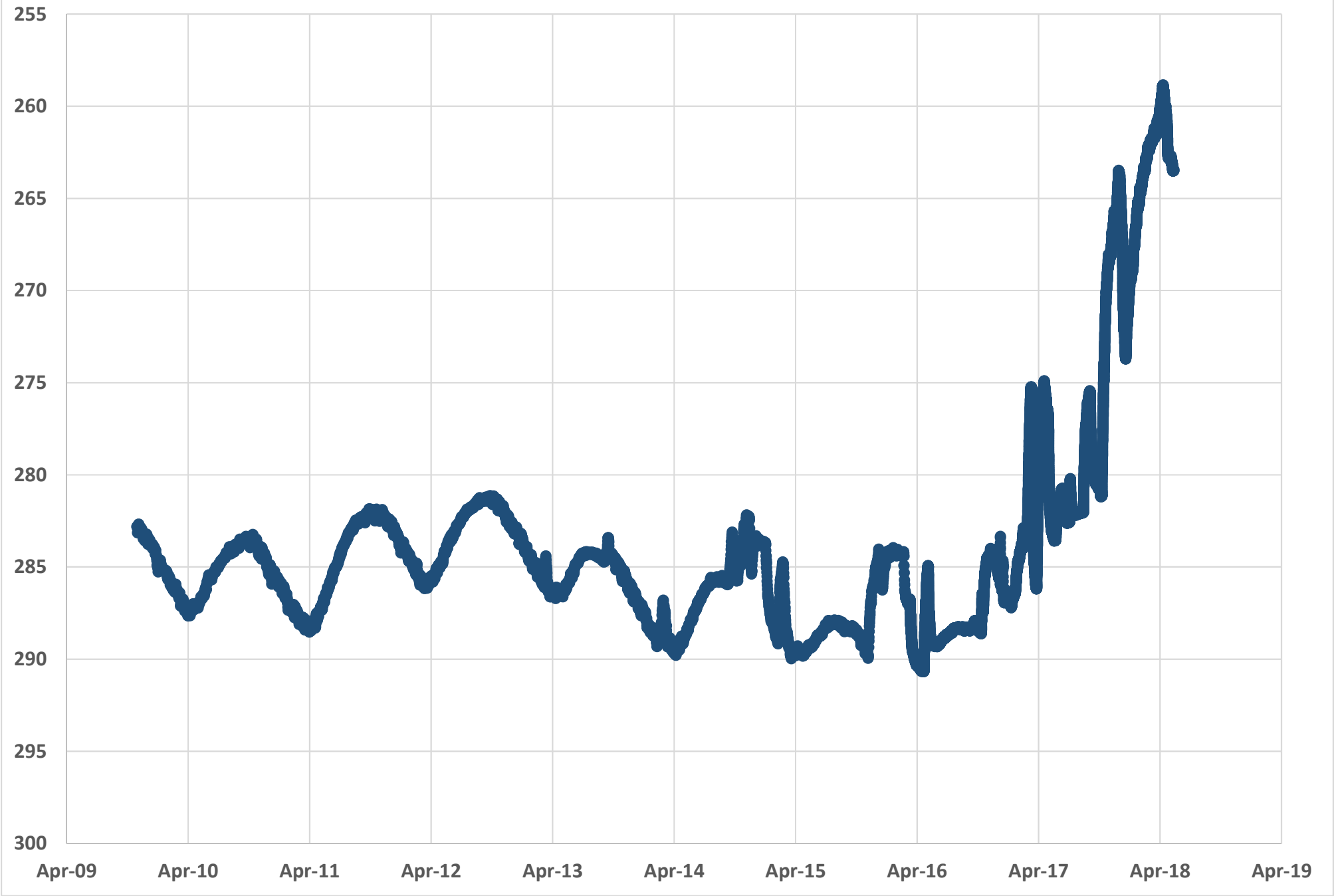
Rationale for using Spring-Season Water Levels

- Conducting measurement events in the spring:
 - Maximizes the time between irrigation seasons.
 - Integrates the impacts due to irrigation-season activities into a resulting condition (annual aquifer storage change).
 - Pre-irrigation measurements reduce the impact of local water use on water levels (unperturbed water table).
- Managed recharge impacts water levels, and these impacts need to be addressed in the storage-change calculations.

Water Levels Impacted by Managed Recharge

- Recharge is a real, regional water-budget component.
- Water levels that are impacted by managed recharge **must be included**.
- We need to avoid over-estimating storage changes by excluding water levels that respond too strongly to recharge.
 - Any approach used to determine which data to include/exclude requires a subjective decision.
 - There is no direct answer as to whether water-level responses to recharge appropriately represent water-budget change

08S 19E 02DCCD1 (MP 31)



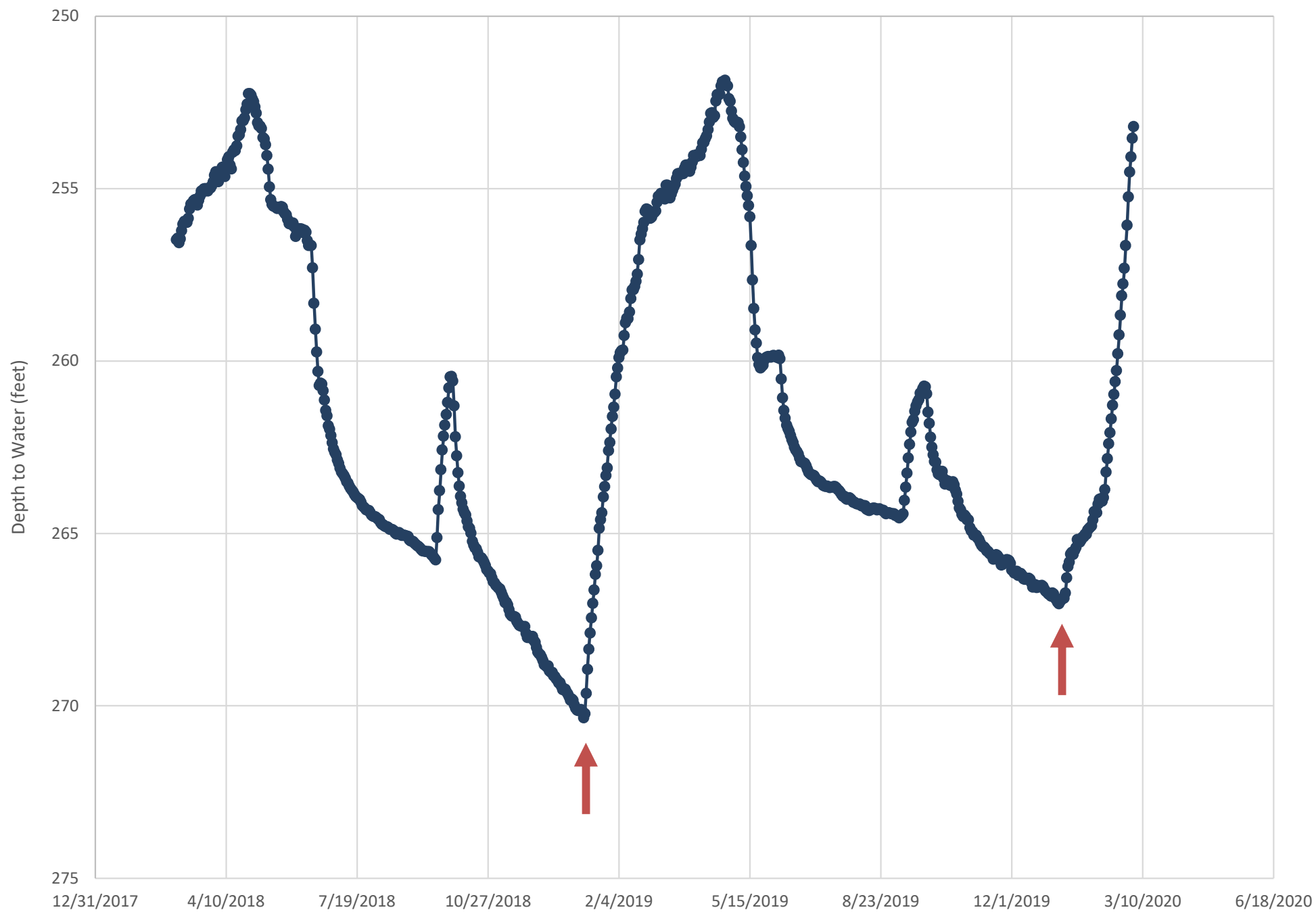
Choosing Wells in Proximity to Managed Recharge

- ESPAM2.2 is a regional model.
 - The model area is broken into one-mile grid cells.
 - The model simulation period is divided into one-month stress periods.
- Because we are calculating regional impacts, I have used the ESPAM2.2 discretization to include/exclude wells.
 - Exclude wells that are less than one mile from a recharge location.
 - For wells $>$ one mile from recharge, exclude water levels that occur less than 30 days after an obvious recharge event –
 - Not all recharge locations are known, and not all water-level data are sufficient for these choices.

The Value of Transducer-Data Loggers

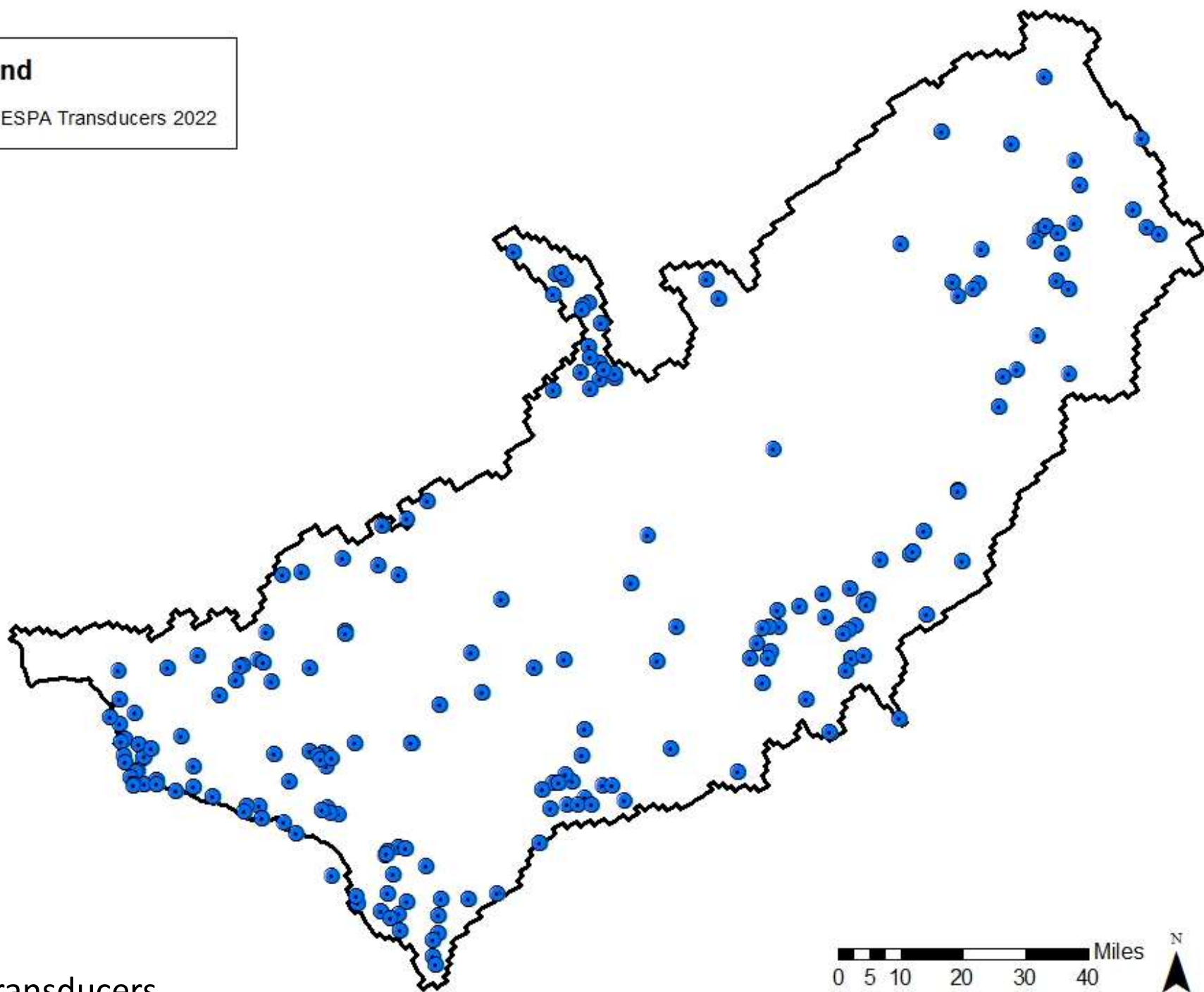
- Transducers measure the pressure of water above the probe.
 - Manual measurements are used to relate the pressure to depth-of-water.
- Data loggers record the pressure measurements.
- We collect much more data using transducers.
- Able to collect measurements even if the well is inaccessible during the synoptic measurement event.
- Allows for understanding of well behavior.
- *Data collected via transducer allows for the selection of the most appropriate water level.*
 - Even if the water levels aren't obviously influenced by recharge.

08S 19E 02CBC1



Legend

● ESPA Transducers 2022



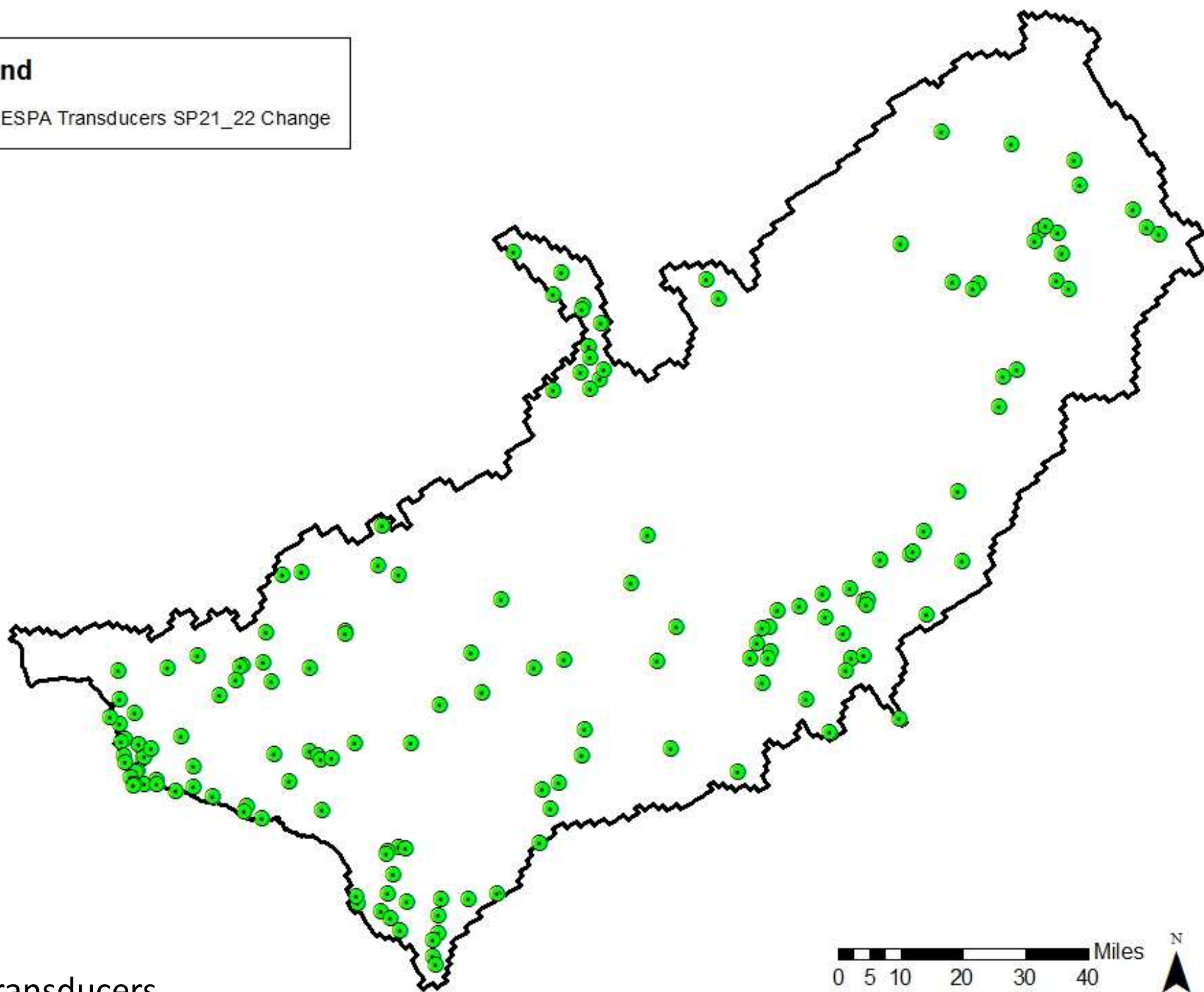
231 Transducers

0 5 10 20 30 40 Miles



Legend

● ESPA Transducers SP21_22 Change

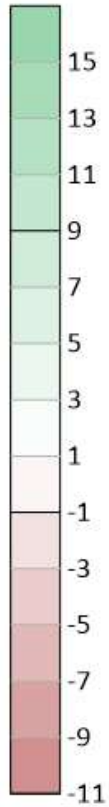


163 Transducers

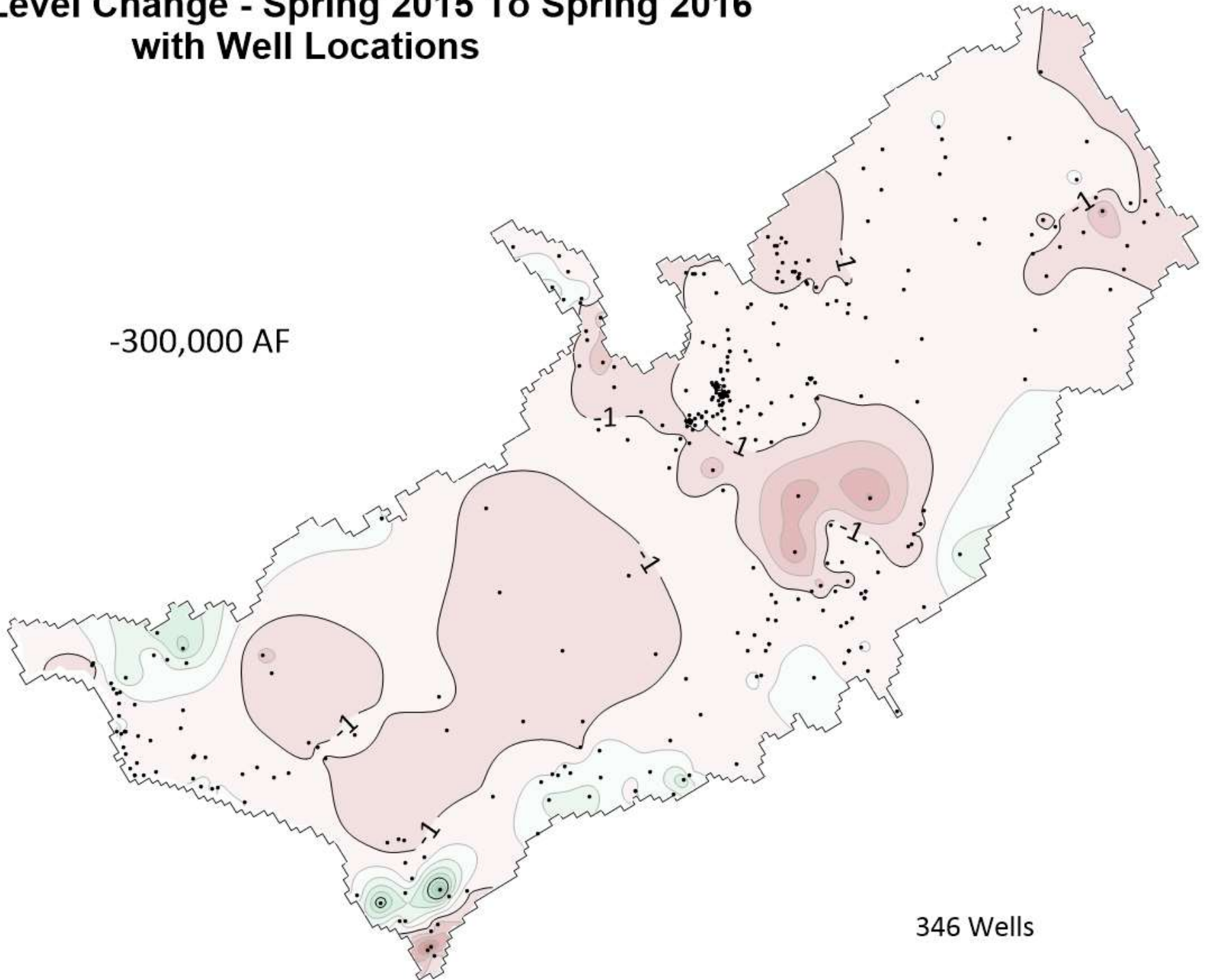
Annual Measurement Change Maps: 2015 – 2022

Water Level Change - Spring 2015 To Spring 2016 with Well Locations

Water Level
Change (ft)



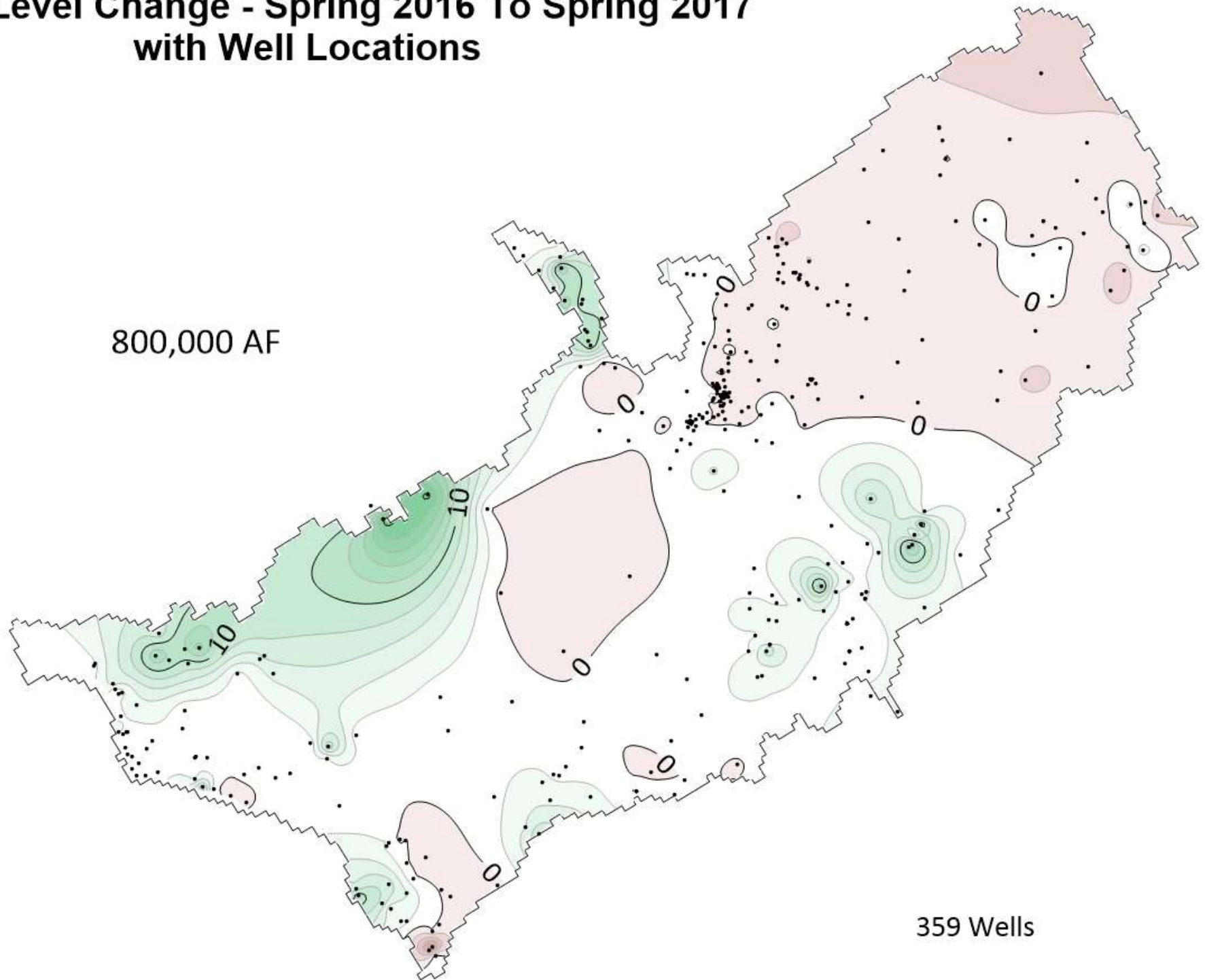
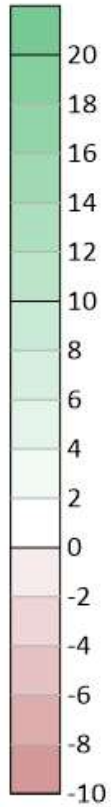
-300,000 AF



346 Wells

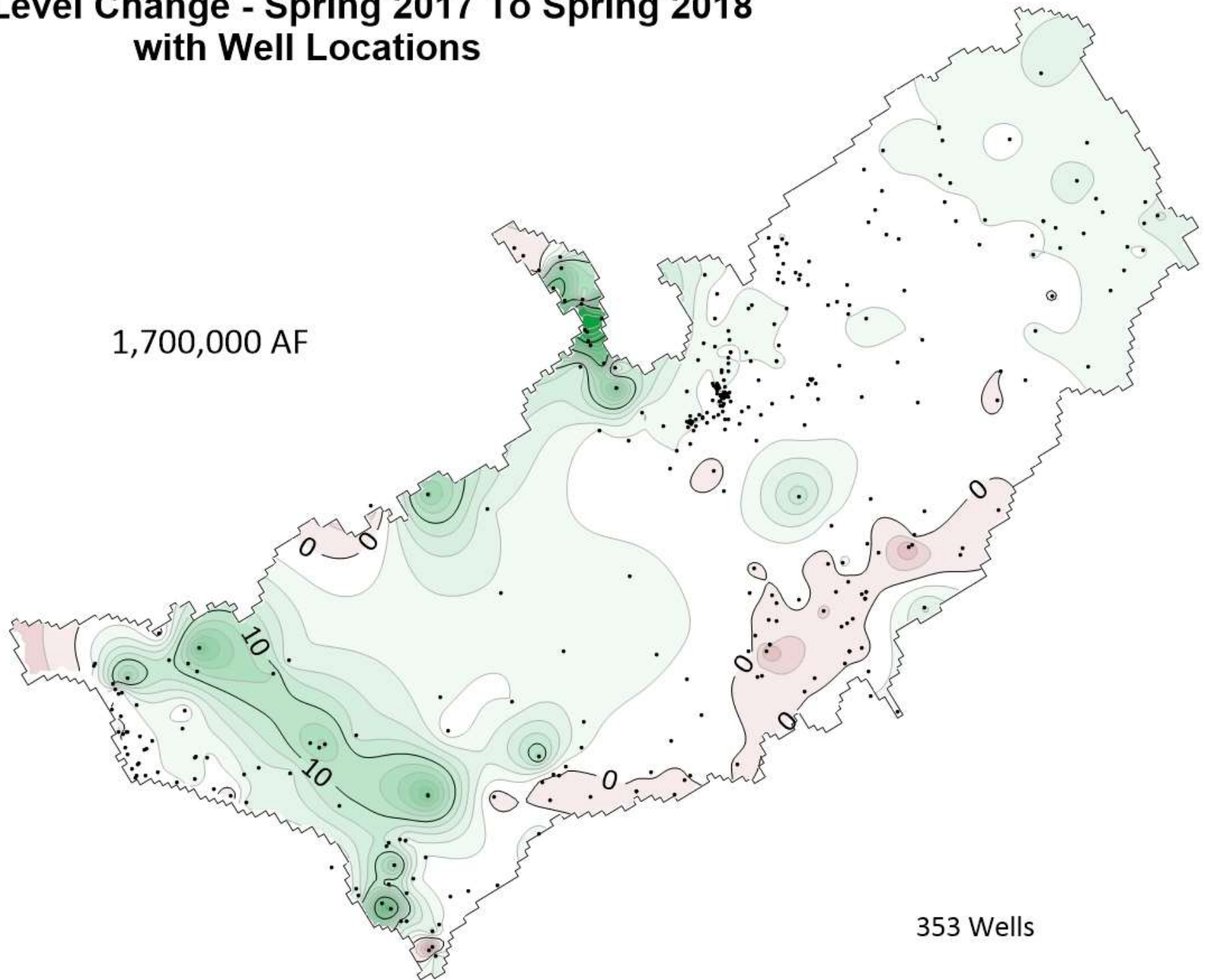
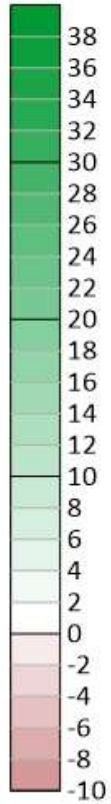
Water Level Change - Spring 2016 To Spring 2017 with Well Locations

Water Level
Change (ft)



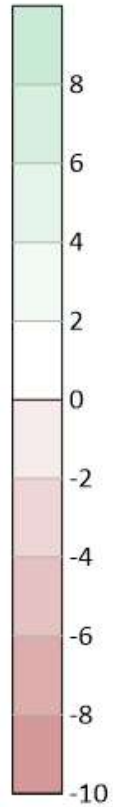
Water Level Change - Spring 2017 To Spring 2018 with Well Locations

Water Level
Change (ft)

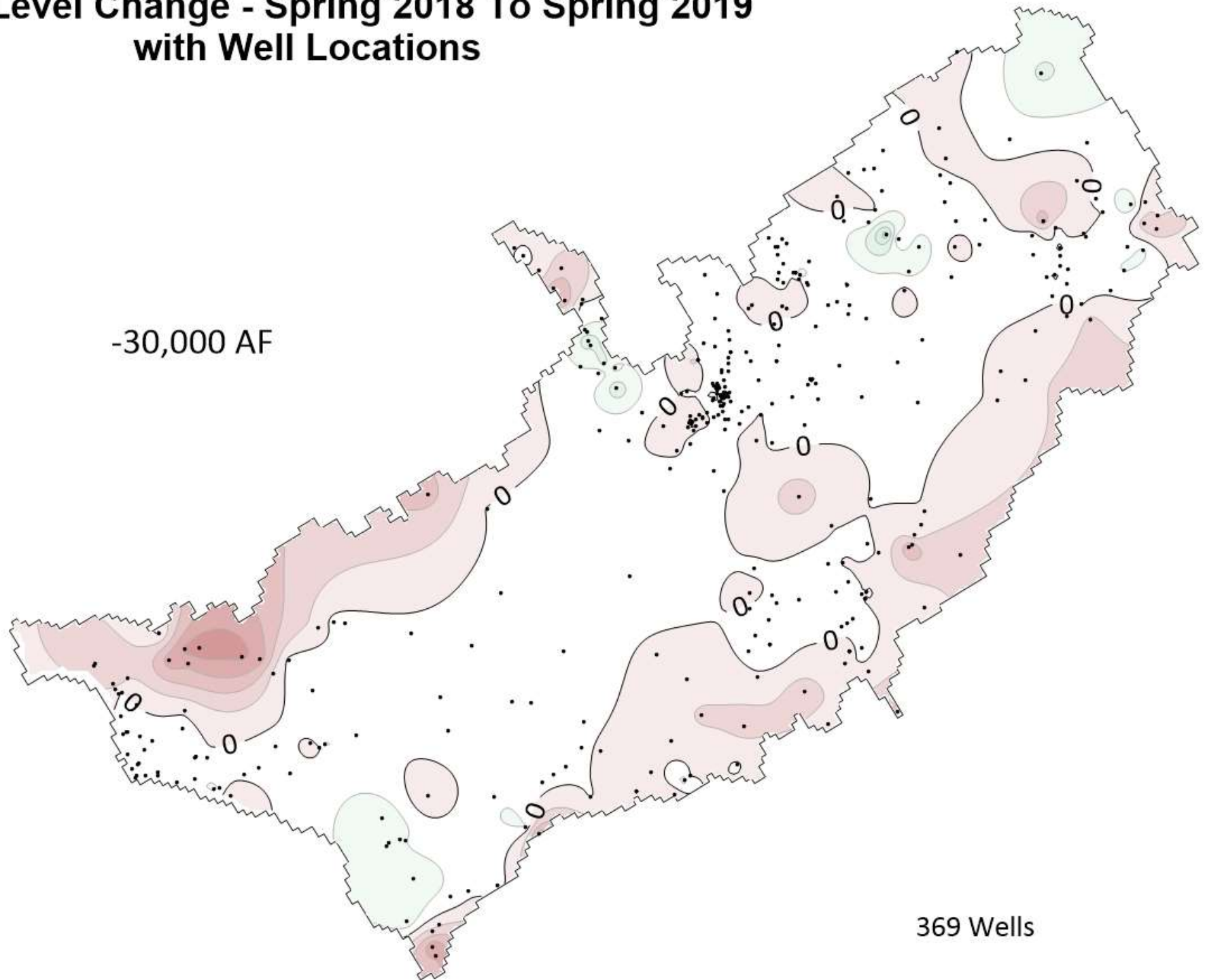


Water Level Change - Spring 2018 To Spring 2019 with Well Locations

Water Level
Change (ft)



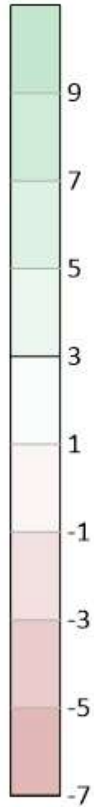
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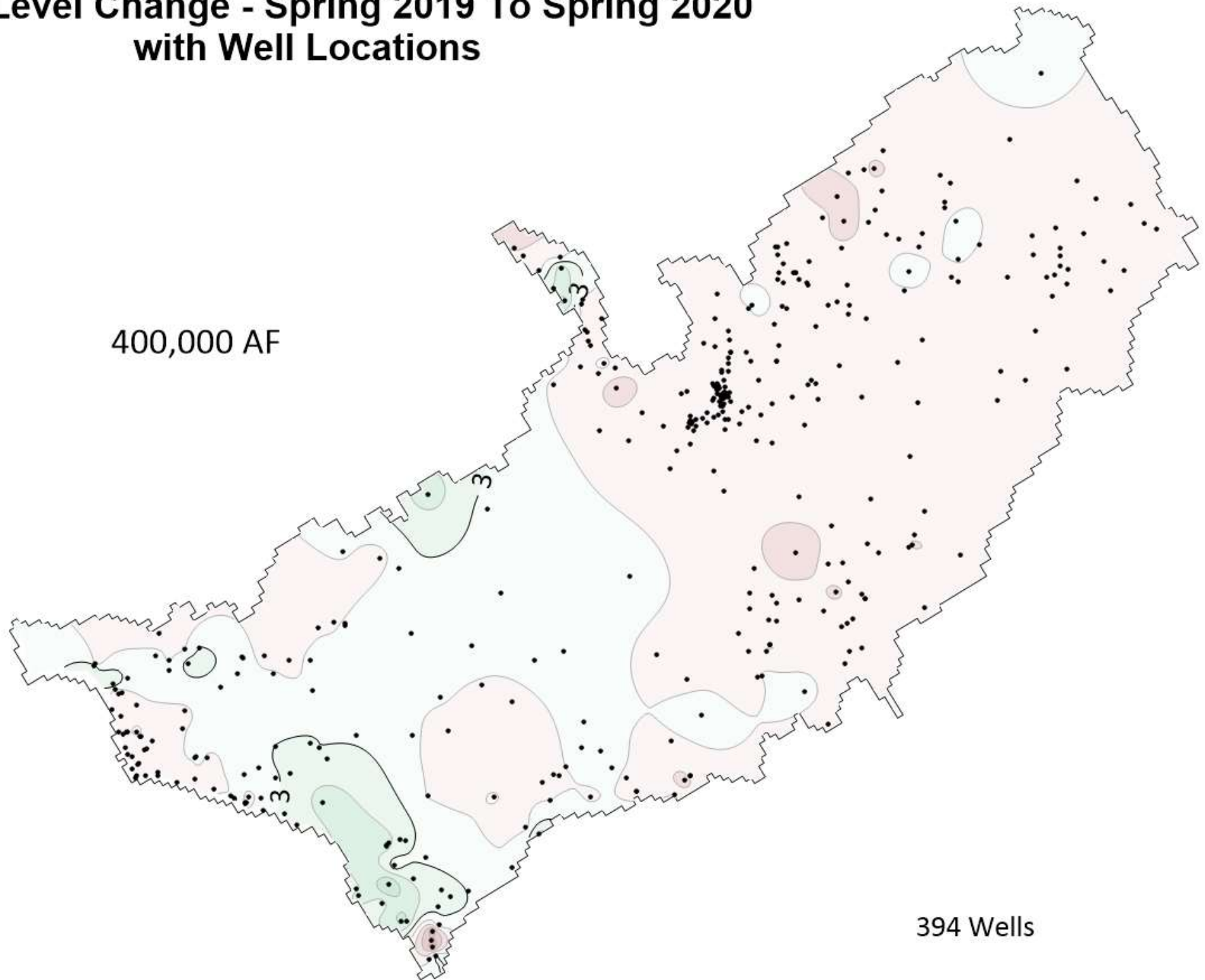
369 Wells

Water Level Change - Spring 2019 To Spring 2020 with Well Locations

Water Level
Change (ft)



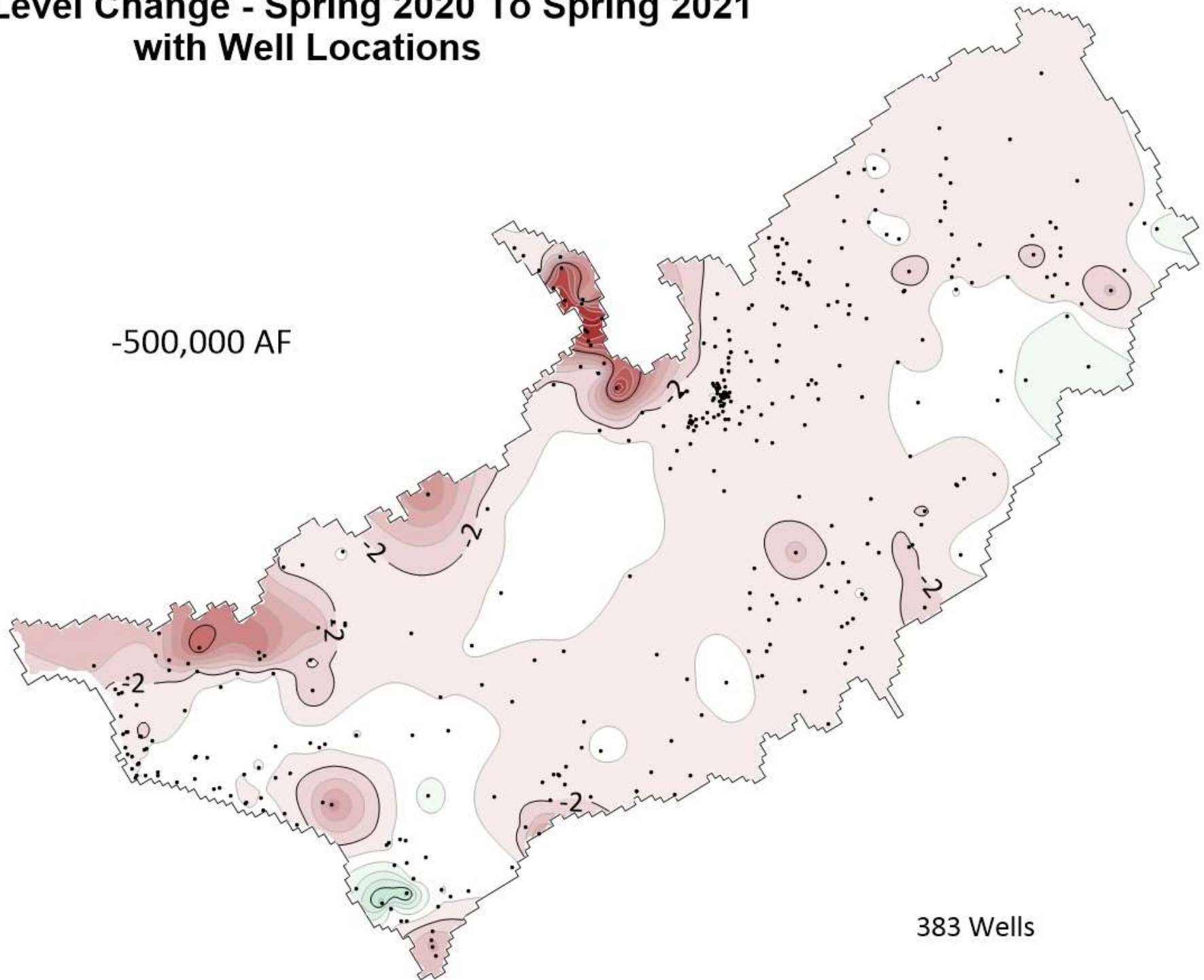
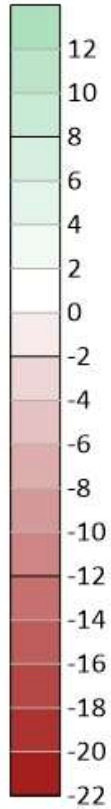
400,000 AF



394 Wells

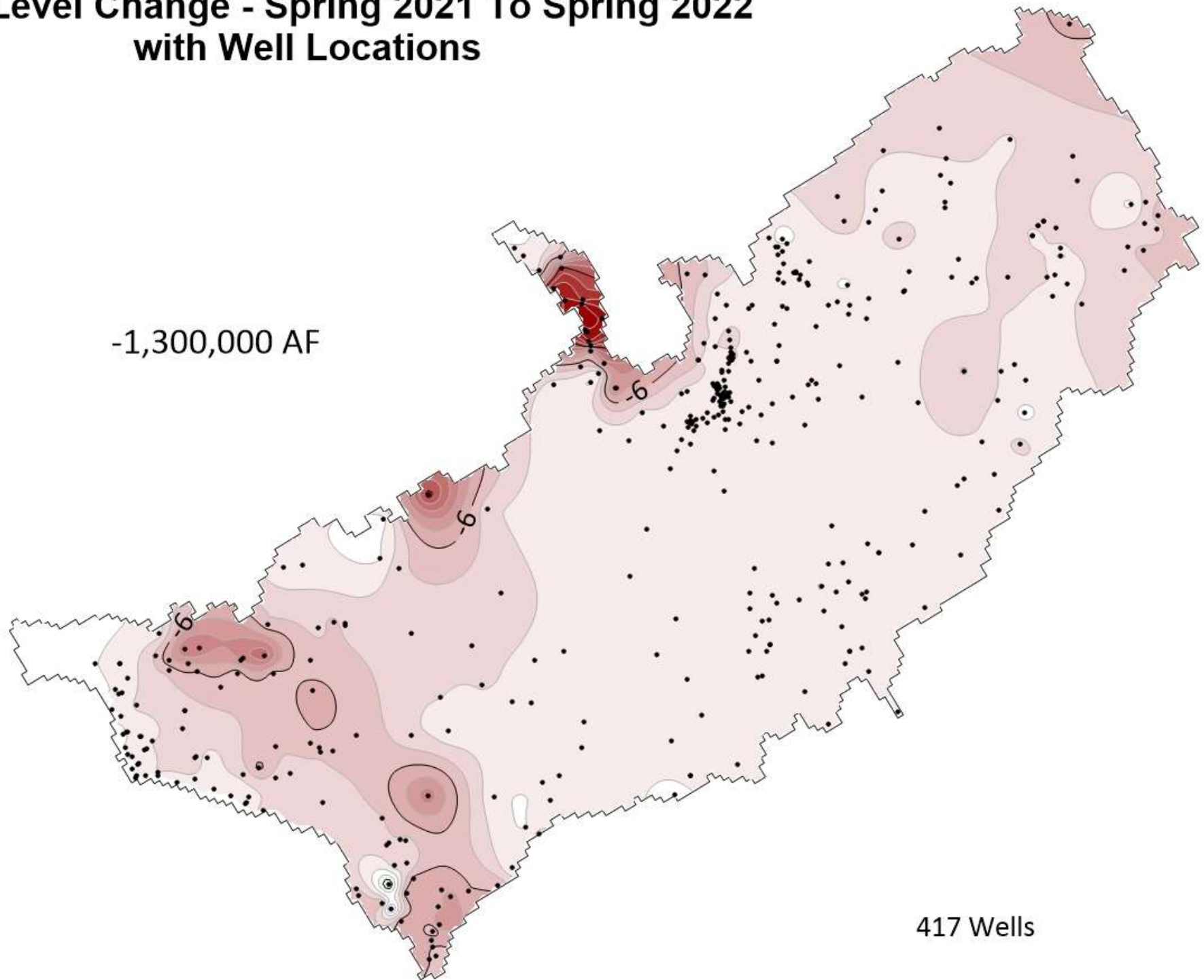
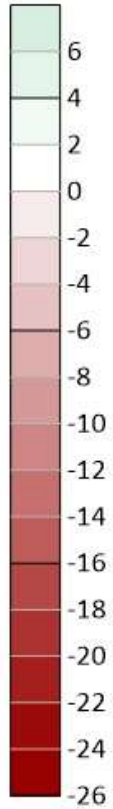
Water Level Change - Spring 2020 To Spring 2021 with Well Locations

Water Level
Change (ft)



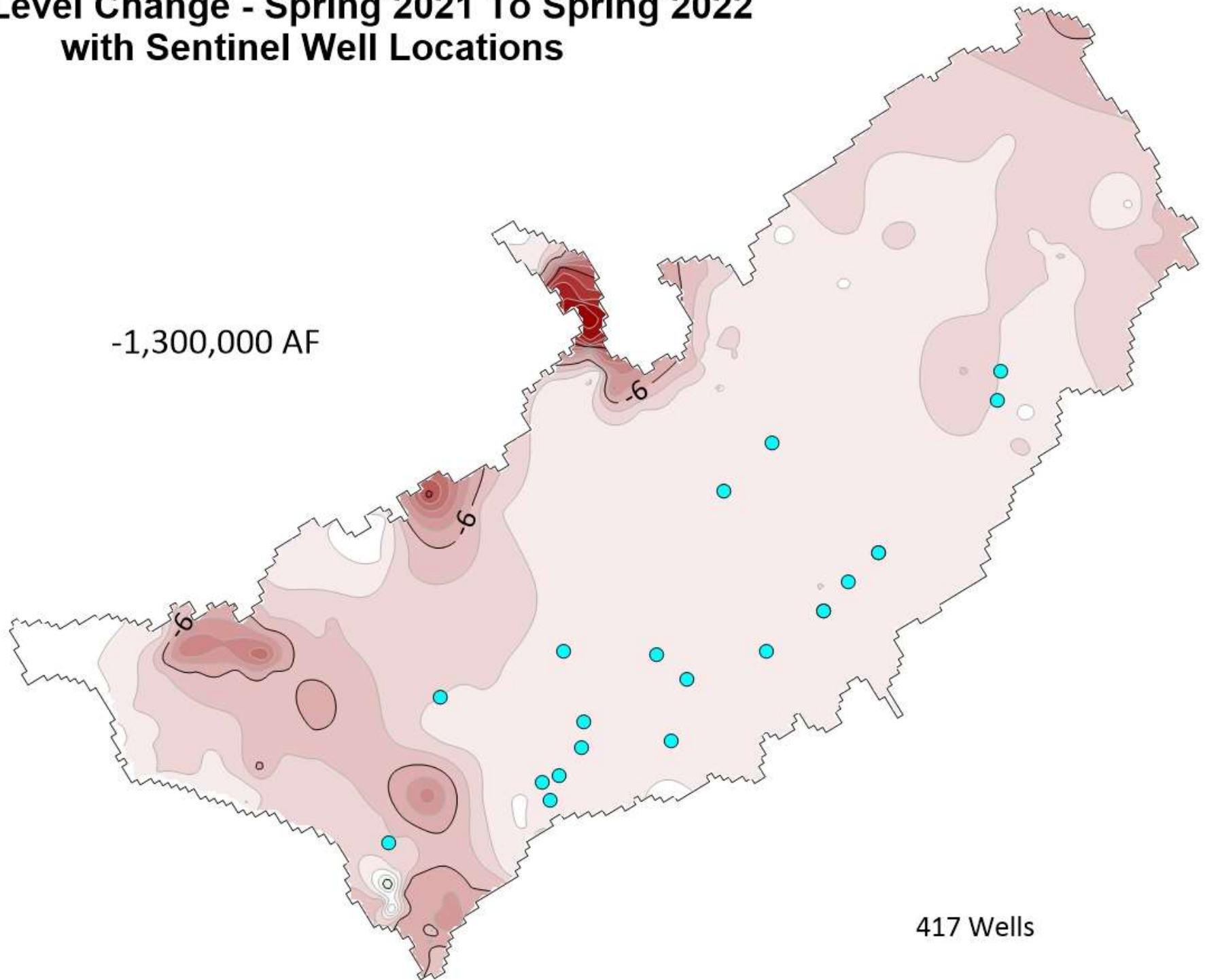
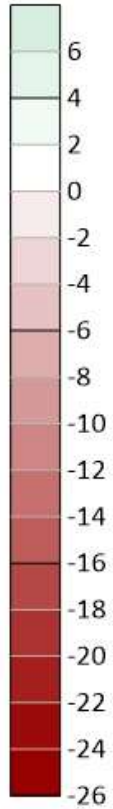
Water Level Change - Spring 2021 To Spring 2022 with Well Locations

Water Level
Change (ft)



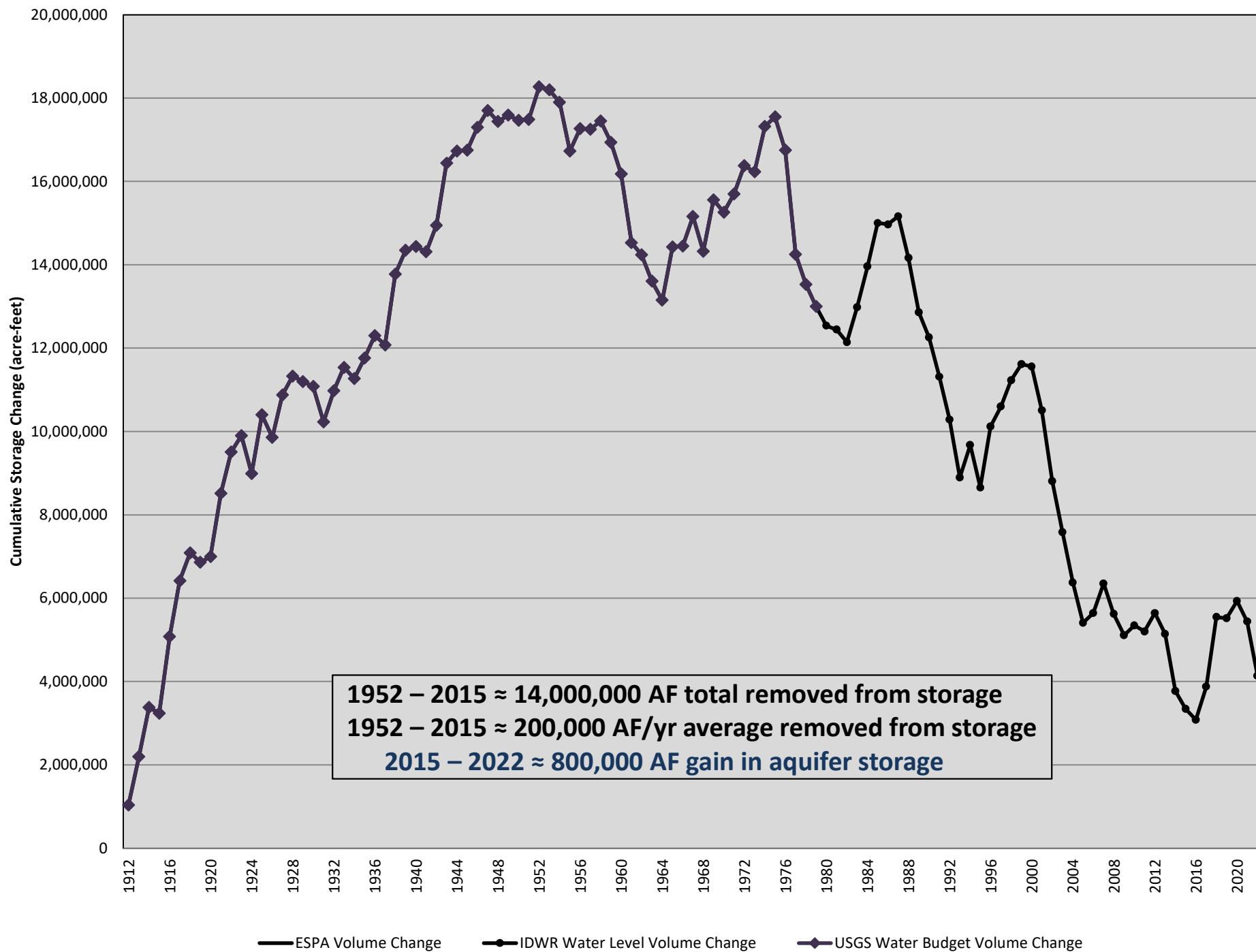
Water Level Change - Spring 2021 To Spring 2022 with Sentinel Well Locations

Water Level
Change (ft)

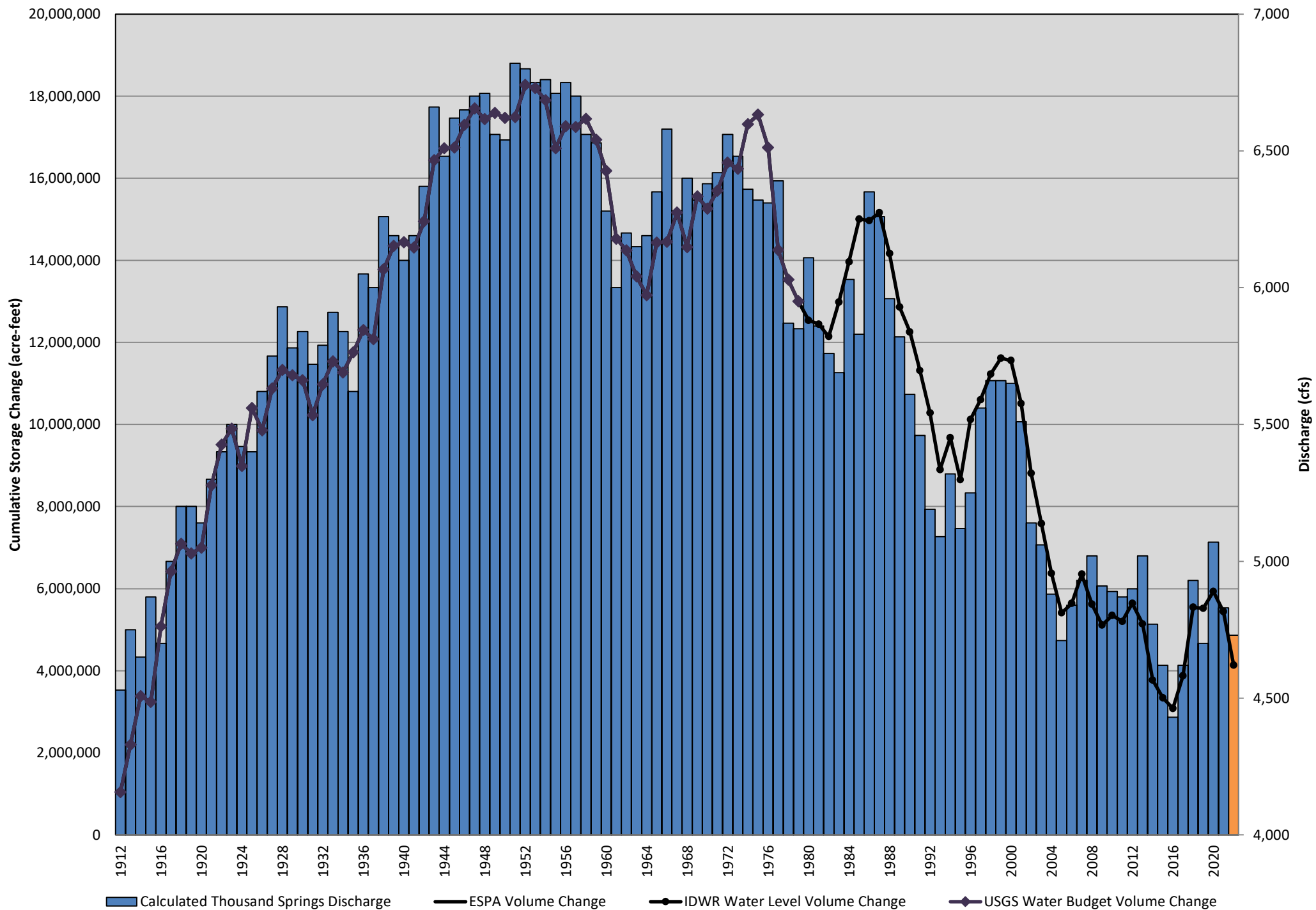


417 Wells

ESPA Change in Volume of Water and Thousand Springs Discharge

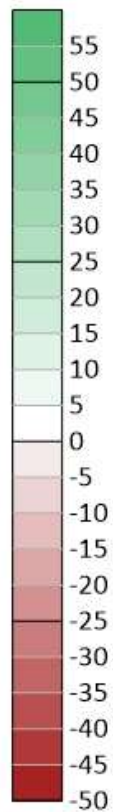


ESPA Change in Volume of Water and Thousand Springs Discharge

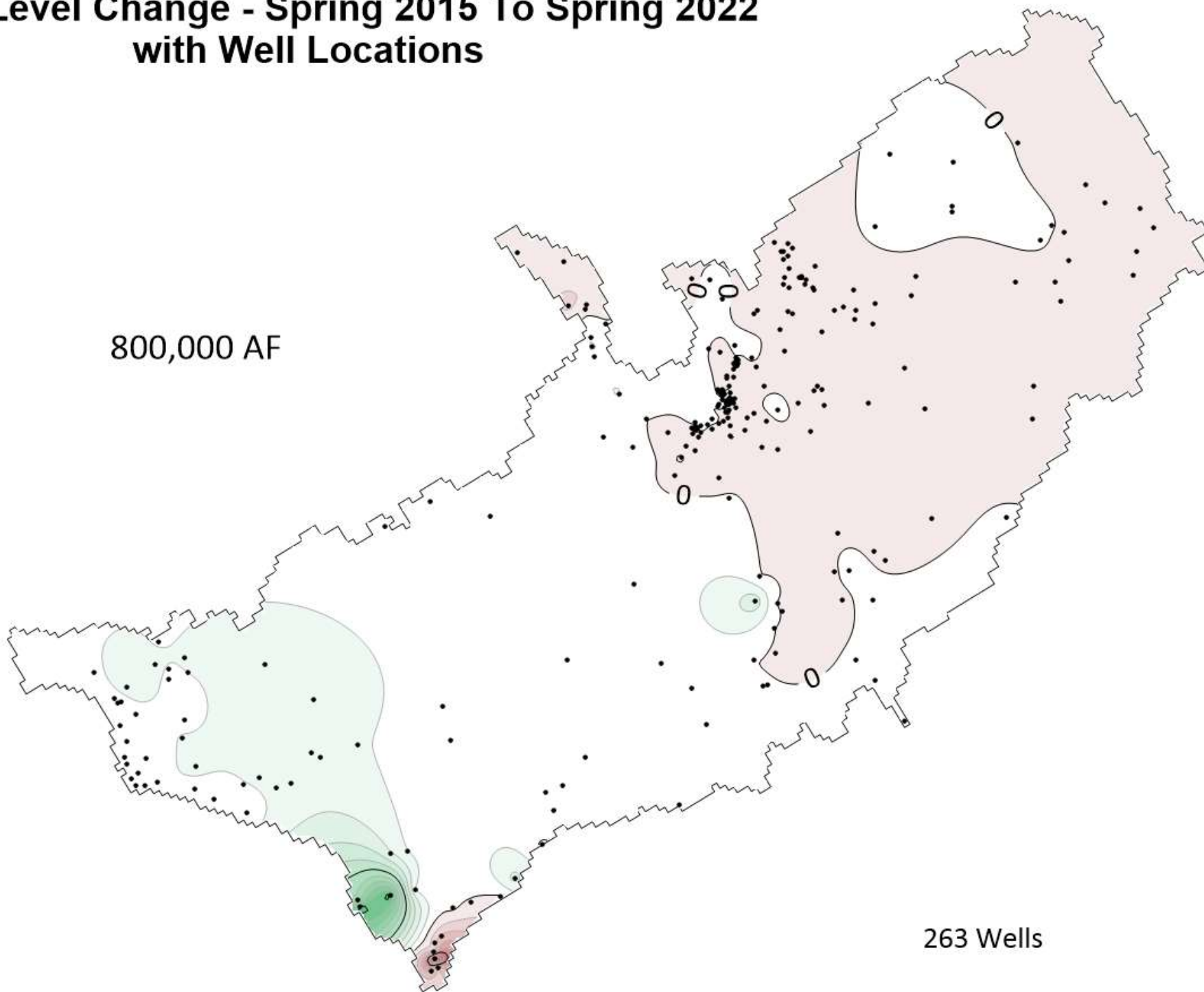


Water Level Change - Spring 2015 To Spring 2022 with Well Locations

Water Level
Change (ft)



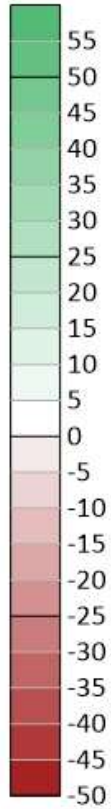
800,000 AF



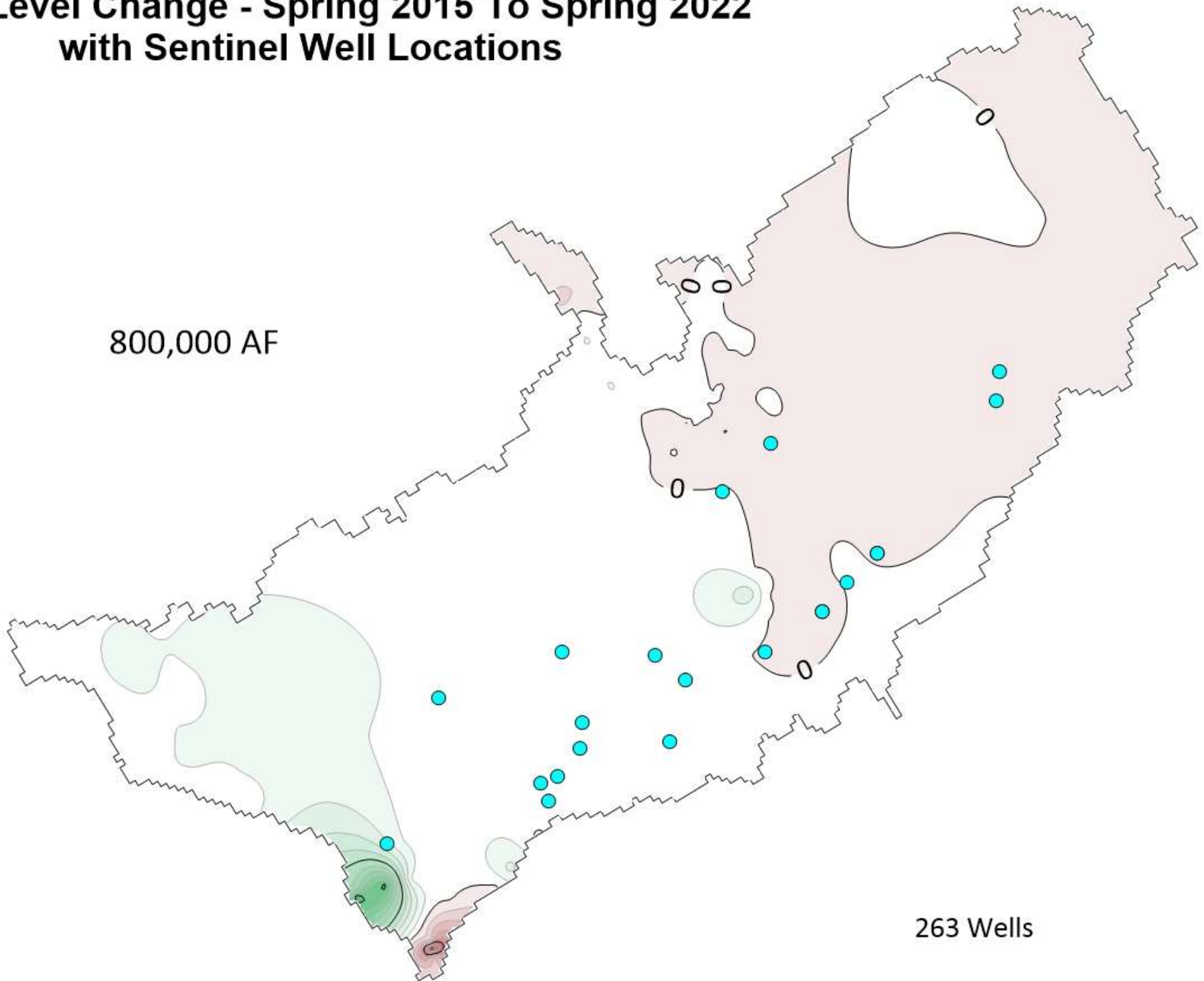
263 Wells

Water Level Change - Spring 2015 To Spring 2022 with Sentinel Well Locations

Water Level
Change (ft)



800,000 AF



263 Wells

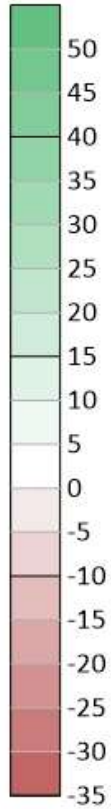
Storage Change Summary

- The aquifer lost 1,300,000 acre-feet from 2021 to 2022.
- The aquifer has gained 800,000 acre-feet of storage since 2015.
- The increase in precipitation in 2016 – 2017 helped us get a good start to a long-term solution.
 - Undulations due to weather are to be expected – 2021 was a dry year
 - The ESPA leaks, and aquifer-storage gains are fleeting.
 - Perseverance through the dry times is vital to success.

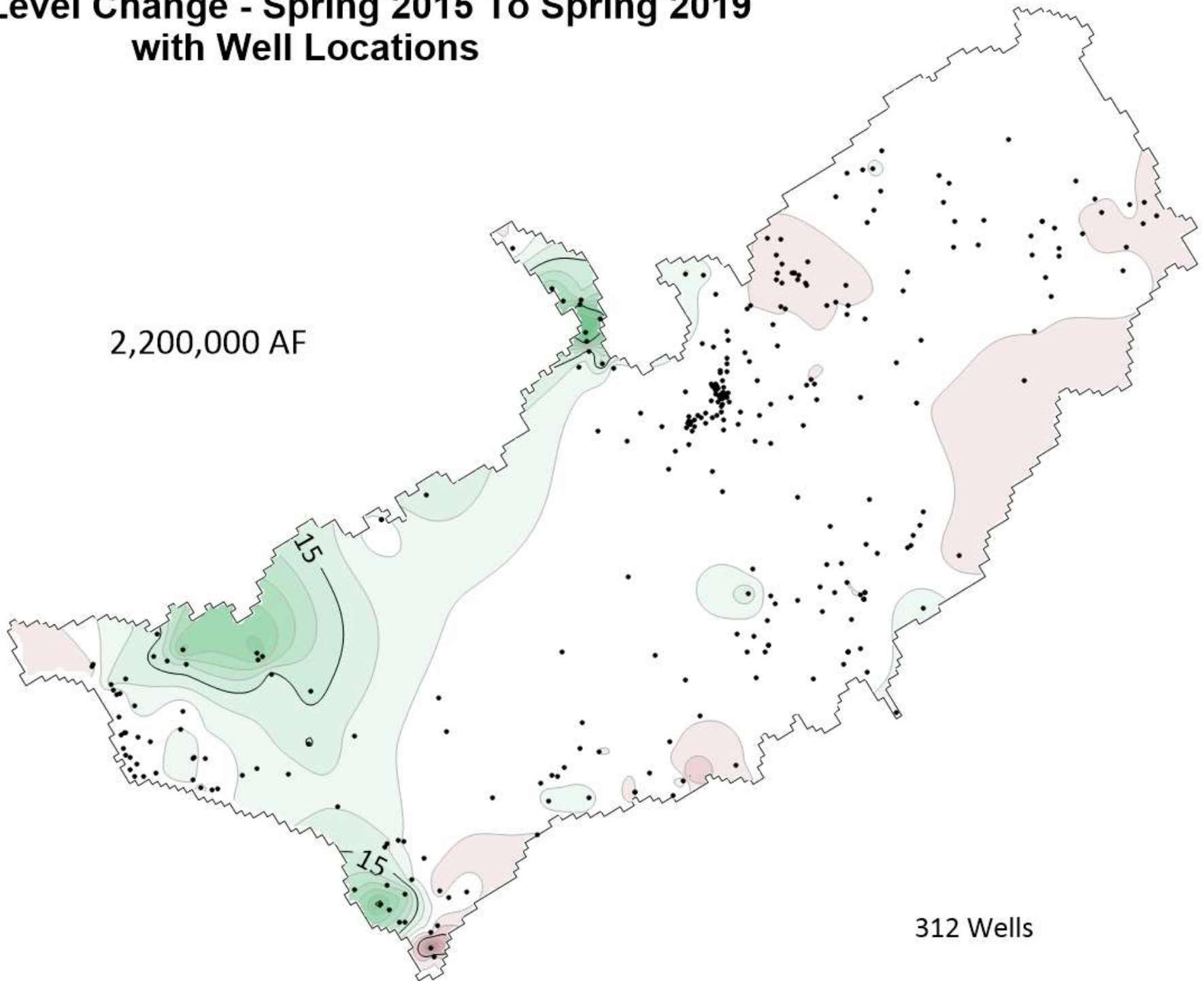
Discussion

Water Level Change - Spring 2015 To Spring 2019 with Well Locations

Water Level
Change (ft)



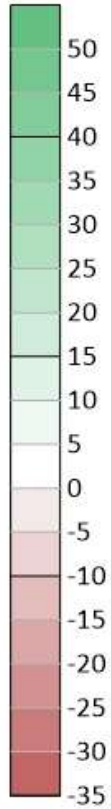
2,200,000 AF



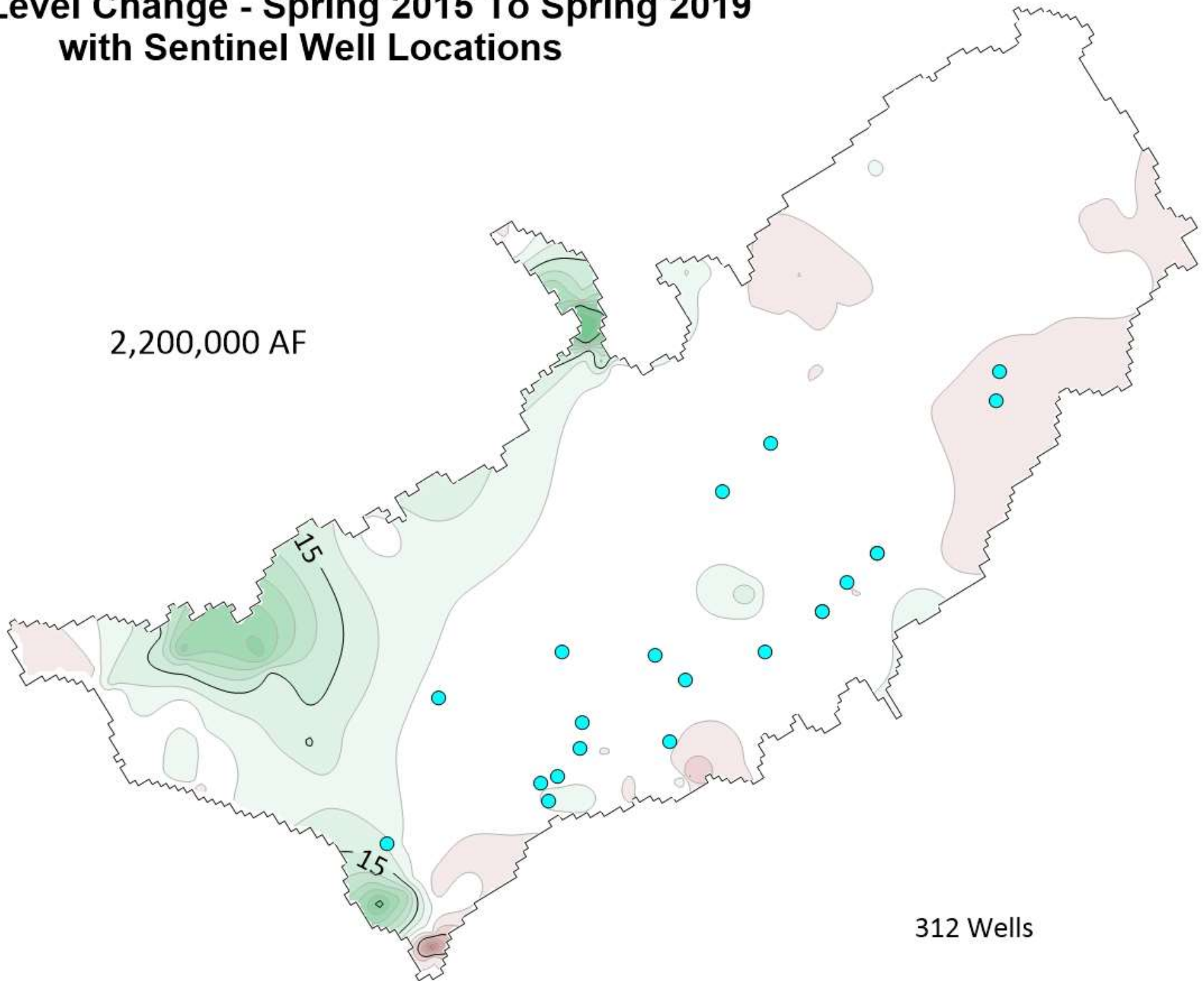
312 Wells

Water Level Change - Spring 2015 To Spring 2019 with Sentinel Well Locations

Water Level
Change (ft)



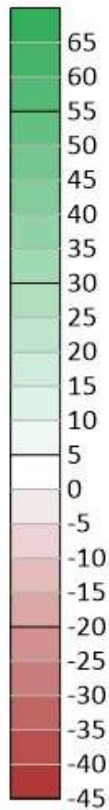
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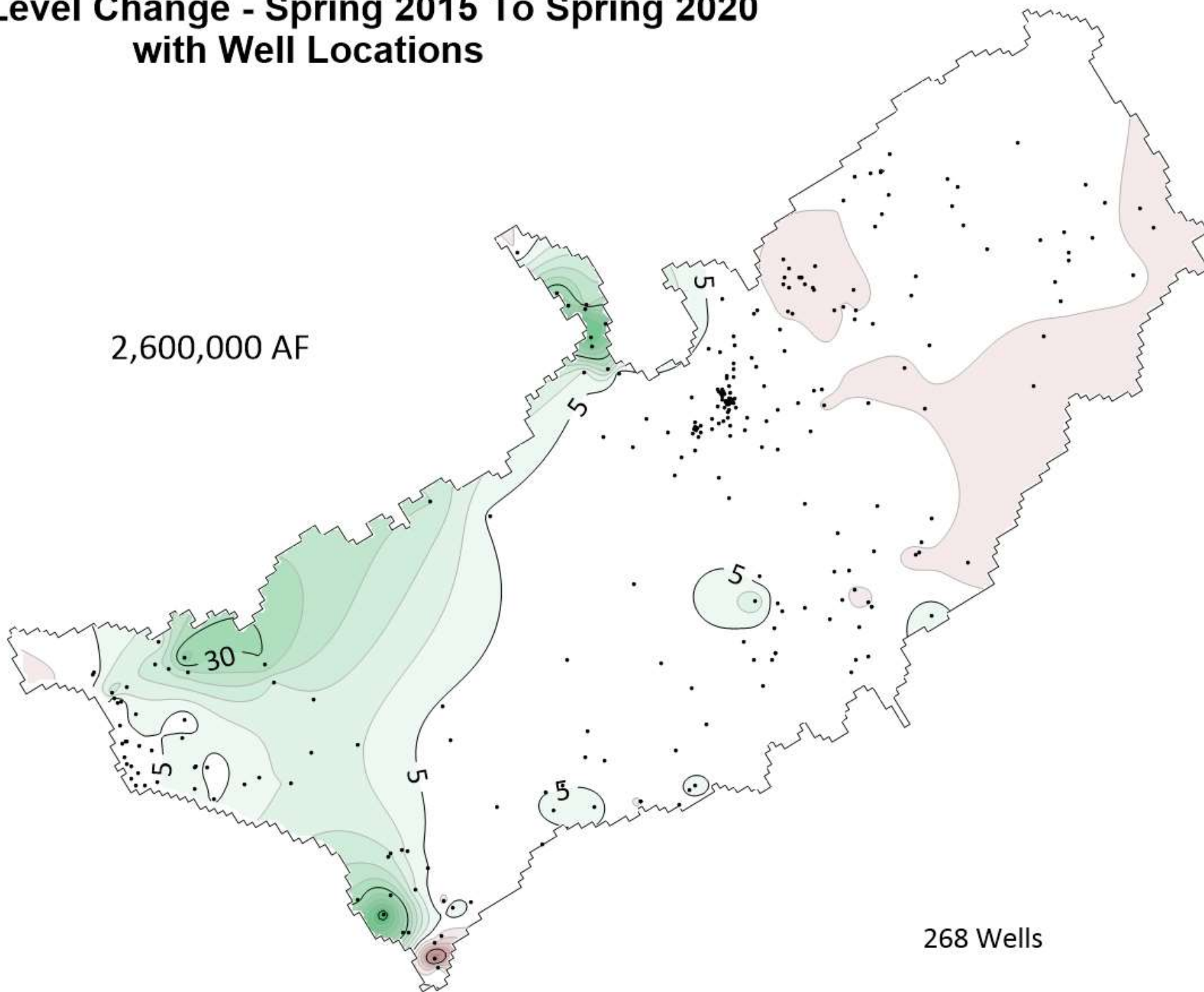
312 Wells

Water Level Change - Spring 2015 To Spring 2020 with Well Locations

Water Level
Change (ft)



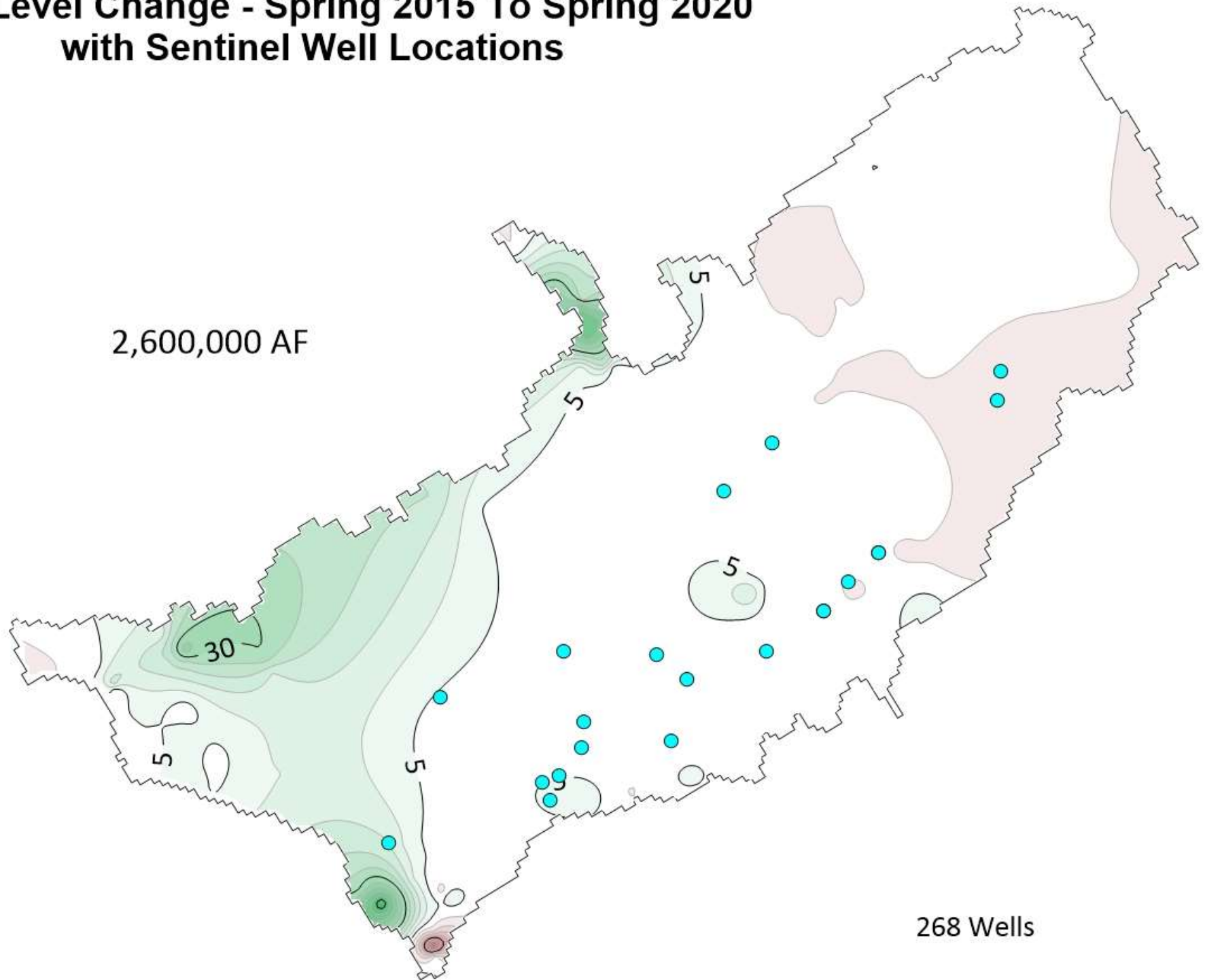
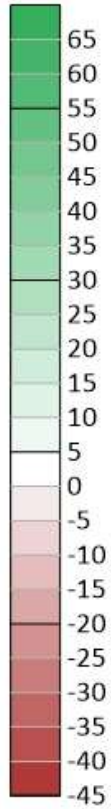
2,600,000 AF



268 Wells

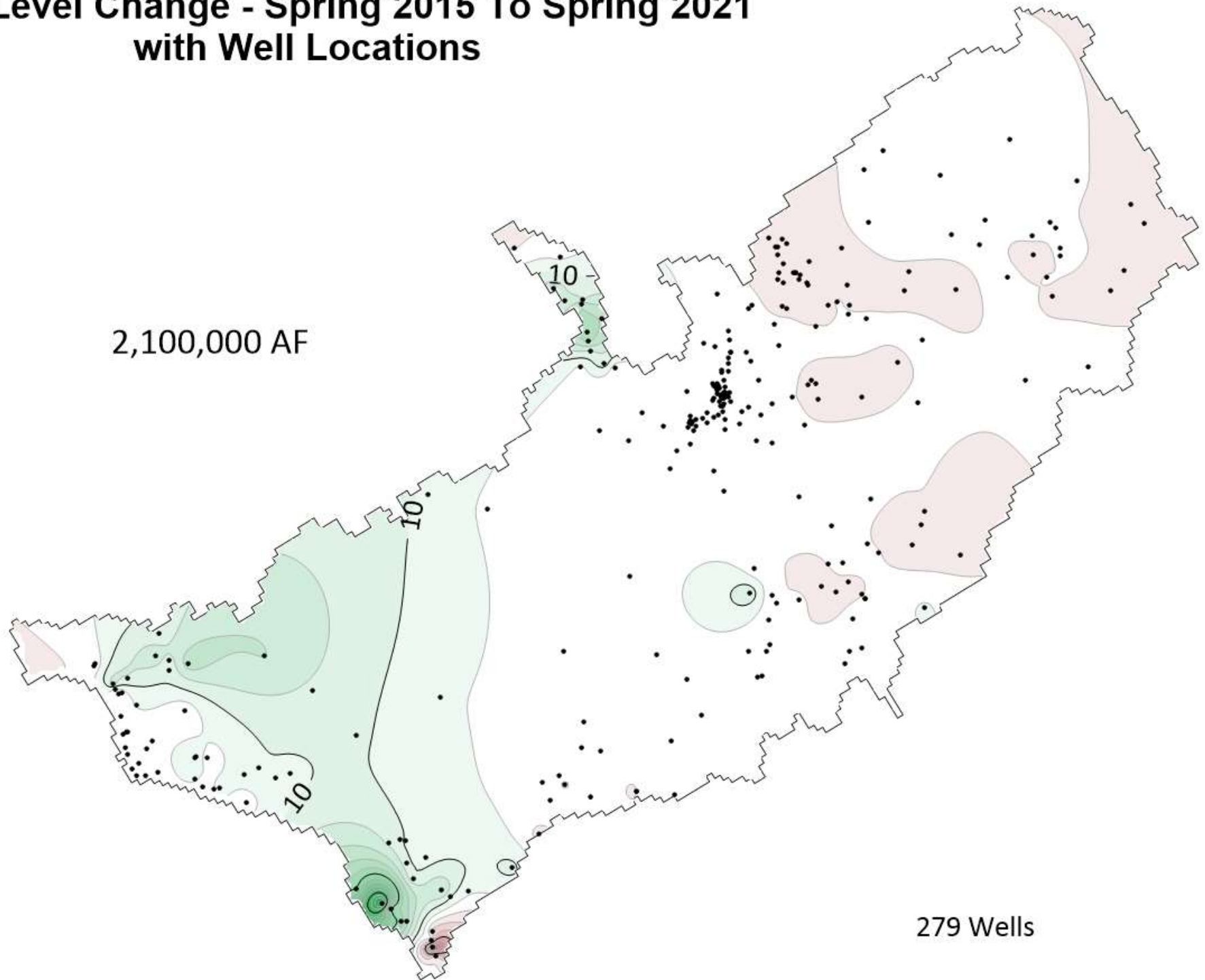
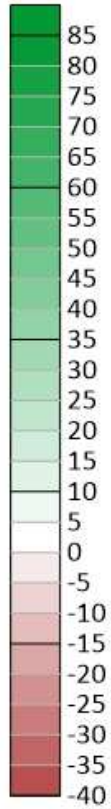
Water Level Change - Spring 2015 To Spring 2020 with Sentinel Well Locations

Water Level
Change (ft)



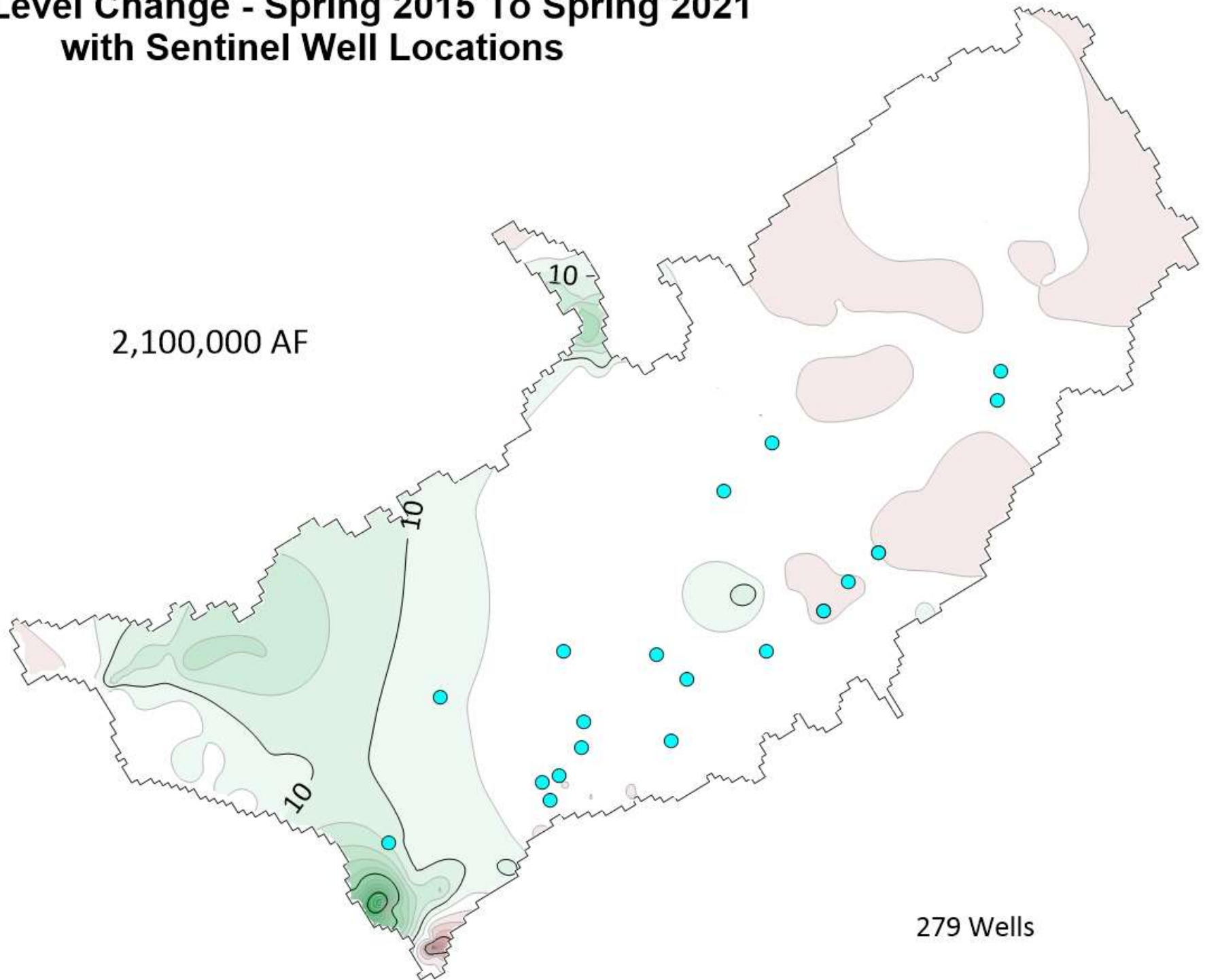
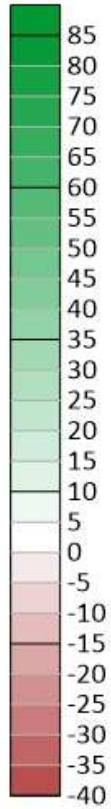
Water Level Change - Spring 2015 To Spring 2021 with Well Locations

Water Level
Change (ft)



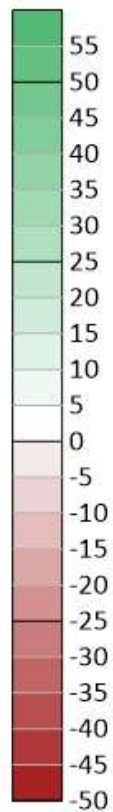
Water Level Change - Spring 2015 To Spring 2021 with Sentinel Well Locations

Water Level
Change (ft)

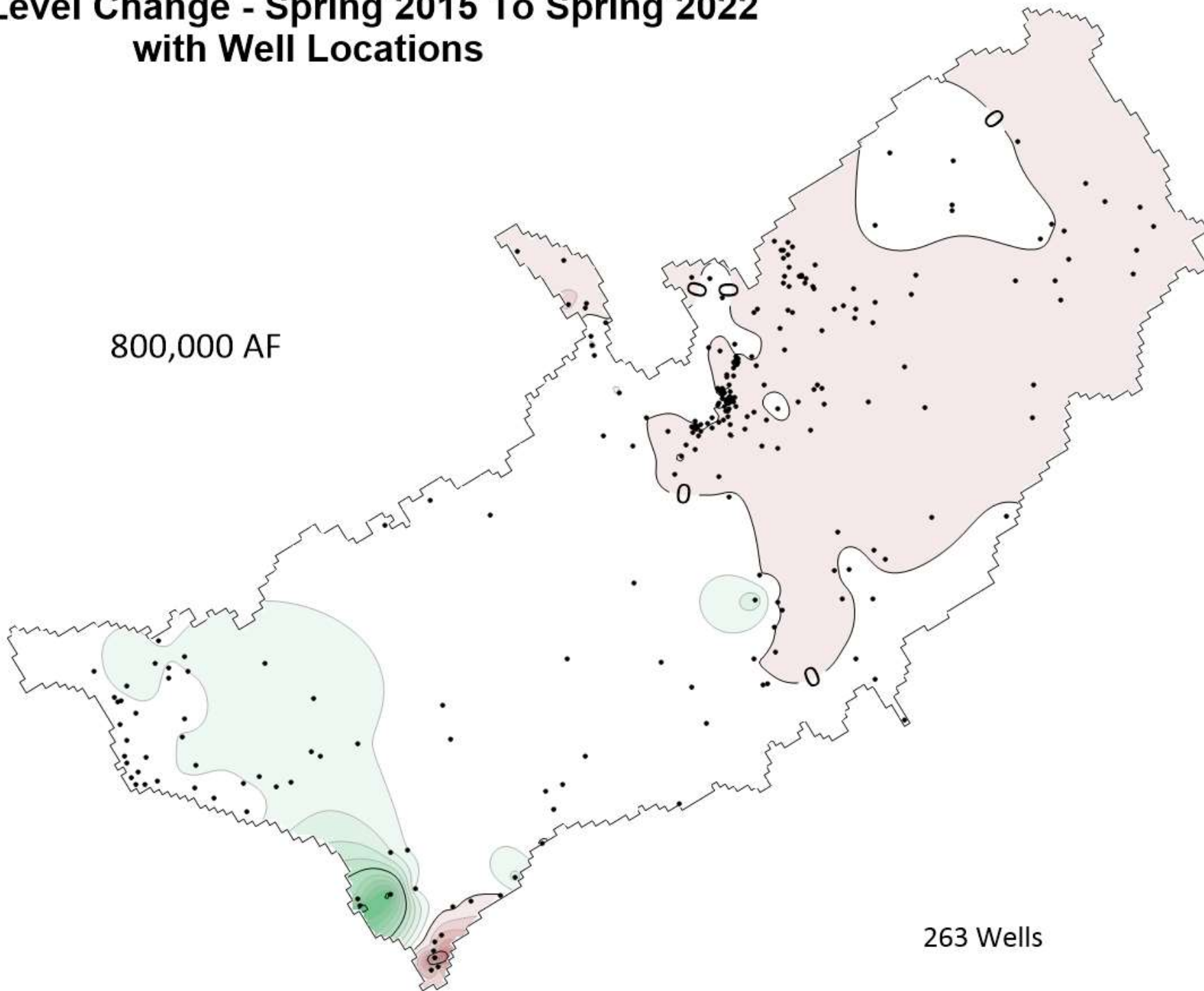


Water Level Change - Spring 2015 To Spring 2022 with Well Locations

Water Level
Change (ft)



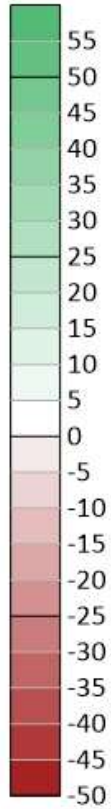
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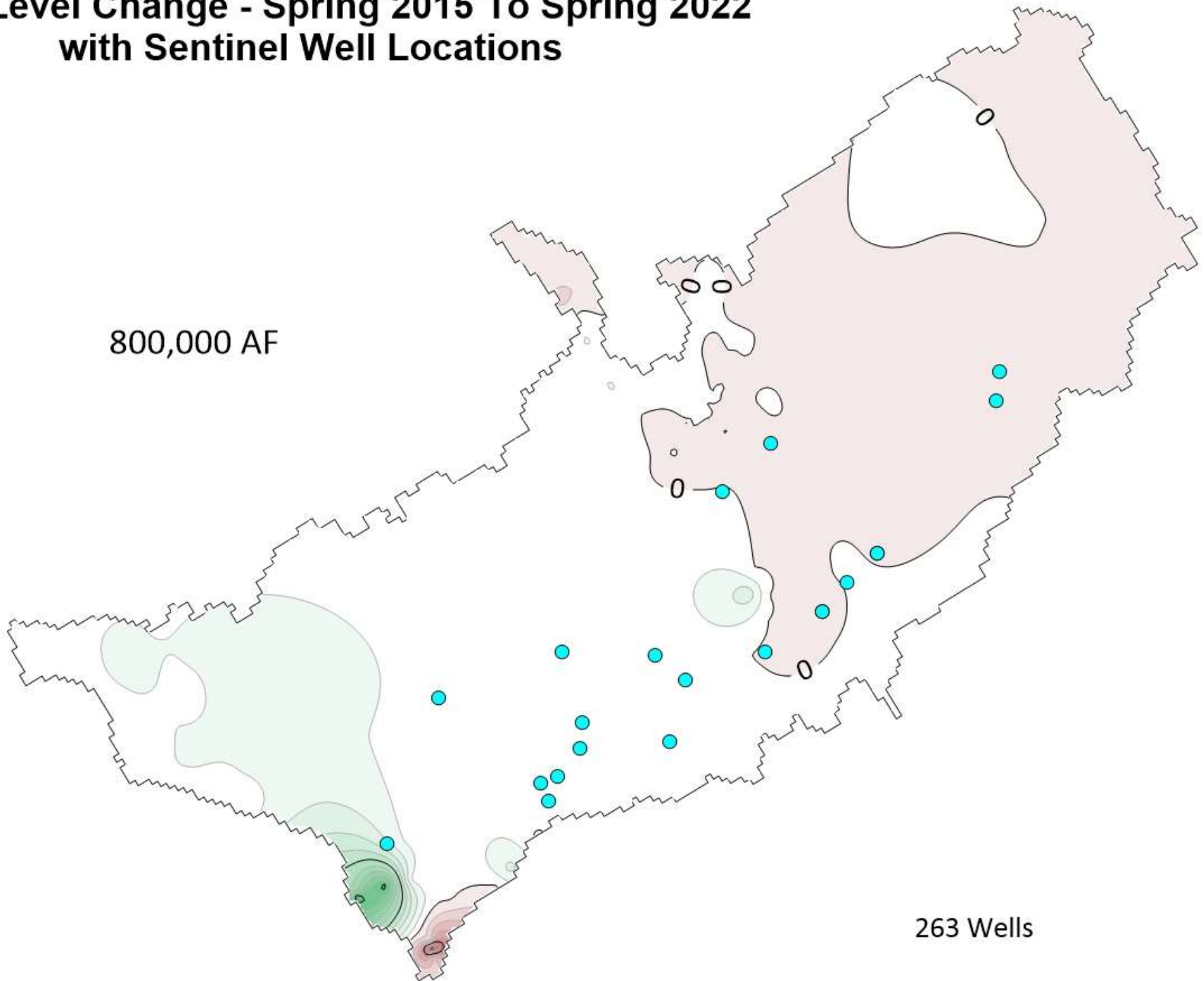
263 Wells

Water Level Change - Spring 2015 To Spring 2022 with Sentinel Well Locations

Water Level
Change (ft)



800,000 AF



263 Wells

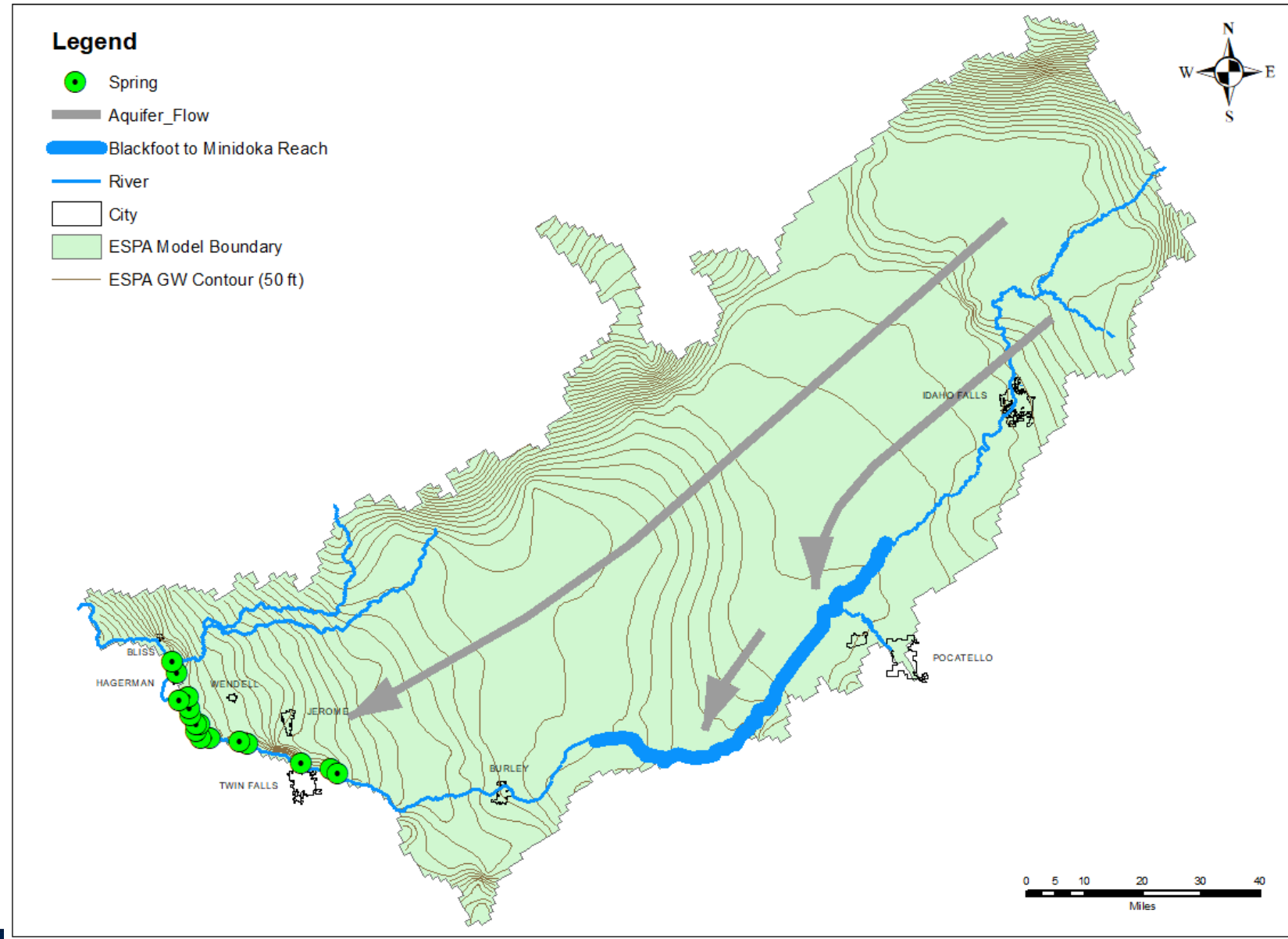


Eastern Snake Plain Aquifer Discharge

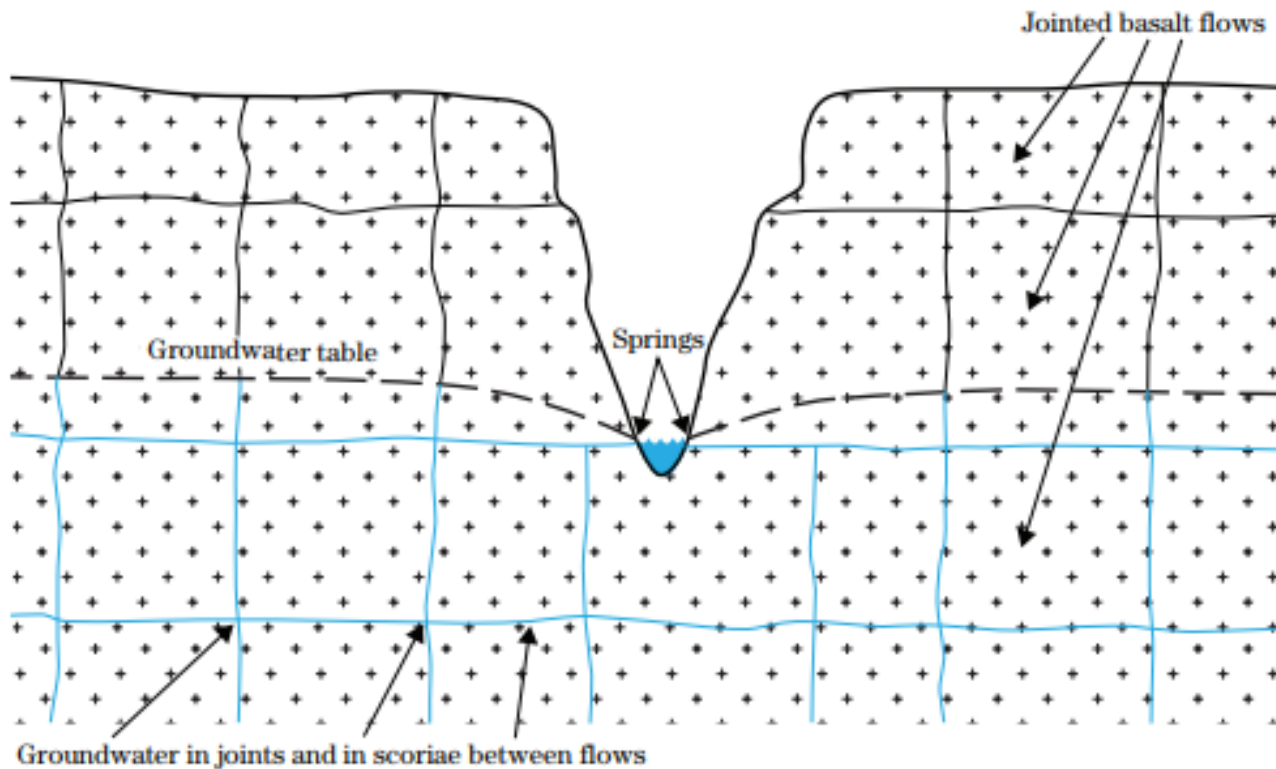
Presented by: Matt Anders

Date: 8/1/2022

Discharge from ESPA



Spring Discharge on ESPA



- Springs occur when the groundwater table intersects the land surface or canyon wall.
- Discharge from springs is controlled by the water level in the ESPA.
- Higher water levels in the aquifer increase discharge at springs, and vice versa.

Total Spring Discharge is Difficult to Measure



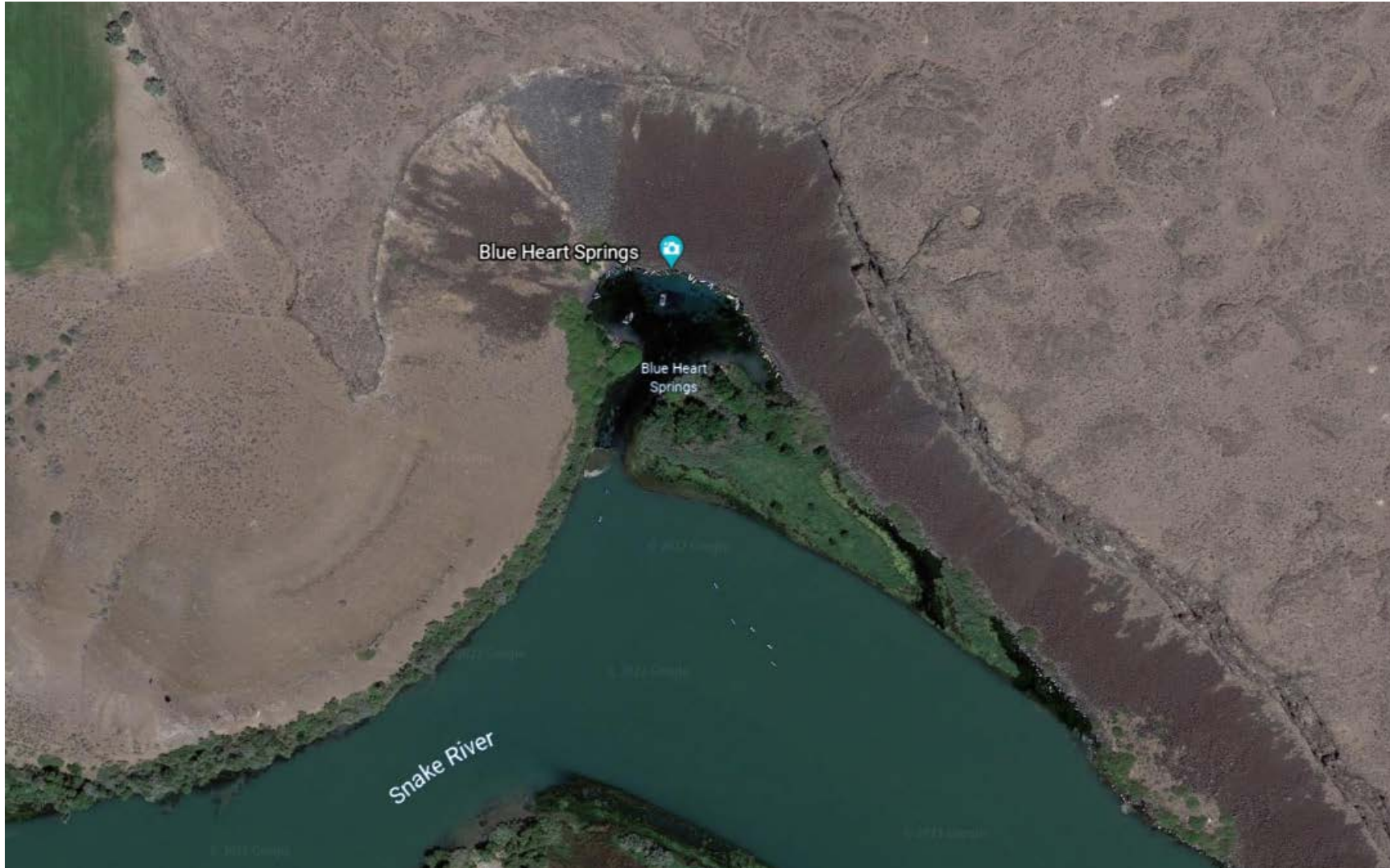
- Example 1: Easy to Measure
- Road access
- Flow becomes concentrated in a single channel.

Total Spring Discharge is Difficult to Measure



- Example 2: Harder to Measure
- Limited road access
- Brush in channel
- Possible seepage into hillside.

Total Spring Discharge is Difficult to Measure

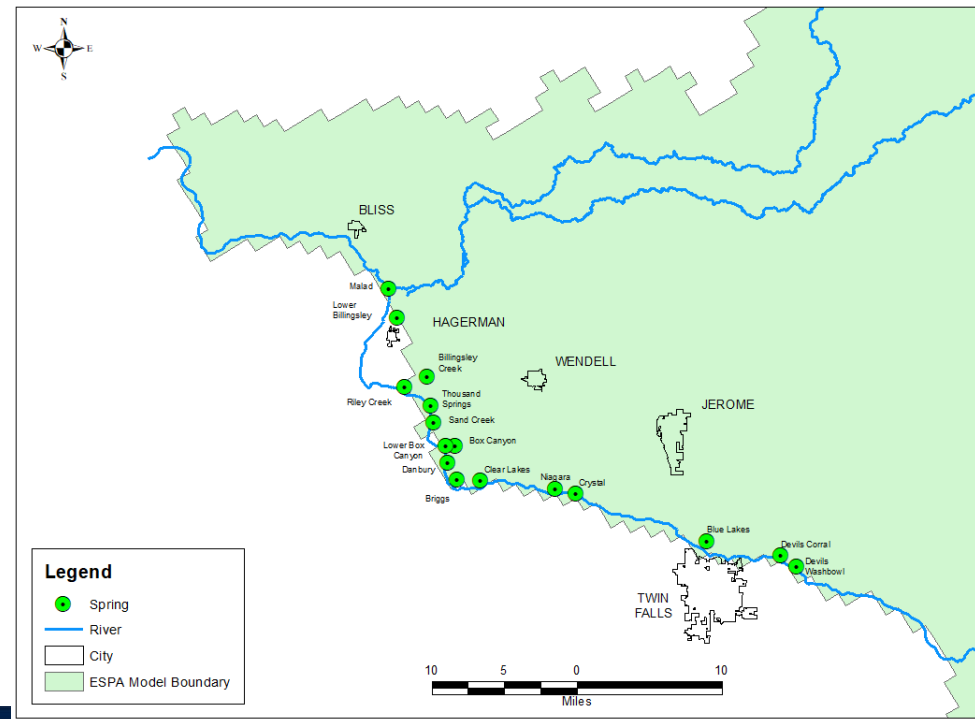


- Example 3: Hard to Measure and Unmeasurable
- River access
- Only measurable during low river flow.
- Possible discharge directly into Snake River.

Current Calculation Method

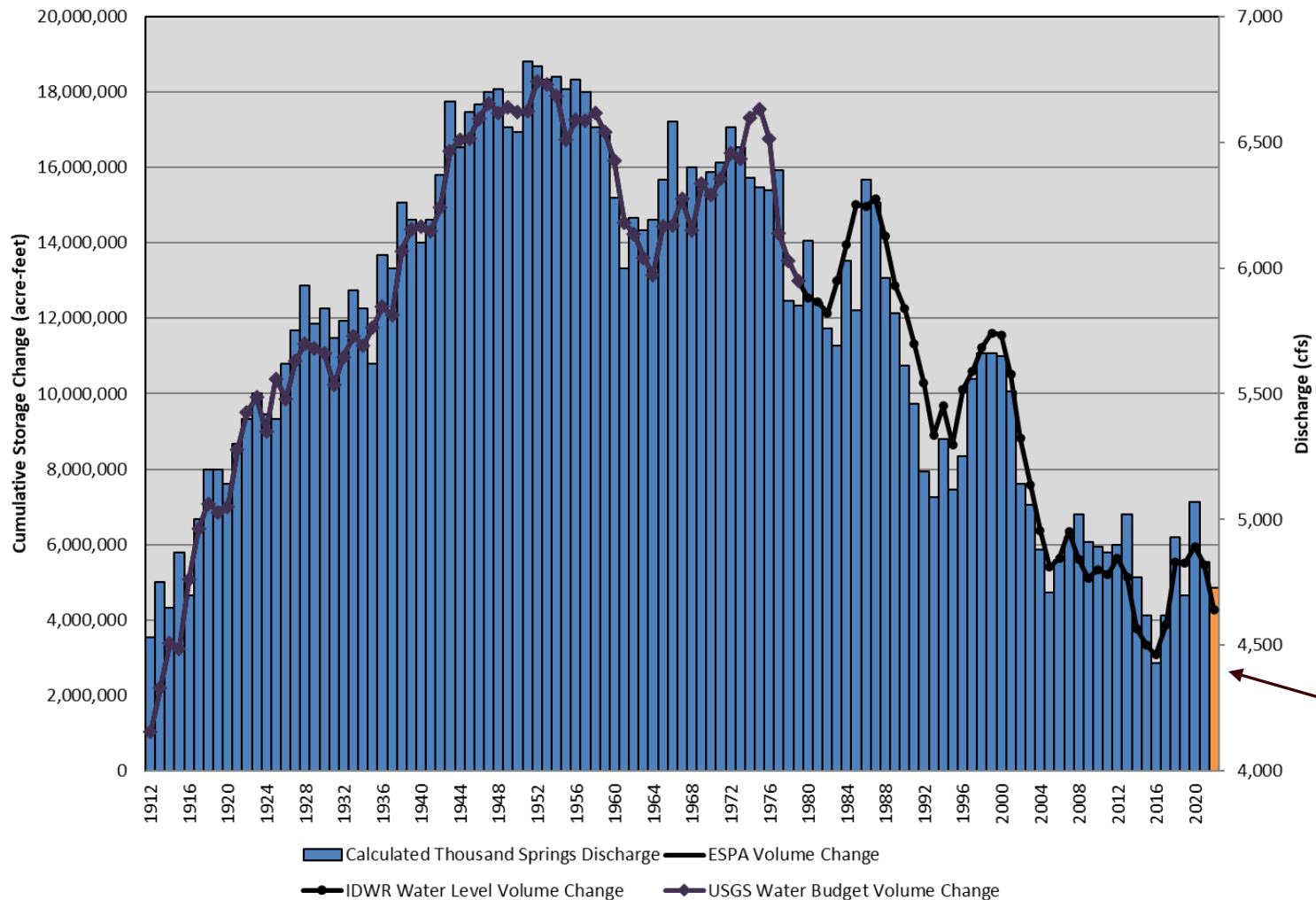
- The current method was developed in 1995 (Kjelstrom) using data available at that time.
- $$\text{Total Spring Discharge} = \text{Actual Measurements} + \text{Statistical Estimates}$$

17 springs in March-April (Measurable) (Unmeasurable)



Spring Discharge – 1912 to 2022

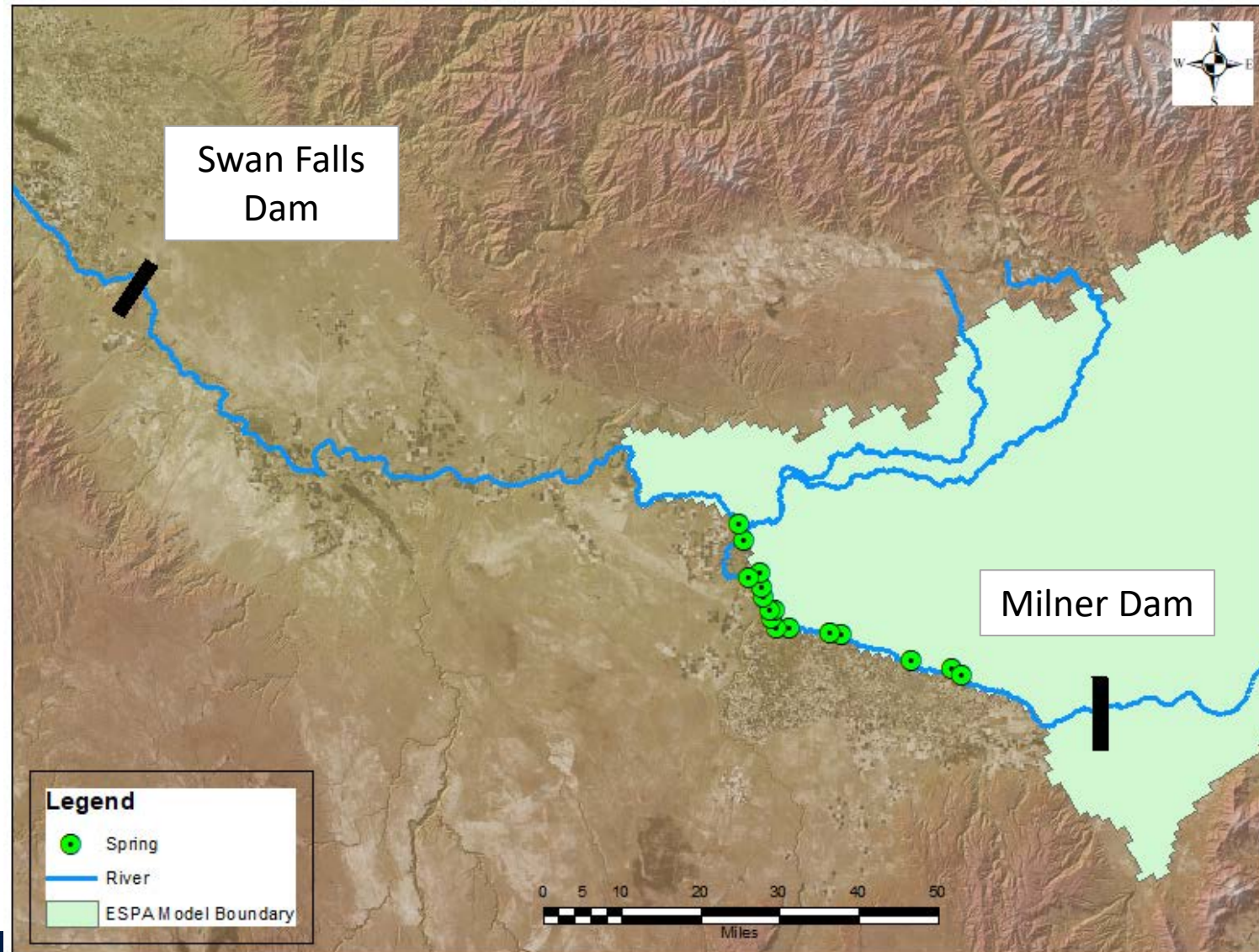
ESPA Change in Volume of Water and Thousand Springs Discharge



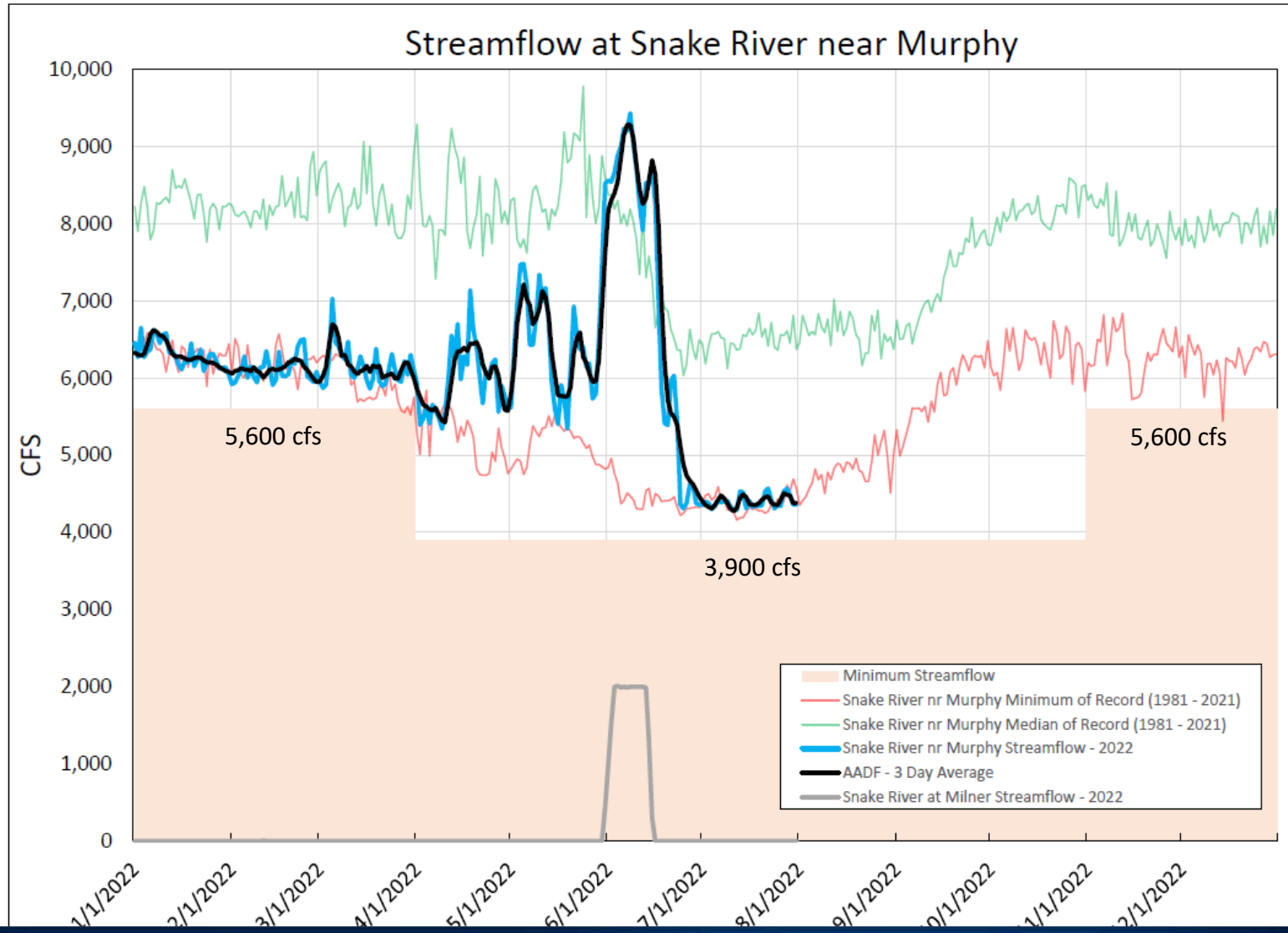
- Blue bars are the calculated discharge from Thousand Springs.
- Spring discharge is an indicator of water storage in the ESPA.

2022 value is
preliminary

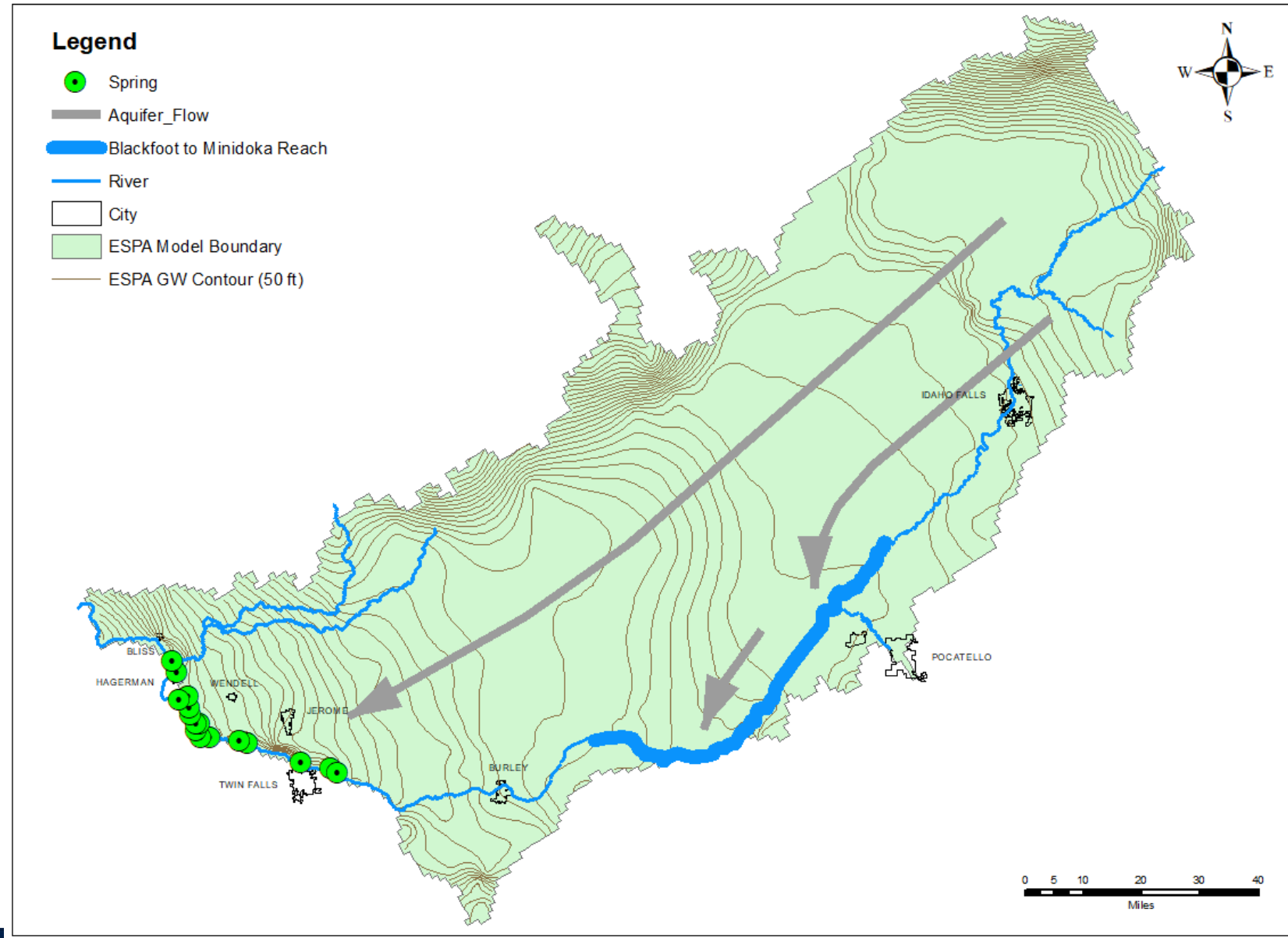
Spring Discharge – Murphy Gage



Murphy Gage – Adjusted Average Daily Flow (AADF)



Near Blackfoot- Minidoka Reach Gains



Reach Gains

- The gain or loss of water between the beginning and end of a river reach.
- $\text{Reach Gain} = \text{Outflow} - \text{Inflow} + \text{Diversions} + \text{Reservoir Change in Content} + \text{Reservoir Evaporation} - \text{Return Flow}$

Outflow is the river discharge at the end of the river reach.

Inflow is the river discharge at the beginning of the river reach.

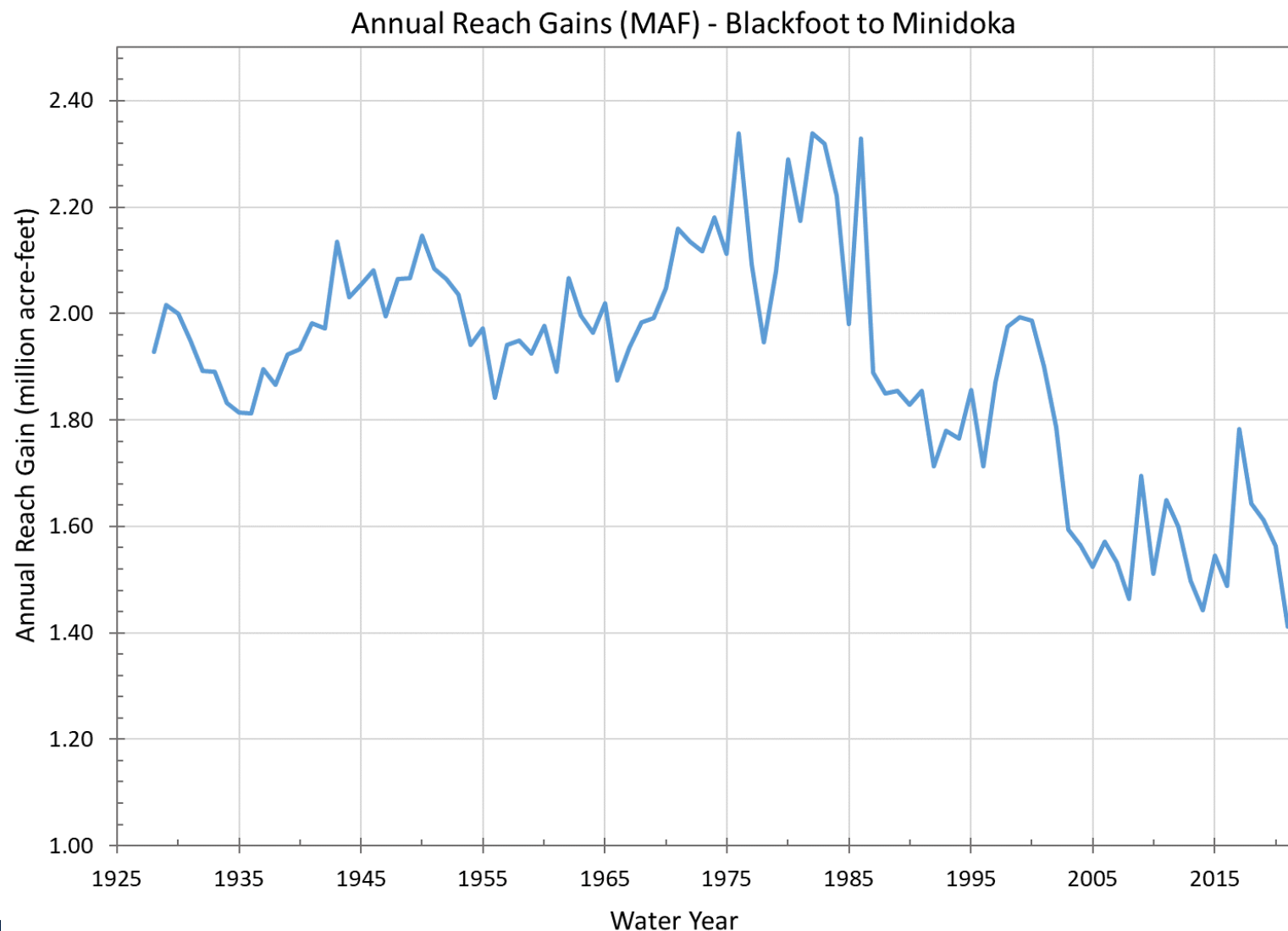
Diversions is the sum of canal and pump diversions from the river reach.

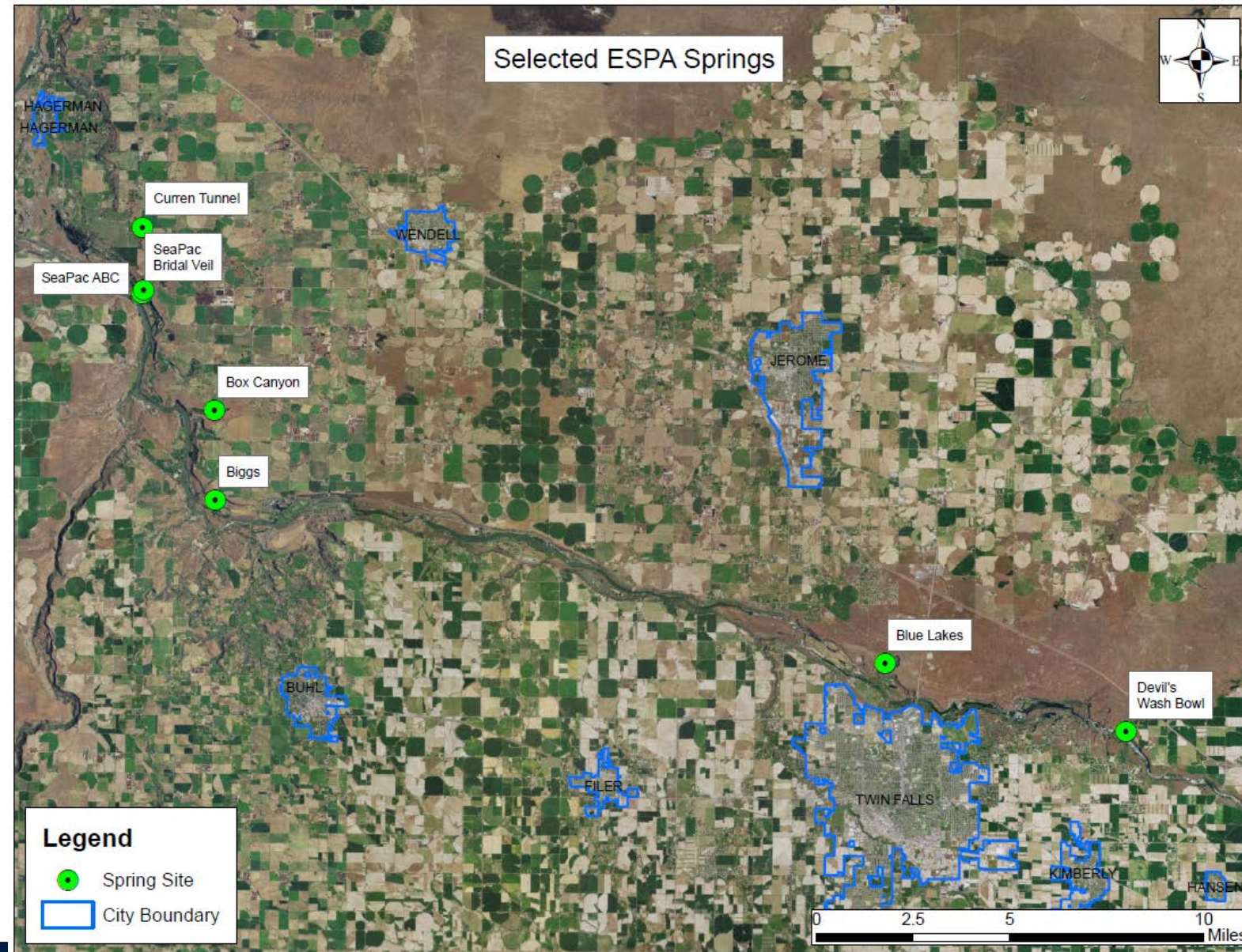
Reservoir Change in Content is the daily increase or decrease in physical content of any reservoirs within the river reach.

Reservoir Evaporation is the calculated evaporative losses from the reservoir.

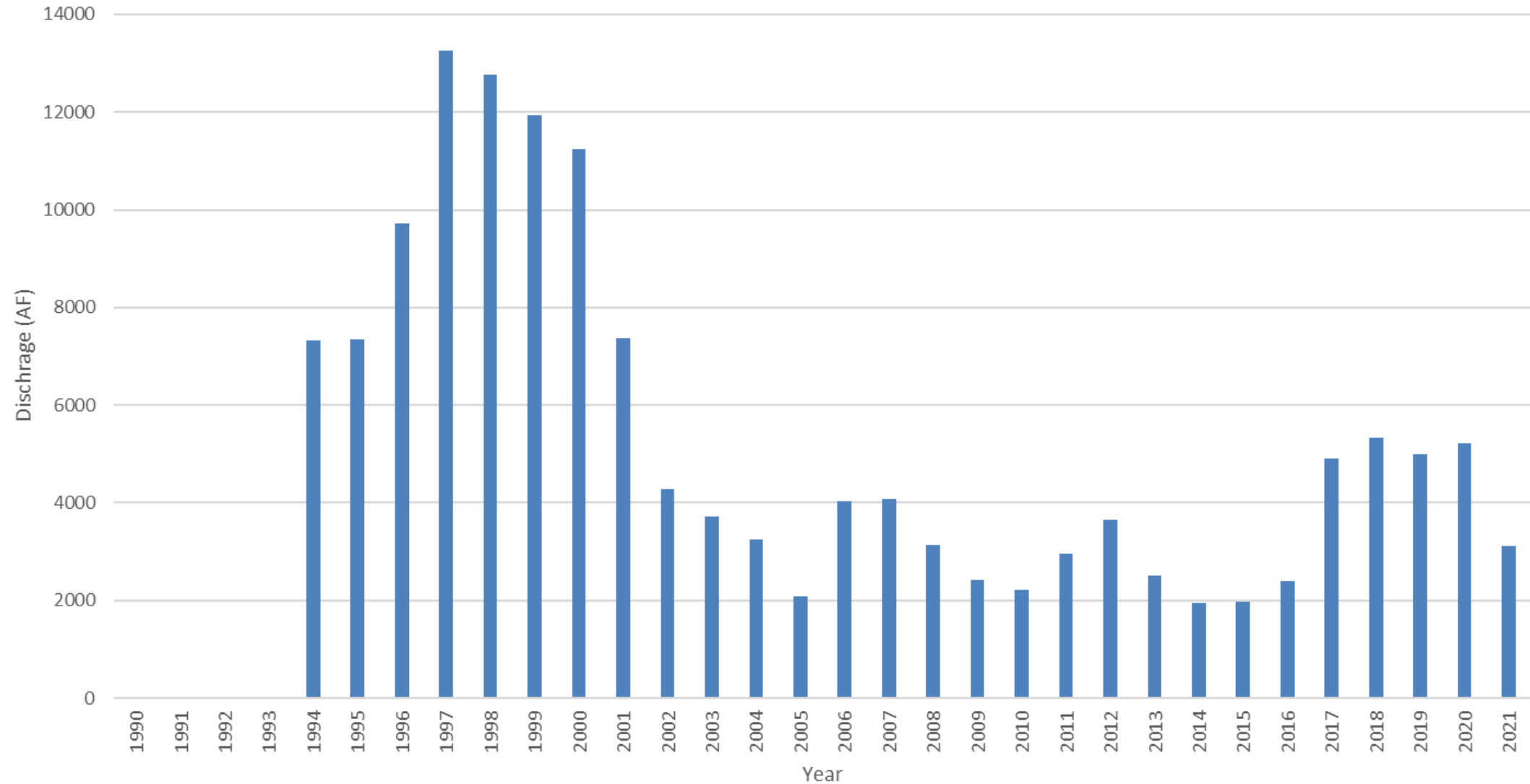
Return Flow is the unused irrigation diversion returning to the river.

Near Blackfoot to Minidoka Reach Gains – 1928 to 2021

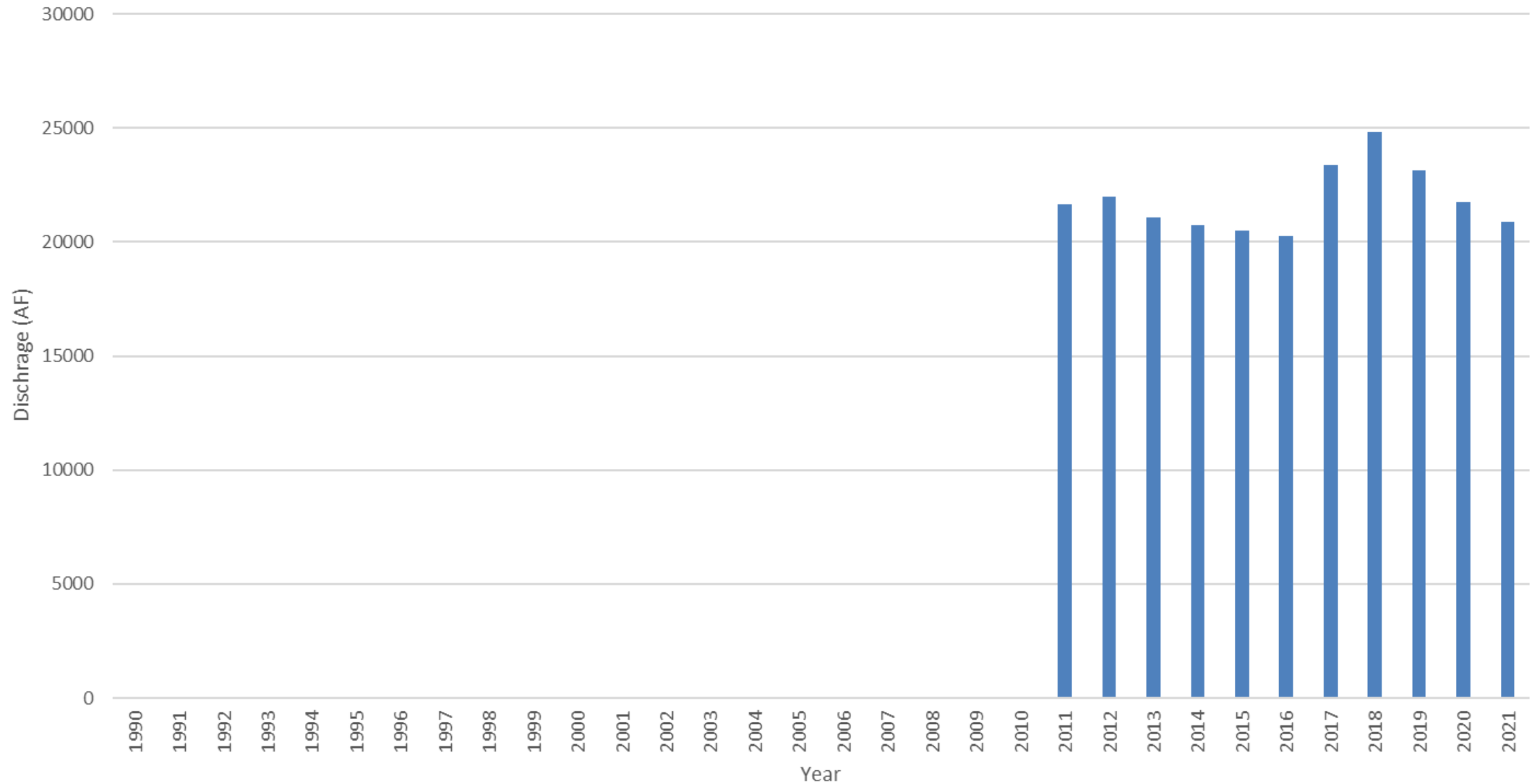




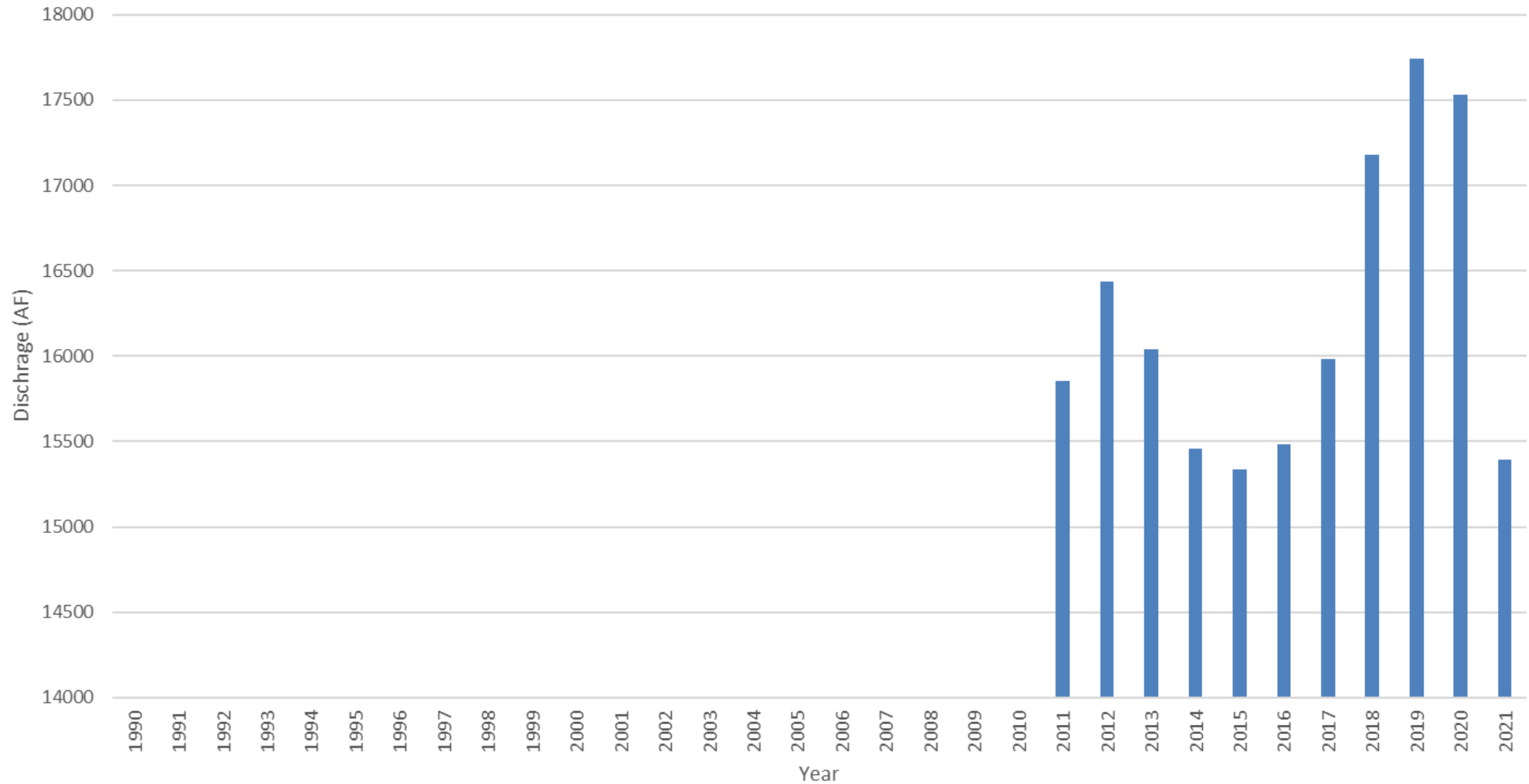
Current Tunnel - Total Discharge



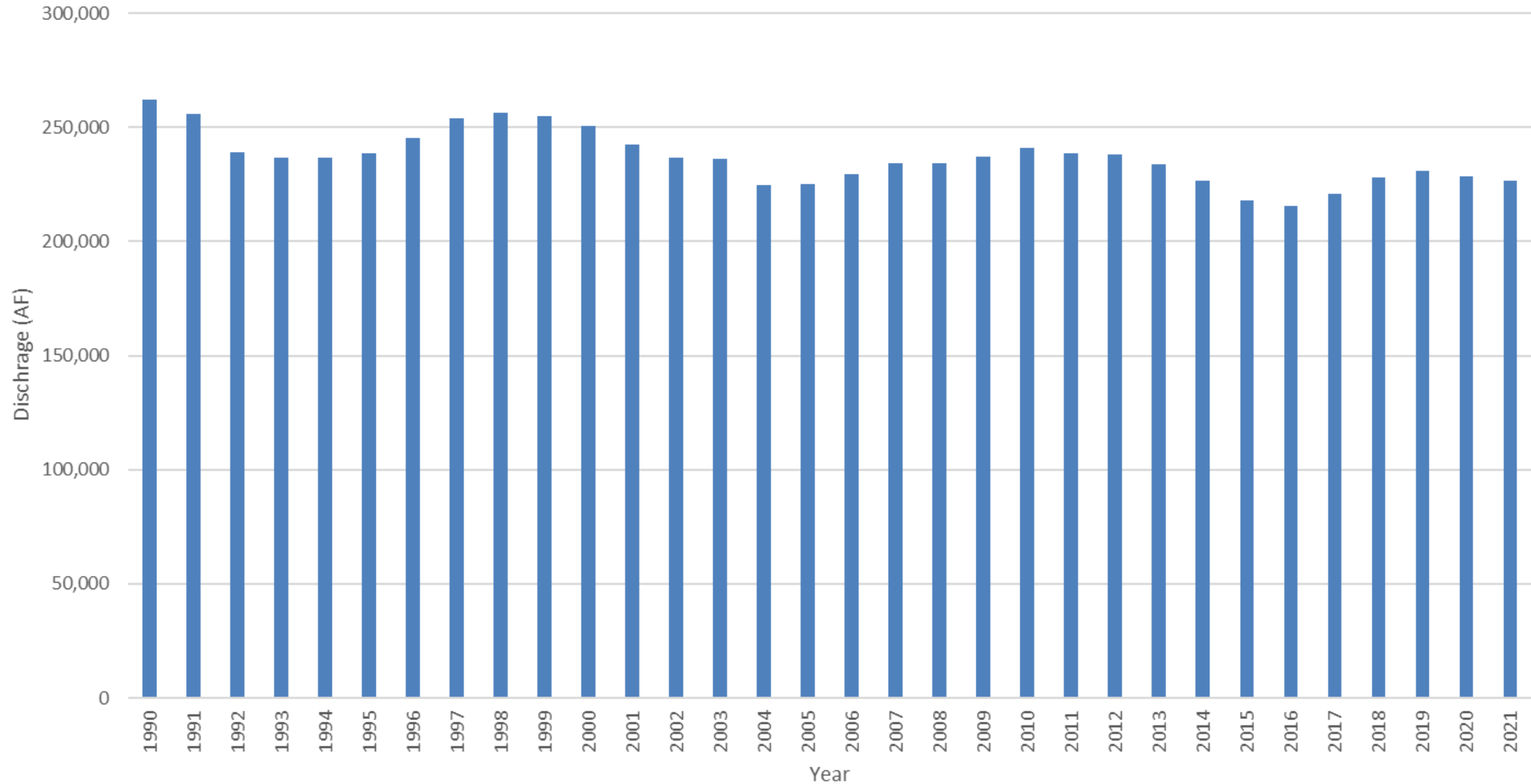
SeaPac Bridal Veil - Total Discharge



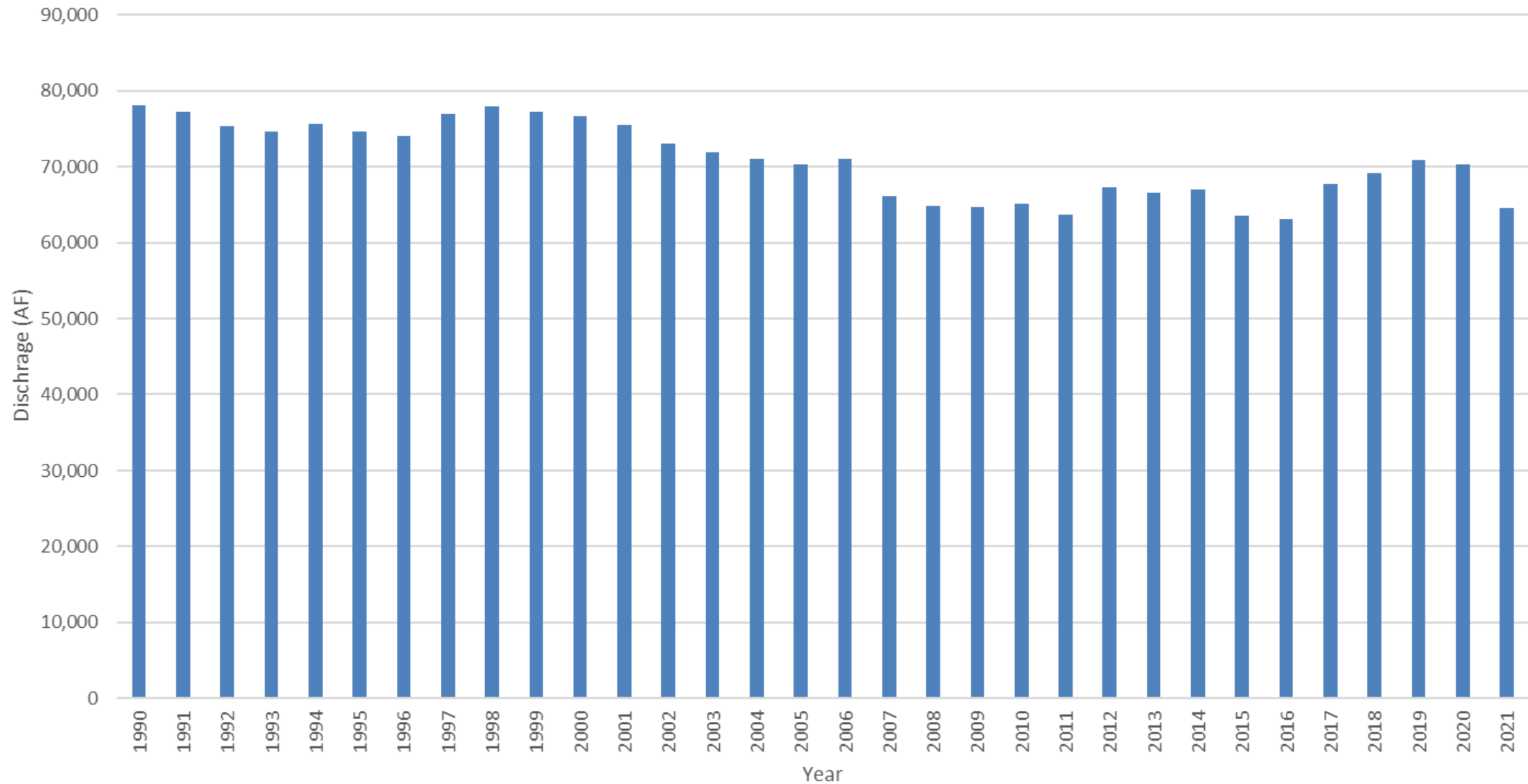
SeaPac ABC - Total Discharge



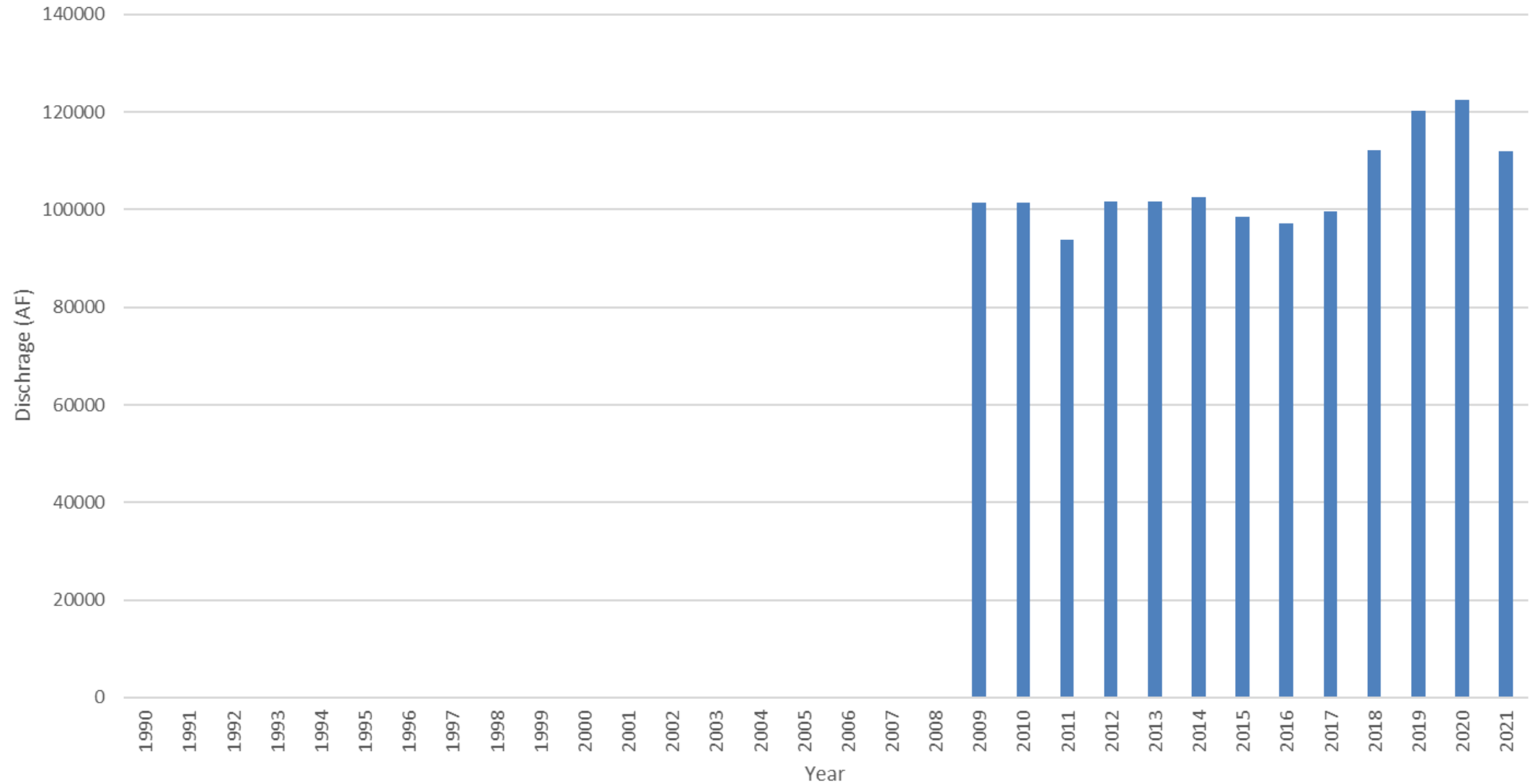
Box Canyon - Total Discharge



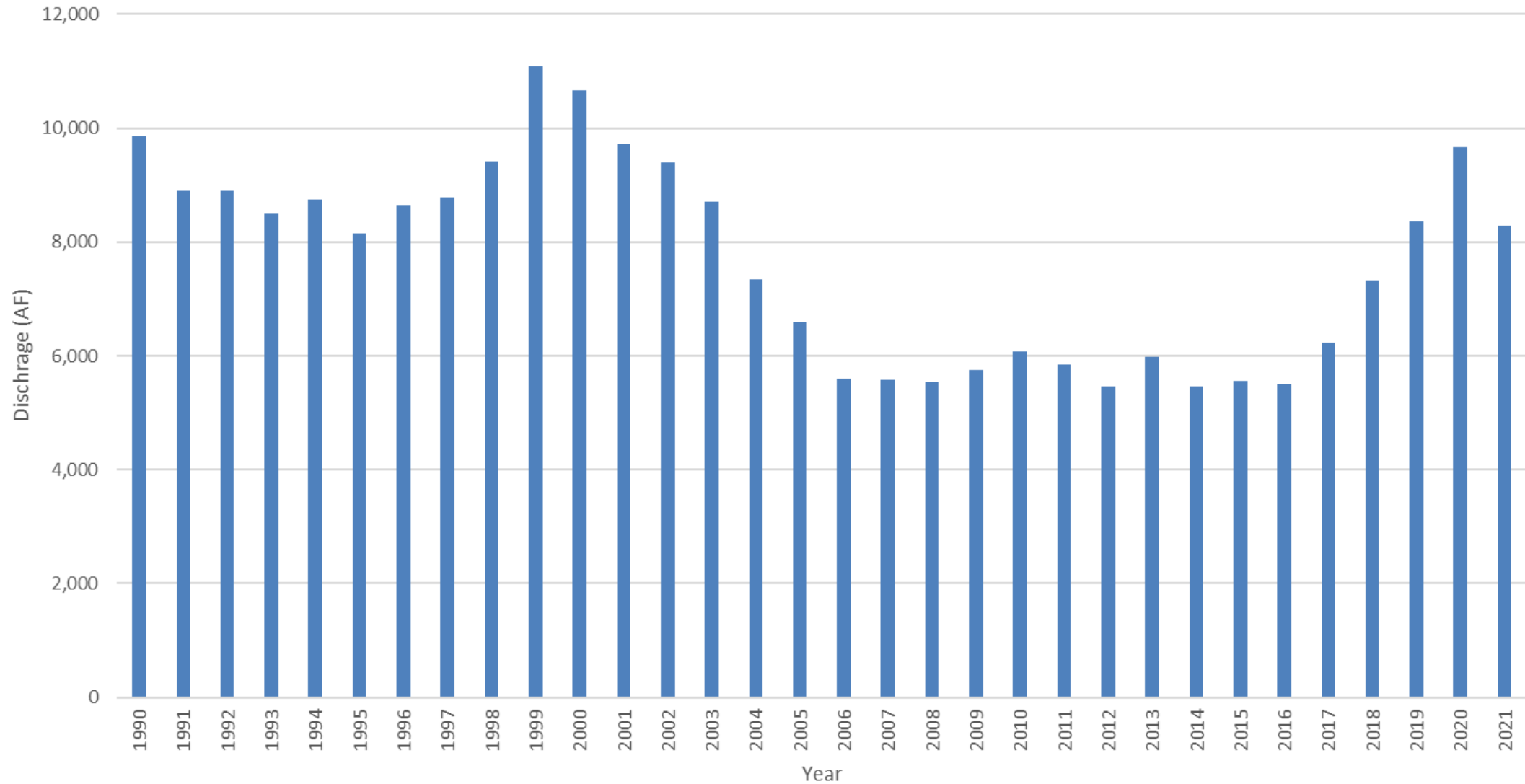
Briggs Spring - Total Discharge



Blue Lakes - Total Discharge

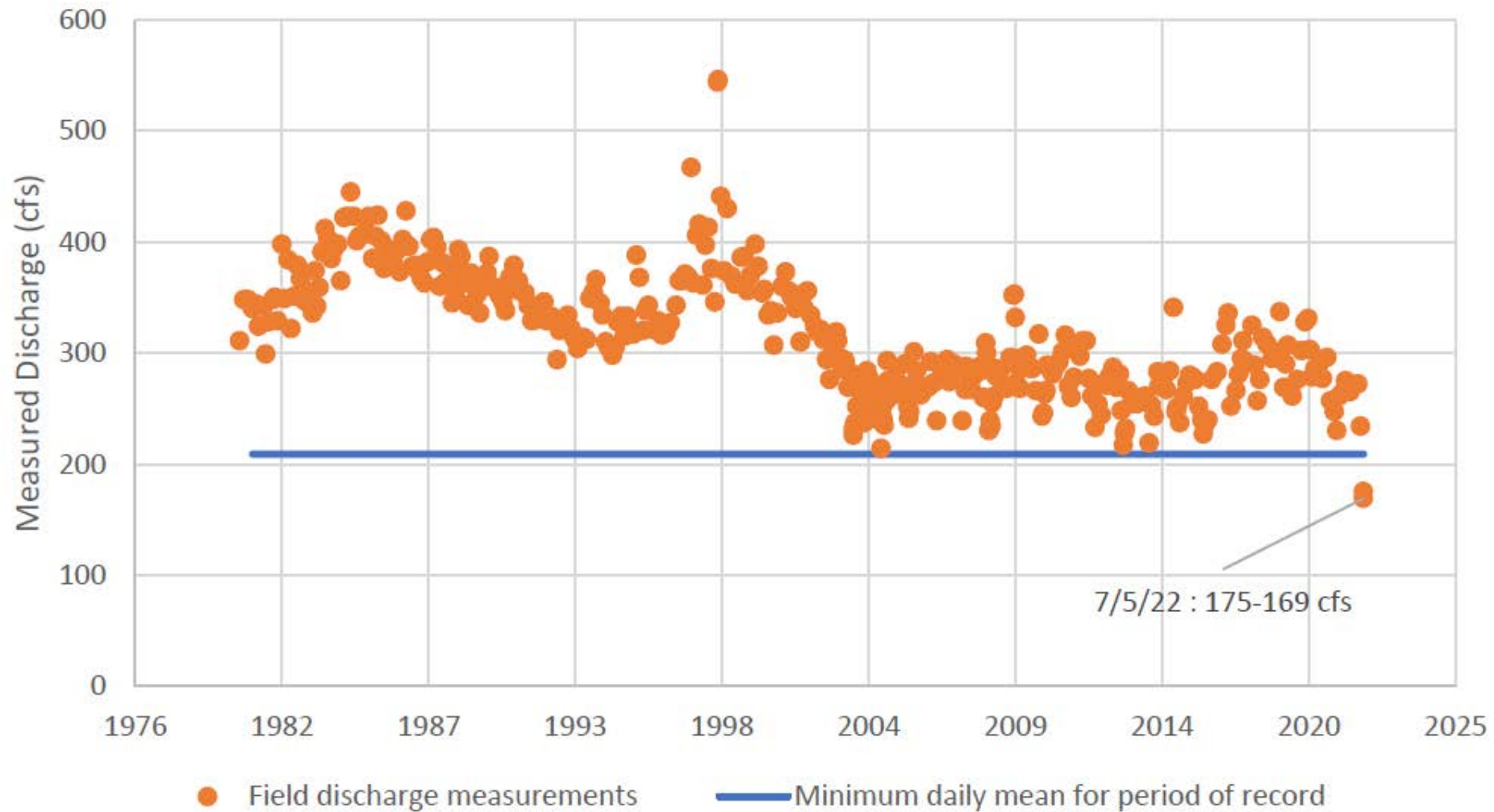


Devils Washbowl - Total Discharge



Questions

Spring Creek at Sheepskin Rd nr Fort Hall ID





Modeling Aquifer Management on the ESPA

Alex Moody, P.G.

Presented August 1, 2022



I

01

Visualizing water level change

How are aquifer levels changing across the
ESPA and what is causing those changes?

02

Quantifying aquifer recovery

What does the model show about management's
impacts on the aquifer and river?

I

01

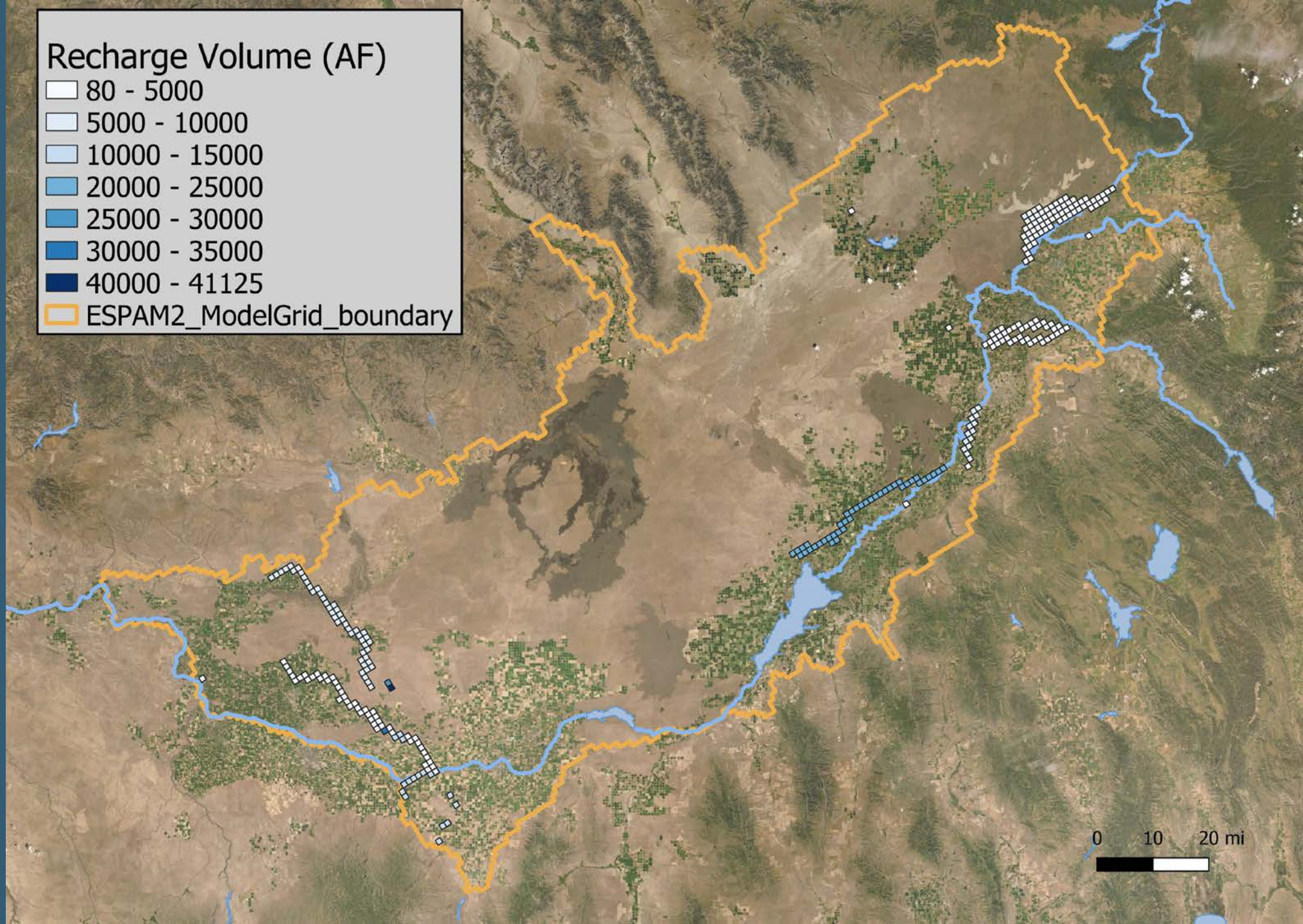
Visualizing water level change

Lower valley
aquifer levels
remain
elevated
relative to
spring 2016

South Fork
area showing
annual
fluctuations
in 2021 and
2022



2021 recharge
on the ESPAM
model grid



Board recharge
has increased
levels in the
lower valley.

Level increases
continue to
progress up-
valley



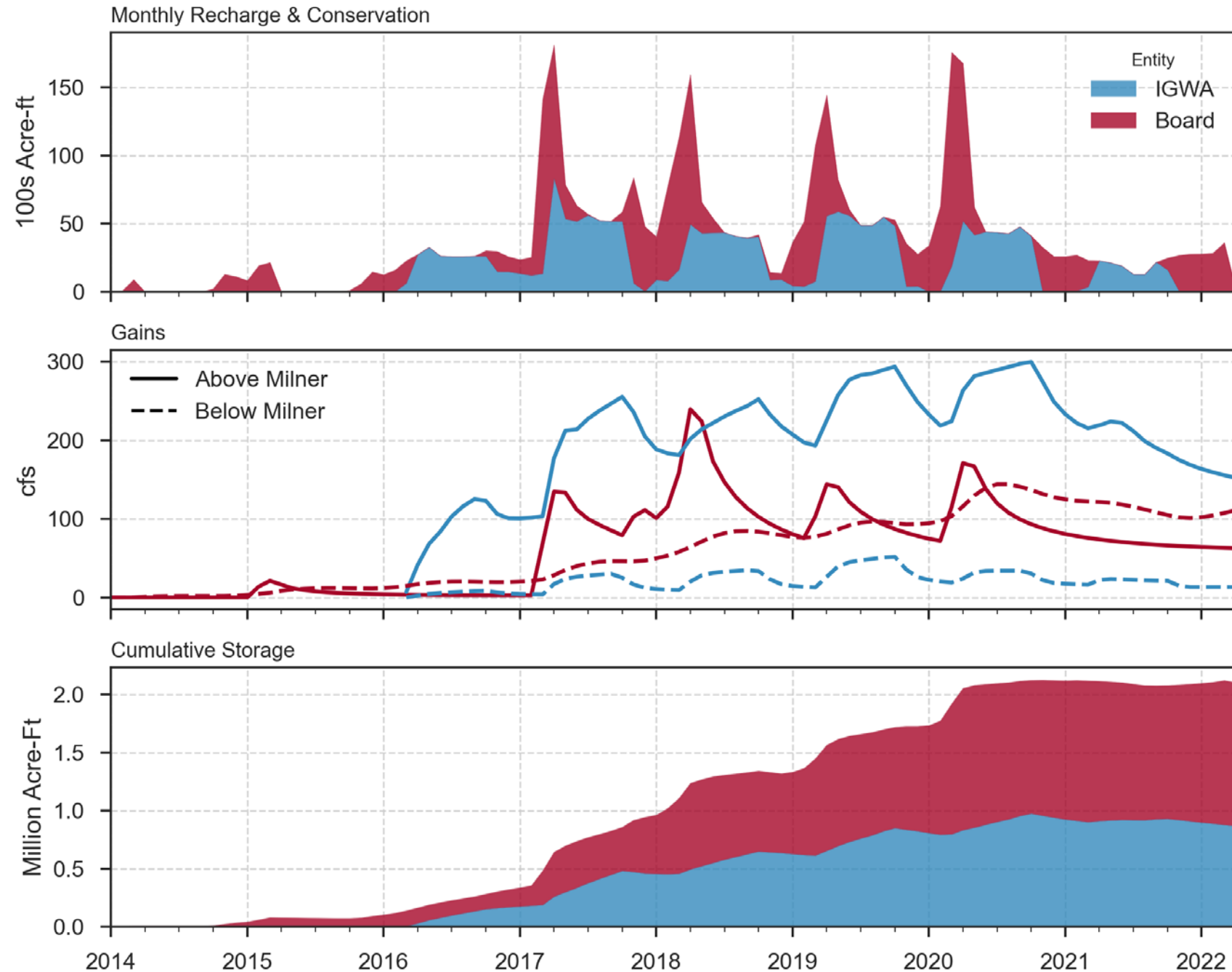
IGWA impacts
widespread
across ESPA
with smaller
level changes

02

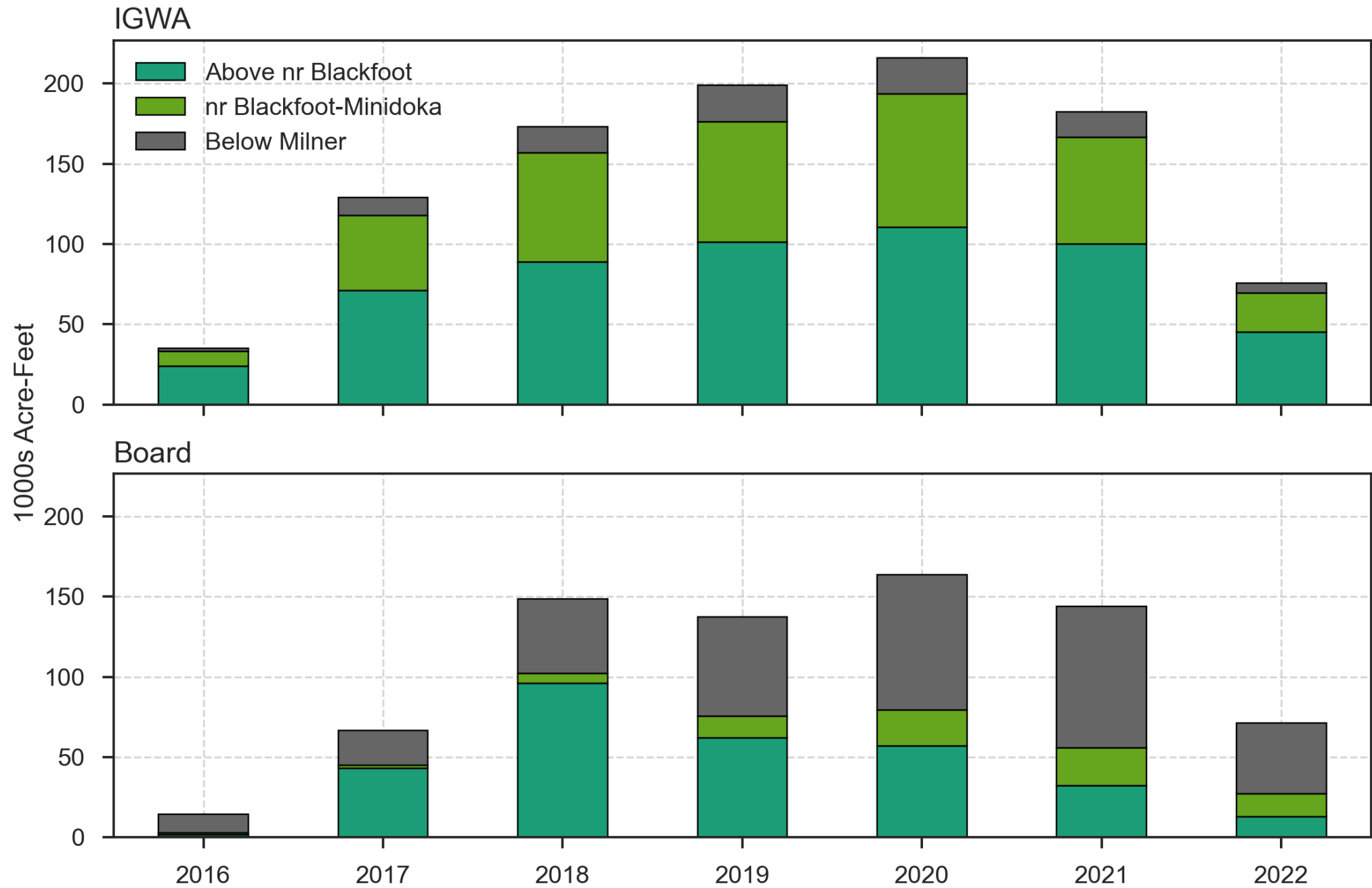
Quantifying aquifer recovery

Aquifer Recharge and Discharge

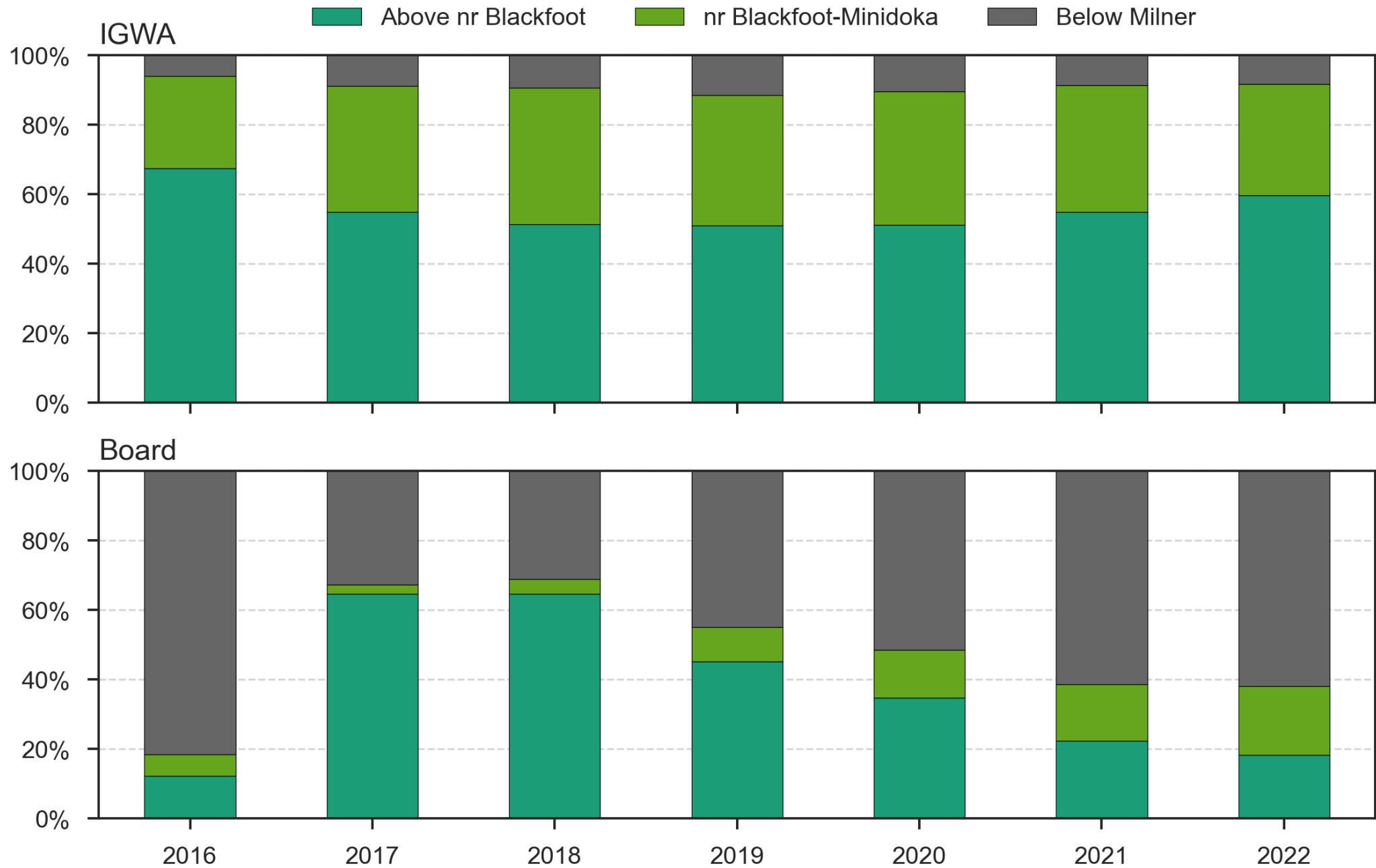
- Aquifer management efforts vary in timing and spatial impact
- Gains increased until 2021 and have generally declined after 2021
- Cumulative storage remained steady during decline in river gains.



Water-Year Reach Gains

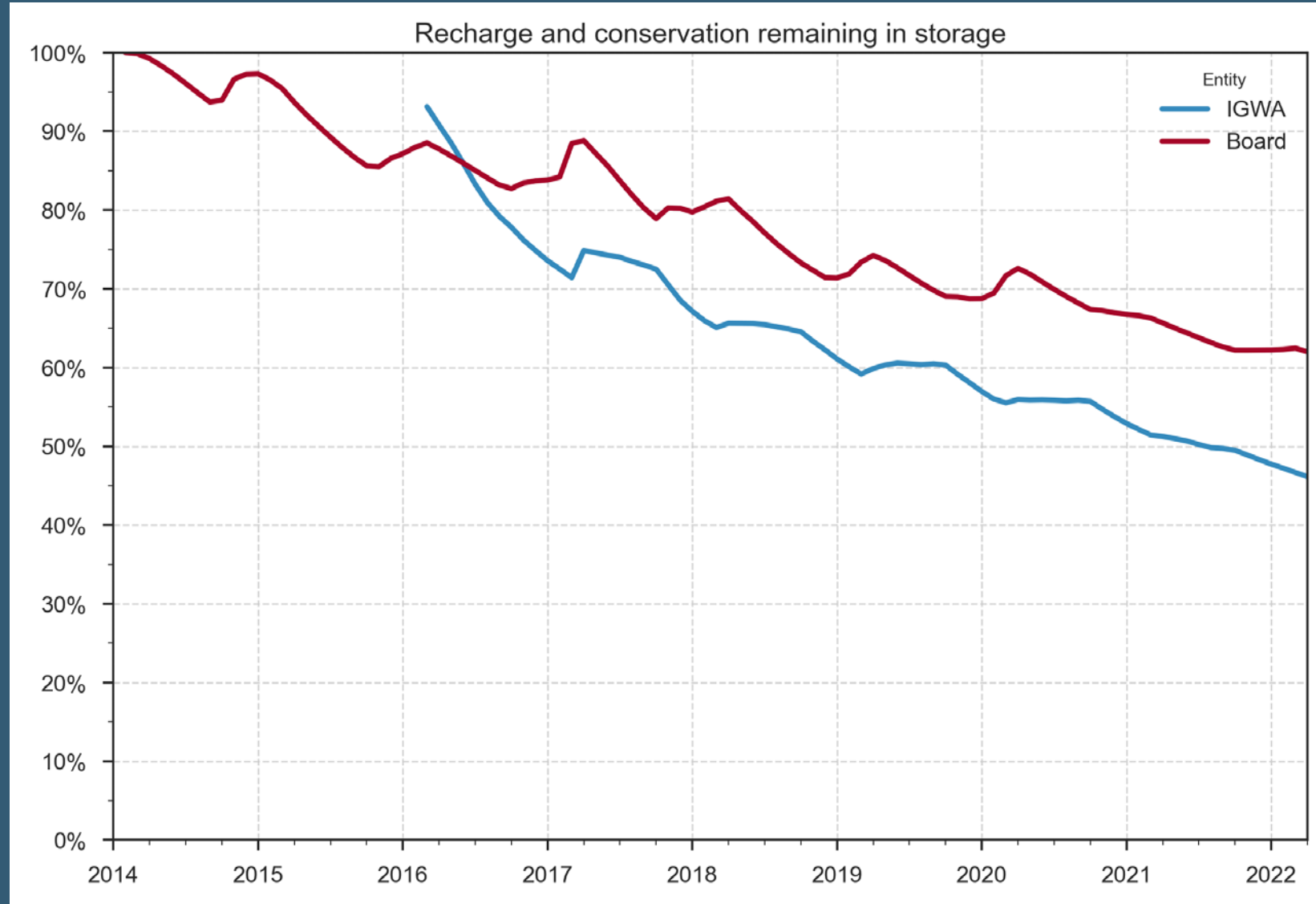


Percent of water-year reach gains

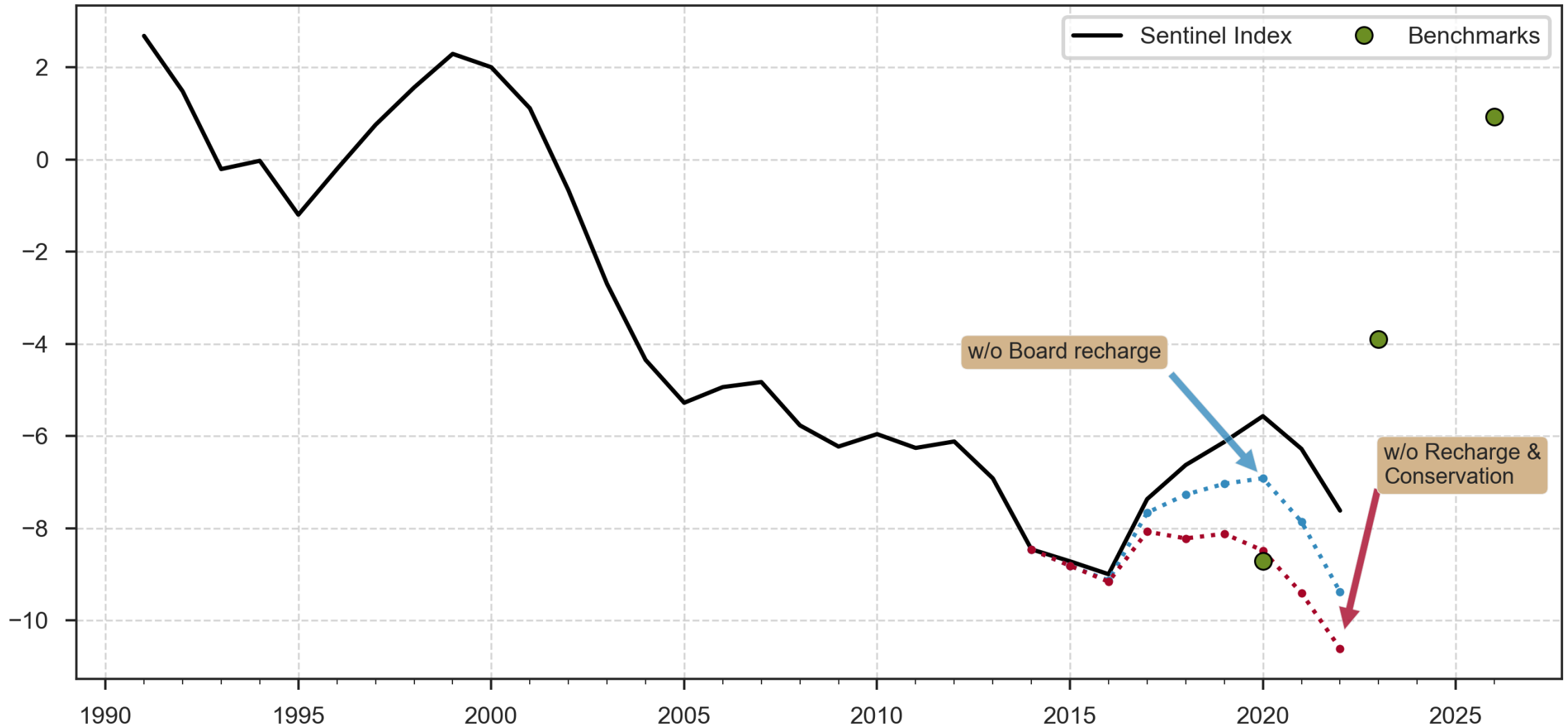


Some perspective

- A majority of recharged and conserved water remains in storage.



Sentinel Well Index



- Sentinel well index approximately 3 feet higher with recharge and conservation

Takeaways



50 – 60% of recharged and conserved water remains in storage



Aquifer recovery will take decades to accomplish



Sentinel well index is higher due to aquifer management

Thank you

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208-287-4849

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ESPA Settlement Agreements: 2021 Activities

Brian Ragan

August 1, 2022



OUTLINE

1. Signatory Cities: 2021 Annual Progress Report
 - 2019-2023: work towards average annual mitigation of 7,650 acre feet
 - 2024 and beyond: maintain 5-year rolling average of at least 7,650 acre feet
2. IGWA: 2021 Annual Progress Report
 - 240,000 acre feet annual reduction in ground water diversion
3. Sentinel Well 2022 Ground Water Level Index

City Settlement Agreement

2021 Annual Recharge
7,247.4 af

Source of Recharge Water	Recharge Location	Recharge Date	Is location authorized? Does location meet Agreement criteria?	2021 Recharge Amount (acre-feet)
City of Pocatello's Palisades Reservoir Storage	NA: Direct delivery to Twin Falls Canal Company	-	Yes. See First Addendum to Agreement.	5,495.8
Source 1. Lease from City of Pocatello (1350 acre-feet)	Sand Creek Site	5/10 - 9/4	Yes. ESPAM2.1 modeled 5-year retention of 17.8% (row 77, columns 160 and 161)	1,392.0
Source 3. Lease from Common Pool (42 AF)	Near Gem lake	?	Yes. ESPAM2.1 modeled 5-year retention of 21% (row 74, columns 156)	
Rexburg Teton River surface water rights 22-203 and 22-204C	Walters Pond	4/27 - 9/8	Yes. ESPAM2.1 modeled 5-year retention of 44.3% (row 77, column 183)	359.6

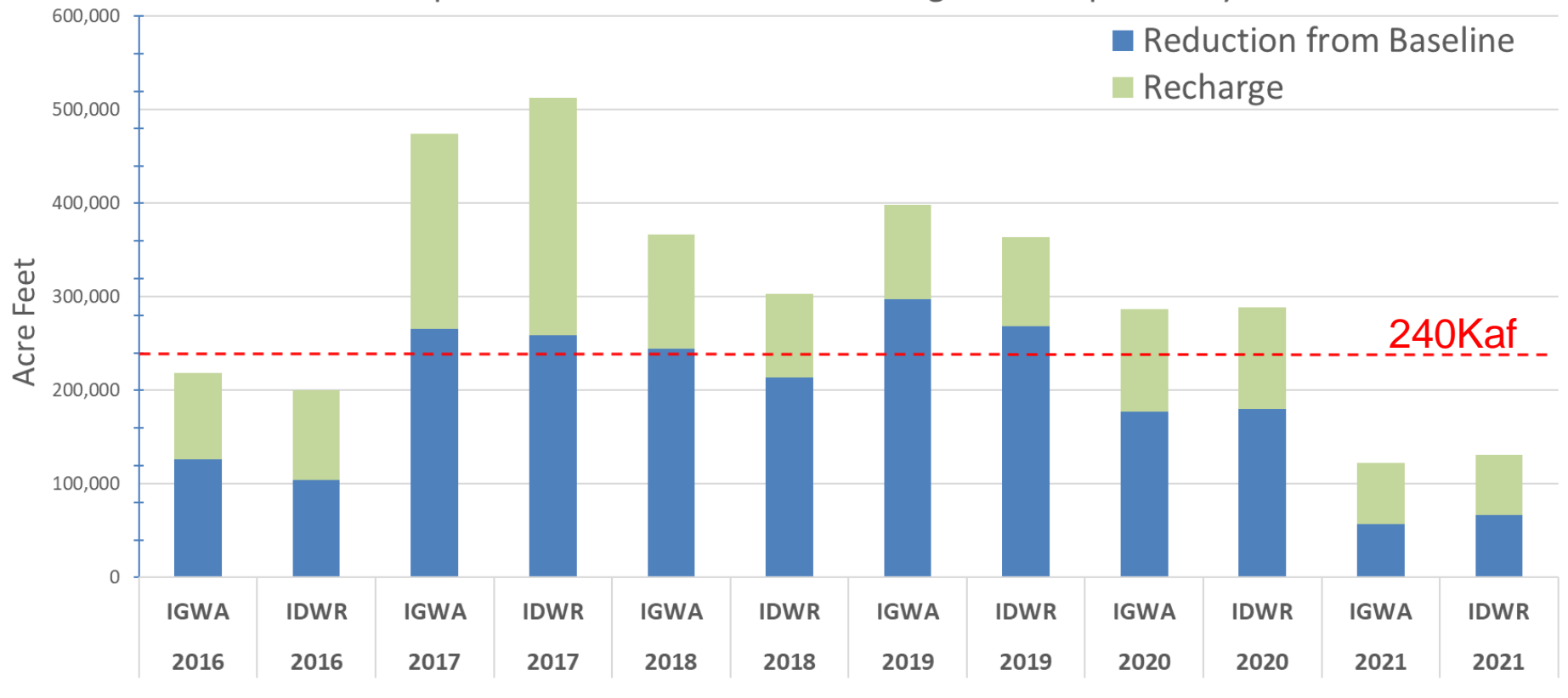
Average Annual Recharge
7,743.5 af

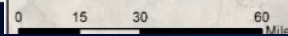
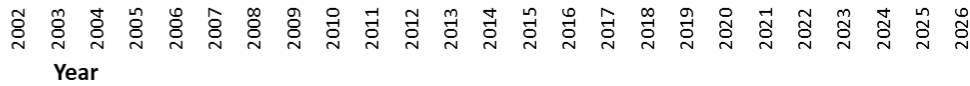
	2019	2020	2021	2022	2023	Five Year Average
Total City Recharge Amount (acre-feet)	8,169.4	7,813.8	7,247.4			7,743.5

IGWA 2021 Progress Report

	IGWA (acre feet)	IDWR (acre feet)	IDWR relative to IGWA
5-Year Baseline	1,787,604	1,780,267	-0.4%
	-		
2021 Usage (AF)	1,730,652	1,713,681	-1.0%
	=		
2021 Reduction (AF)	56,953	66,586	16.9%
	+		
2021 Recharge (AF)	65,831	64,317	-2.3%
	=		
Total Conservation (AF)	122,784	130,903	6.6%

Annual Comparison of Reduction and Recharge Data Reported by IGWA and IDWR





Questions?



**ESPA Cities' Comments to
Idaho Water Resource Board
Aquifer Stabilization Committee
August 1, 2022**

I. INTRODUCTION

The Eastern Snake Plain Aquifer Cities¹ (ESPA Cities) support the Idaho Water Resource Board's ESPA Recharge Activities and have met or exceeded their obligation to help stabilize the ESPA. The ESPA Cities will continue to do their part to stabilize the ESPA and encourage the IWRB to continue its work to meet or exceed the State's obligations to increase water levels in the ESPA.

II. CITIES' RELIANCE ON THE IWRB RECHARGE PROGRAM

Beginning in 2015 the Cities recharged water through the IWRB program to mitigate for any injury from City ground water pumping under the Surface Water Coalition delivery call. In 2015 and for several years after, the Cities entered into annual agreements with the Surface Water Coalition and engaged over the course of several years in purposeful settlement negotiations.

A settlement was executed in 2018 between the Surface Water Coalition, the Idaho Ground Water Appropriators and certain ESPA Cities (the Signatory Cities²) entered into a *Settlement Agreement Between the Surface Water Coalition, Participating Members of Idaho Ground Water Appropriators, Inc., and Signatories Cities* (Final Settlement Agreement). The Final Settlement Agreement was effective January 1, 2019, and requires the Signatory Cities to supply mitigation water for aquifer enhancement or other mitigation activities ("Mitigation Obligation") averaging 7,650 af per year (af/y)³ on a five-year running average, with a minimum requirement to supply 1,000 af/y commencing January 1, 2019. The first compliance period will be assessed in 2024 for the period 2019-2023.

The Signatory Cities allocated the Mitigation Obligation amongst themselves on a basis that accounts for priority dates of each city's groundwater rights and average annual groundwater pumping. To satisfy the Mitigation Obligation, each Signatory City may lease water from Pocatello, Water District 01, or other suppliers, or supply mitigation arising from its own water supplies and/or through its own aquifer enhancement projects that are consistent with paragraphs II.A.2.a. and b. of the Final Settlement Agreement and the

¹ Includes the cities set forth in Table 1.

² The cities obligated under the Final Settlement Agreement, hereinafter referred to as the "Signatory Cities," are the cities of Bliss, Burley, Carey, Declo, Dietrich, Gooding, Hazelton, Heyburn, Idaho Falls, Jerome, Paul, Pocatello, Richfield, Rupert, Shoshone, Wendell, Albion, Blackfoot, Atomic City, Rexburg, Ammon, and Iona.

³ IGWA's performance under its settlement with the Surface Water Coalition can affect the Cities' mitigation obligation—failure to satisfy certain obligations could result in the Cities' mitigation obligation increasing to 9,640 af.

August 2021 First Amendment to the Final Settlement Agreement (providing specifically for direct delivery of water for mitigation purposes).

The Cities have benefited from the IWRB's operation of its recharge program because participating cities can make mitigation water available to IWRB at the end of the irrigation season. While this flexibility has sometimes been a source of stress for Water District 01 staff awaiting signed leases and lease payments, it has also been critical to the success of the Cities' efforts—many of the smaller city settlement-participants do not have full time city staff and their city councils or town boards meet infrequently. It is a hallmark of the IWRB program that it can accommodate the entity contributing the water for recharge. We have heard that there may be efforts to try to limit or schedule recharge obligations—if that were to occur, the Cities would have a difficult time engaging with the program.

III. CONCLUSION

The Cities encourage the IWRB to continue administration of the recharge program in the manner they have historically. We look forward to continued participation and engagement in the important task of returning the aquifer to historical levels.