AGENDA

IDAHO WATER RESOURCE BOARD

Aquifer Stabilization Committee Meeting No. 3-23
Tuesday, July 25, 2023
1:00 p.m. (MT)

Water Center
Conference Rooms 602 C & D / Online Zoom Meeting
322 E. Front St.
BOISE

Board Members & the Public may participate via Zoom
Click here to join our Zoom Meeting
Dial in Option: 1(253) 215-8782
Meeting ID: 853 3412 7453 Passcode: 460667

1. Introductions and Attendance
2. ESPA Storage Update
3. ESPA Springs and Reach Gains Update
4. ESPA Settlement Agreements: 2022 Activities
5. ESPA Aquifer Impacts
6. Treasure Valley Model Aquifer Recharge Scenarios
7. Other Items
8. Adjourn

Committee Members: Chair Dean Stevenson, Al Barker, Brian Olmstead, and Pat McMahon.

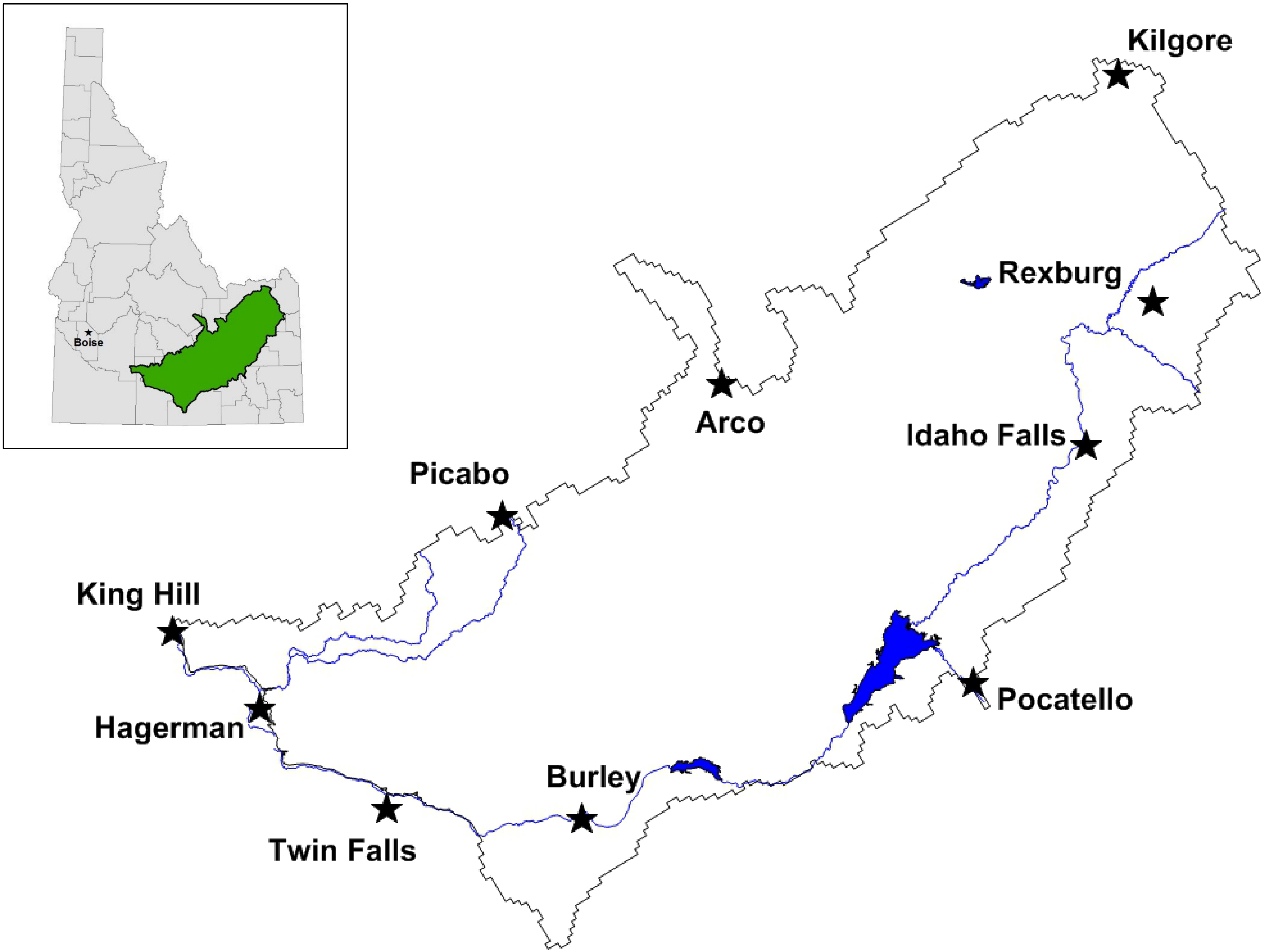
* Action Item: A vote regarding this item may be made at this meeting. Identifying an item as an action item on the agenda does not require a vote to be taken on the item.

Americans with Disabilities
The meeting will be held in person and online. 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.

ESPA Storage Changes

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

July 25, 2023



Boise
Kilgore
Rexburg
Arco
Idaho Falls
Picabo
King Hill
Hagerman
Pocatello
Burley
Twin Falls

Aquifer Water Balance

Inflow – Outflow = ΔStorage

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

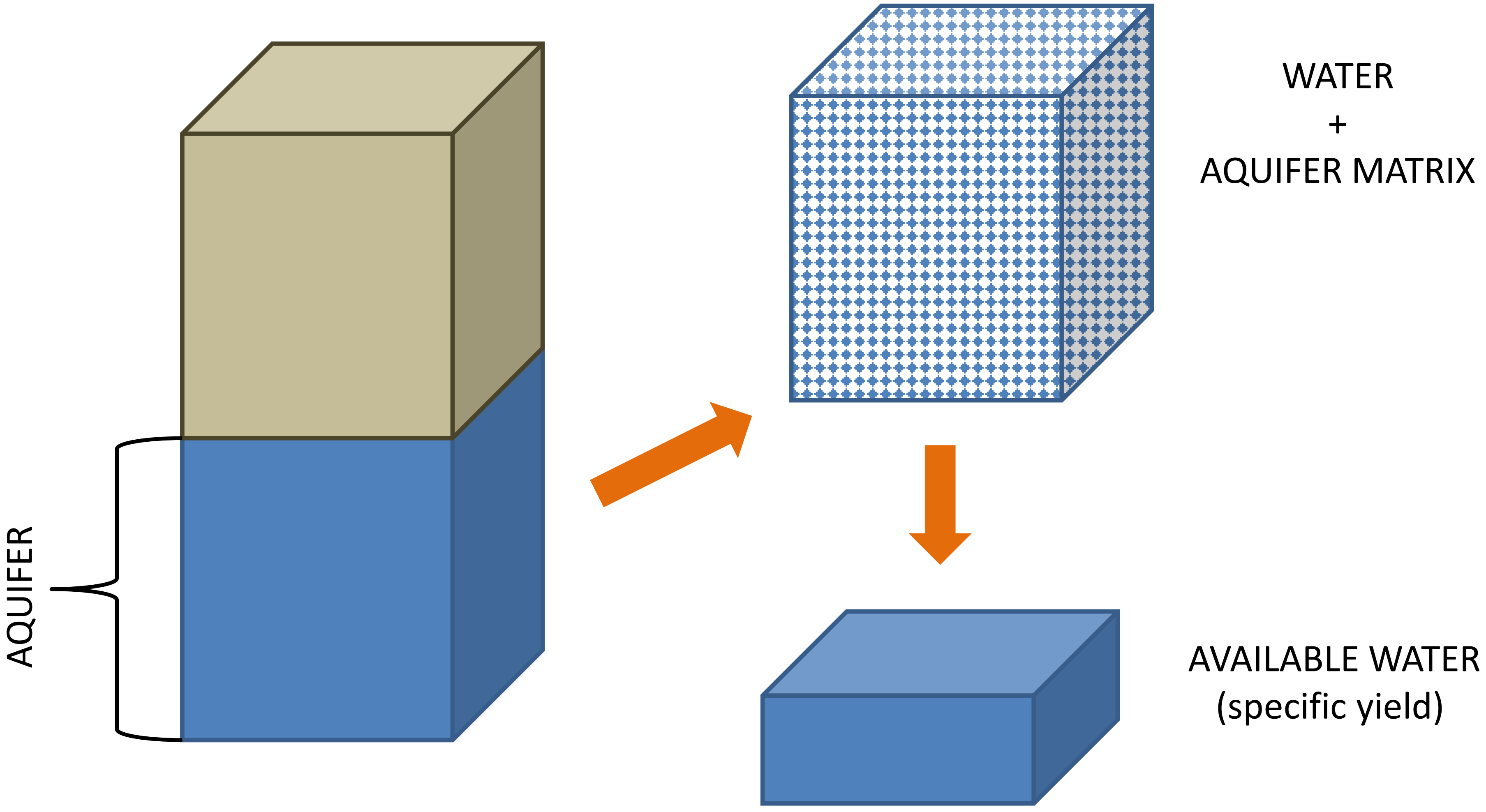
ESPA Outflows = Evapotranspiration, Spring Discharge, Well Pumping

- 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.
- Specific Yield (Sy) 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



Using Water-Level Data to Estimate Changes in Aquifer Storage

- Water-level data are differenced to produce water-level changes at discrete points (at the wells).
- Changes at the wells are interpolated across the 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 Sy from EPAM2.2 to calculate the change in volume of water.

Mass Measurements and Aquifer Storage Changes

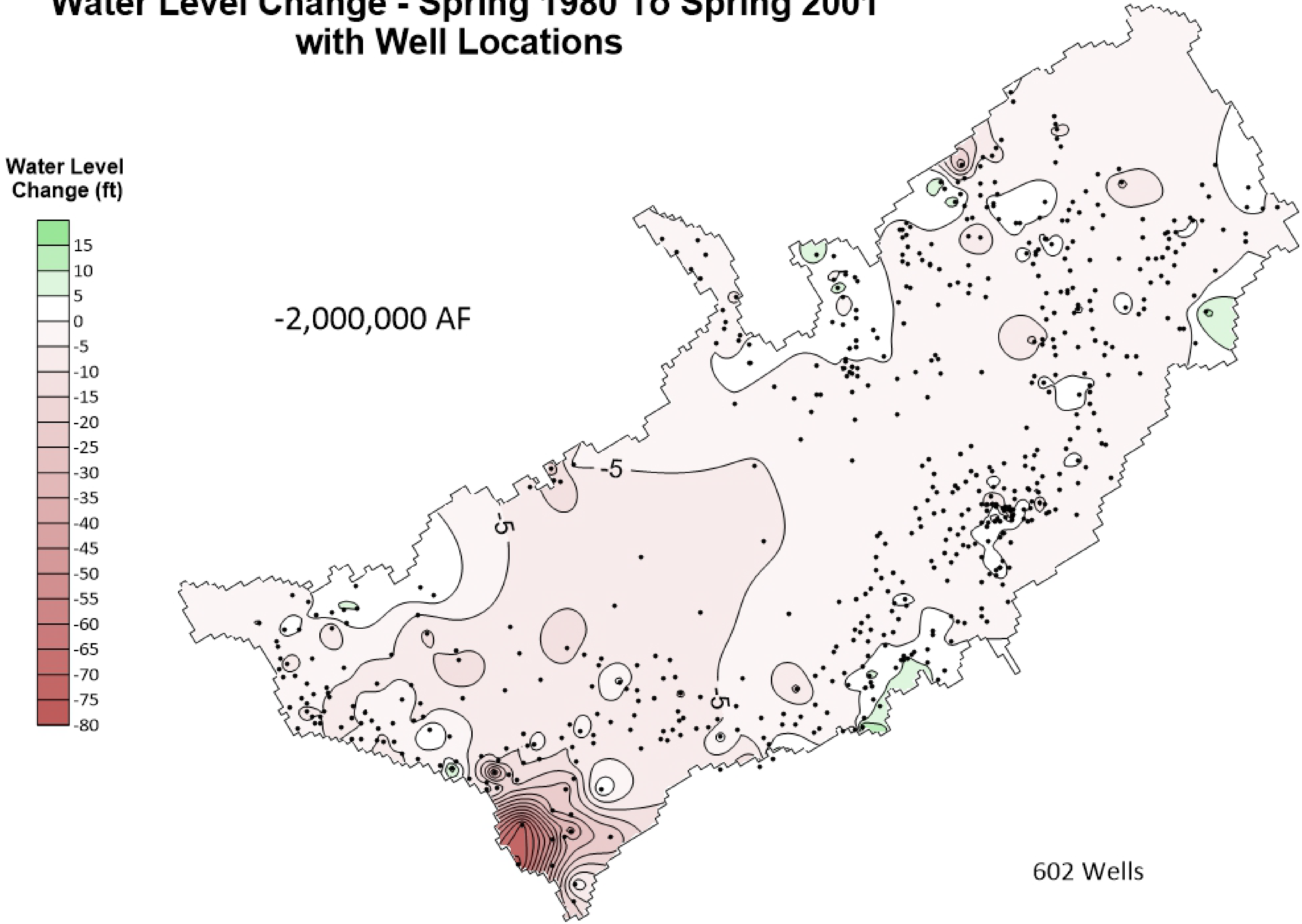
- Storage change calculations are based on data collected during mass measurement events.
- Mass measurement events are designed to collect as much data as possible during a brief window of time.
    - Provides a snapshot of the aquifer.
- Mass measurement events take place annually in the **spring**.

Rationale for using Spring-Season Water Levels

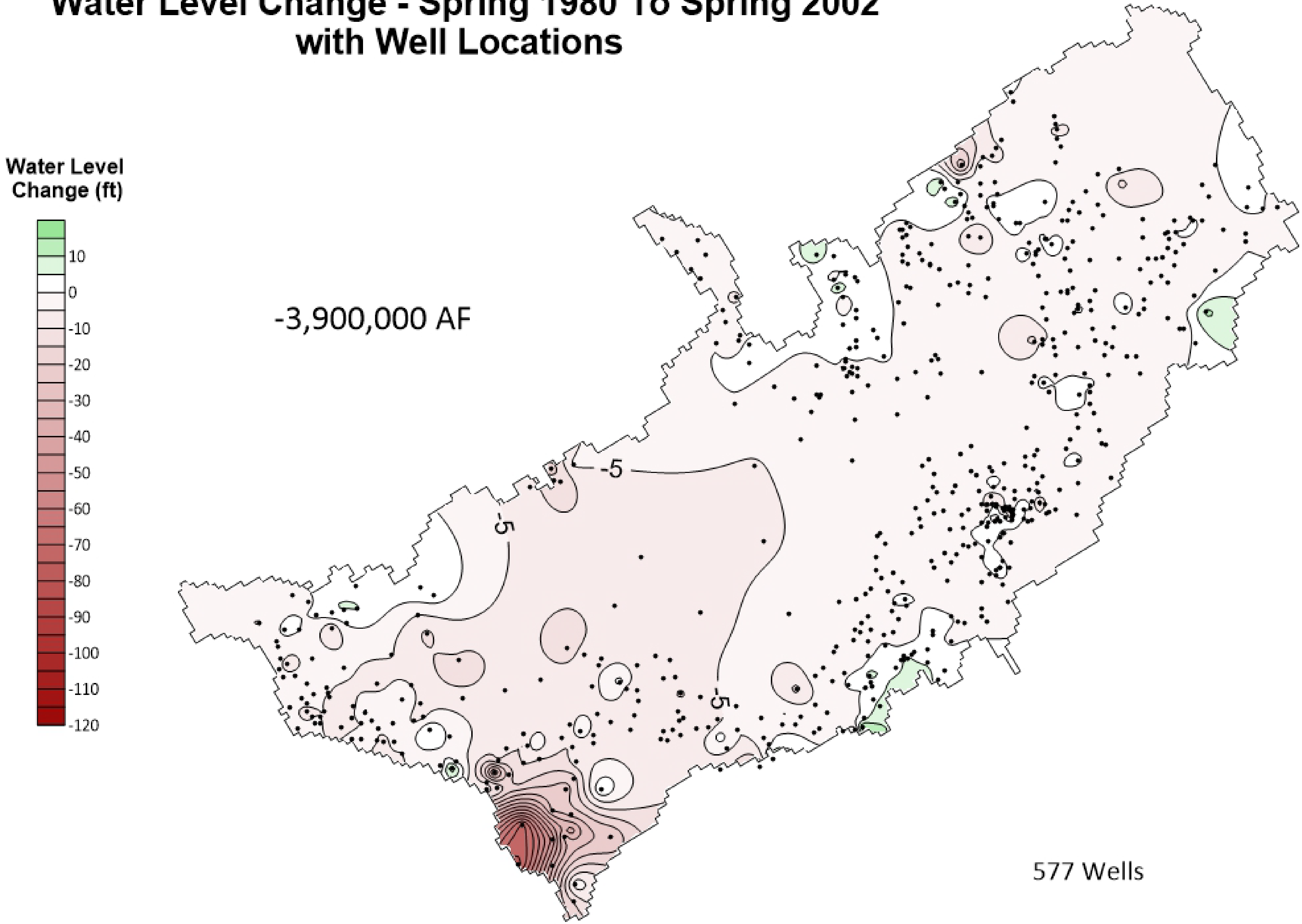
- Conducting measurement events in the spring:
  - Integrates the impacts due to irrigation-season activities into a resulting condition (annual aquifer storage change).
  - Maximizes the time between irrigation seasons.
  - Pre-irrigation measurements reduce the impact of local water use on water levels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

Mass Measurement Change Maps

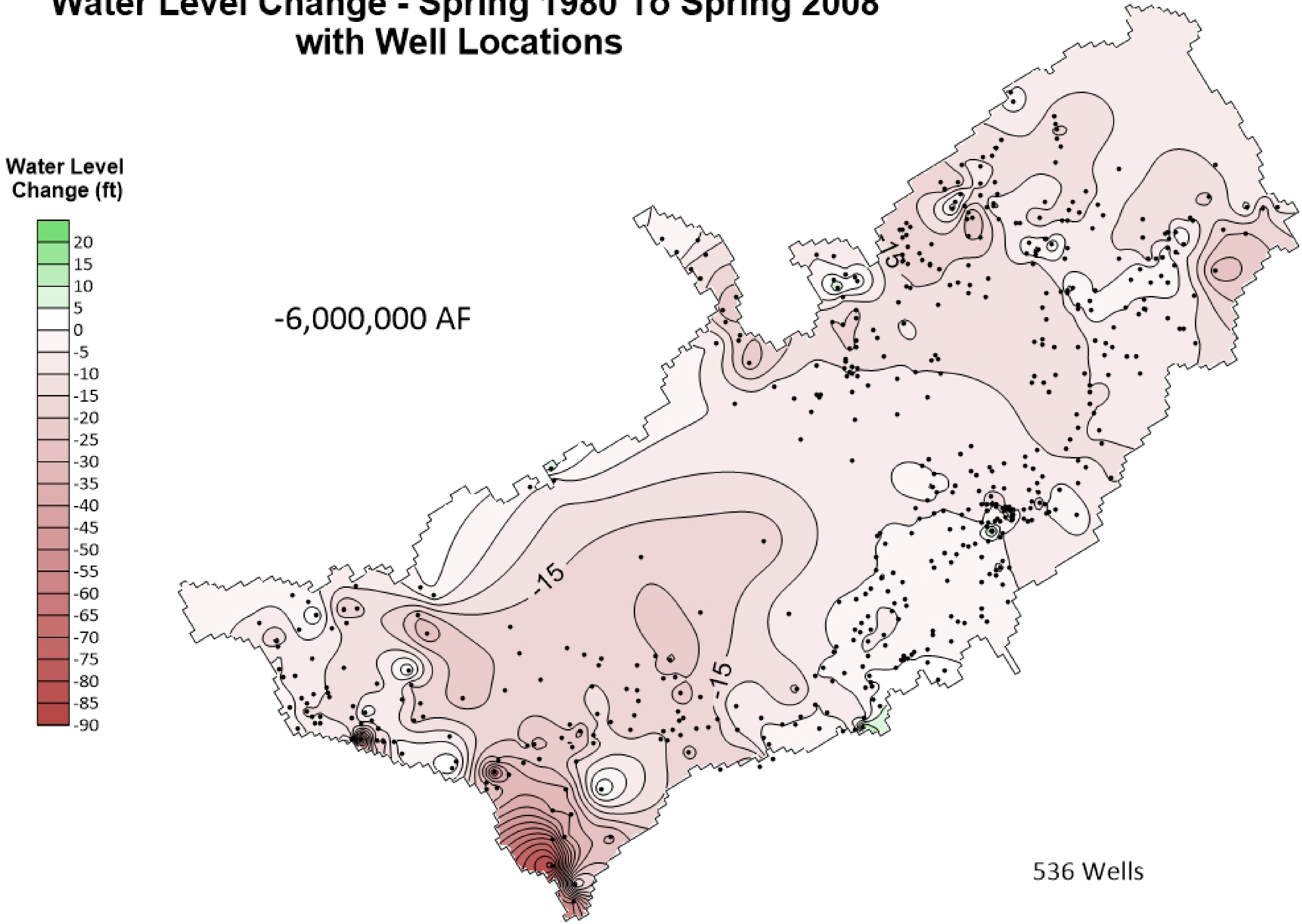
Water Level Change - Spring 1980 To Spring 2001 with Well Locations



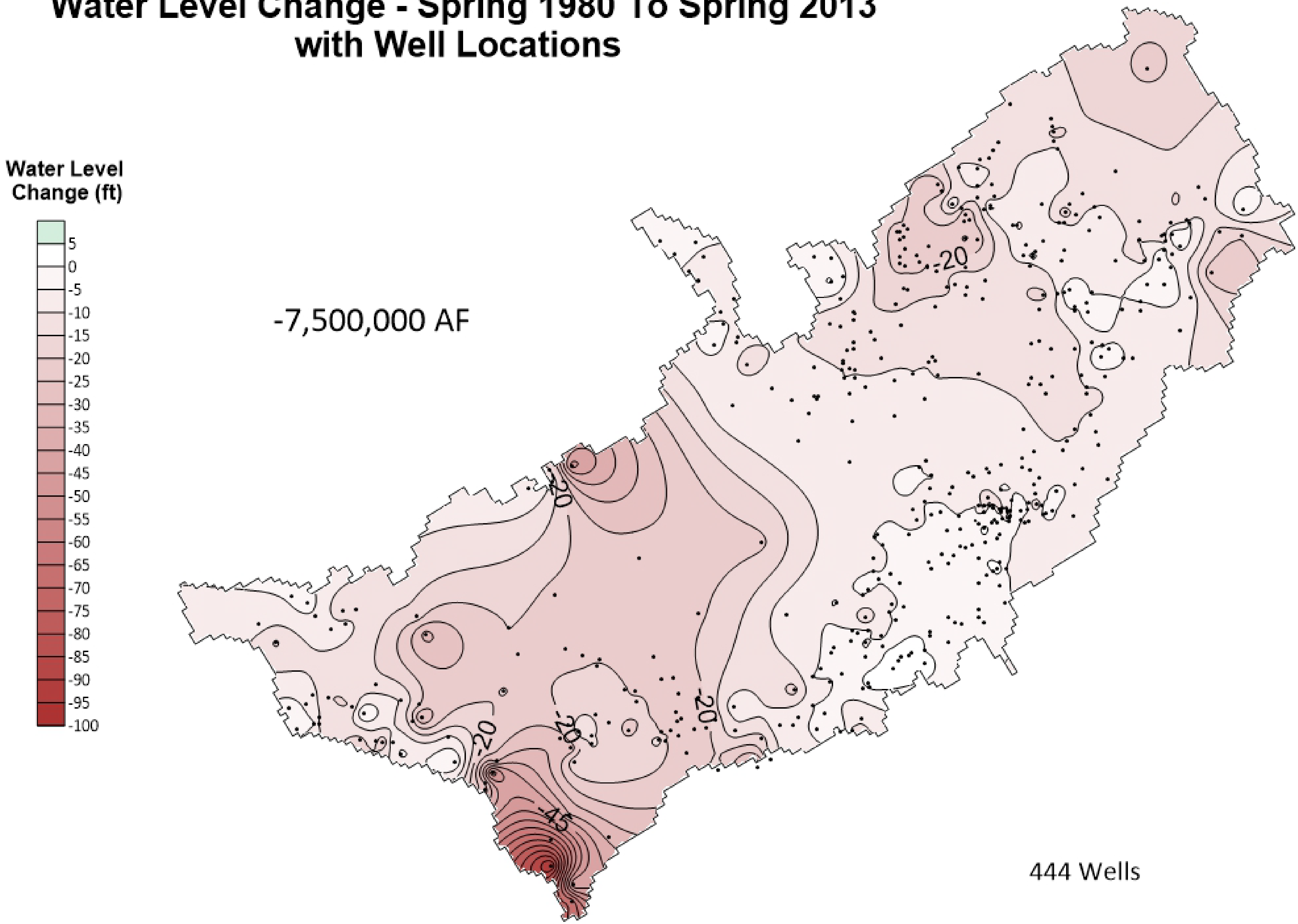
Water Level Change - Spring 1980 To Spring 2002 with Well Locations



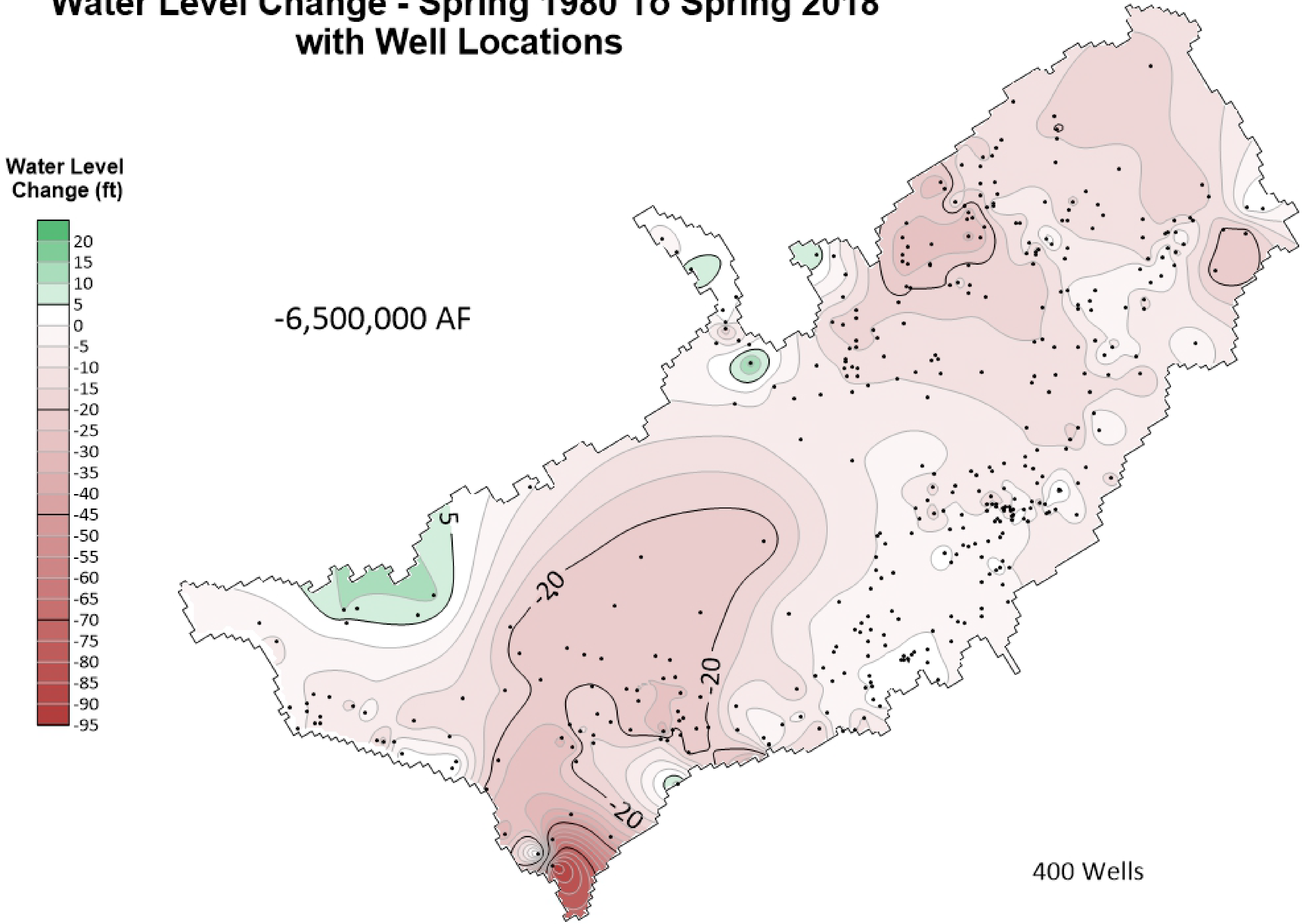
Water Level Change - Spring 1980 To Spring 2008 with Well Locations

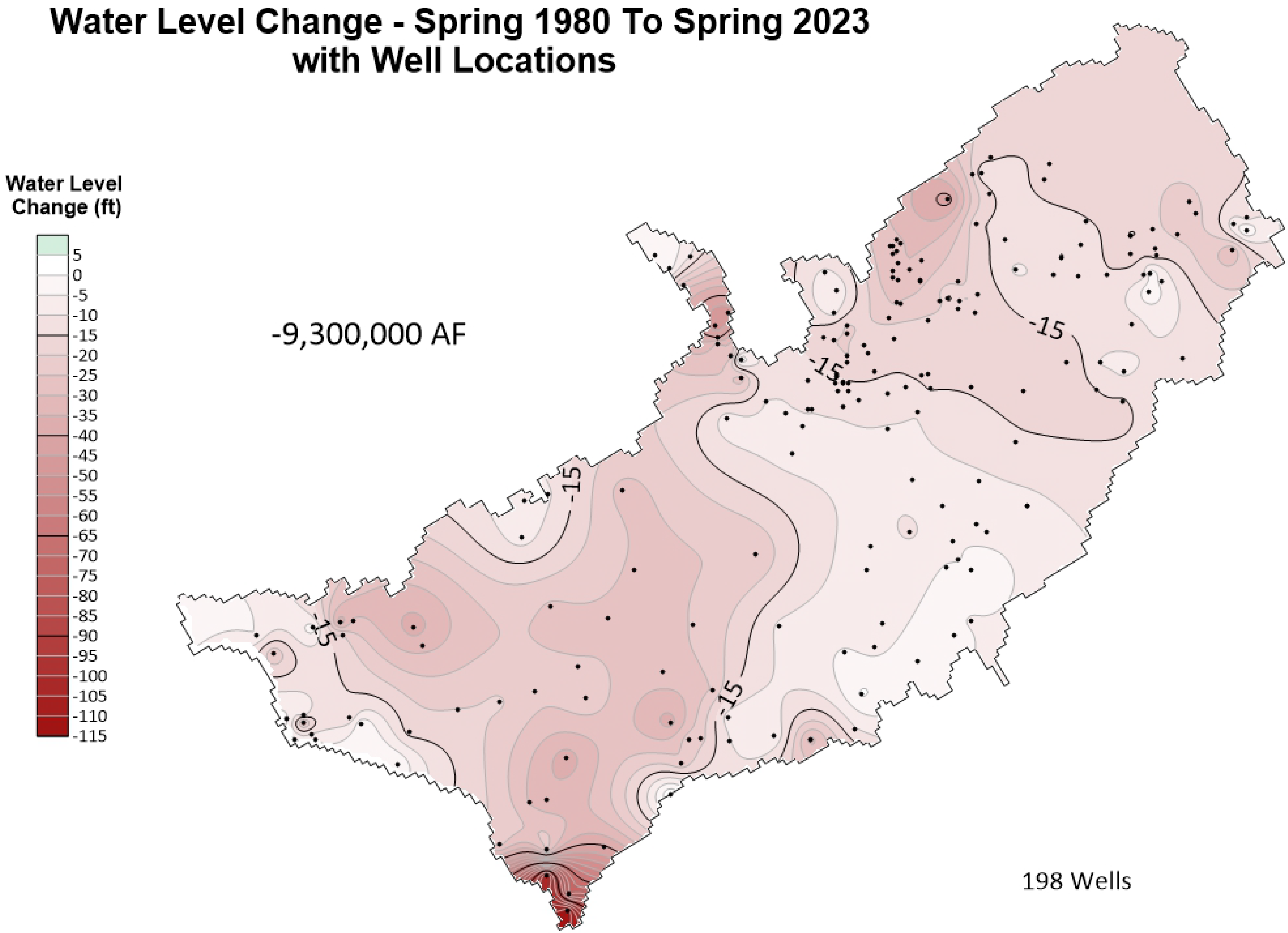


Water Level Change - Spring 1980 To Spring 2013 with Well Locations



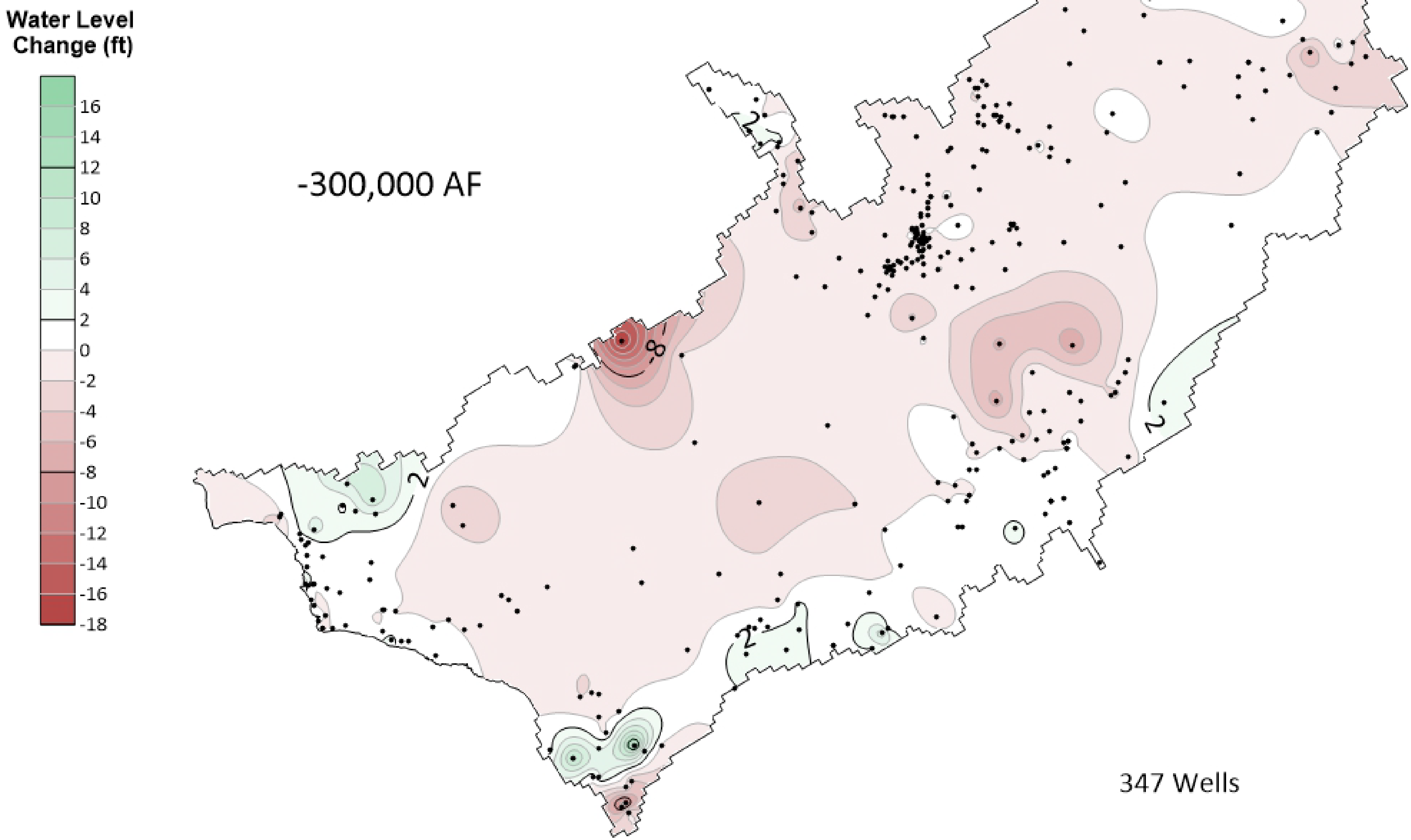
Water Level Change - Spring 1980 To Spring 2018 with Well Locations



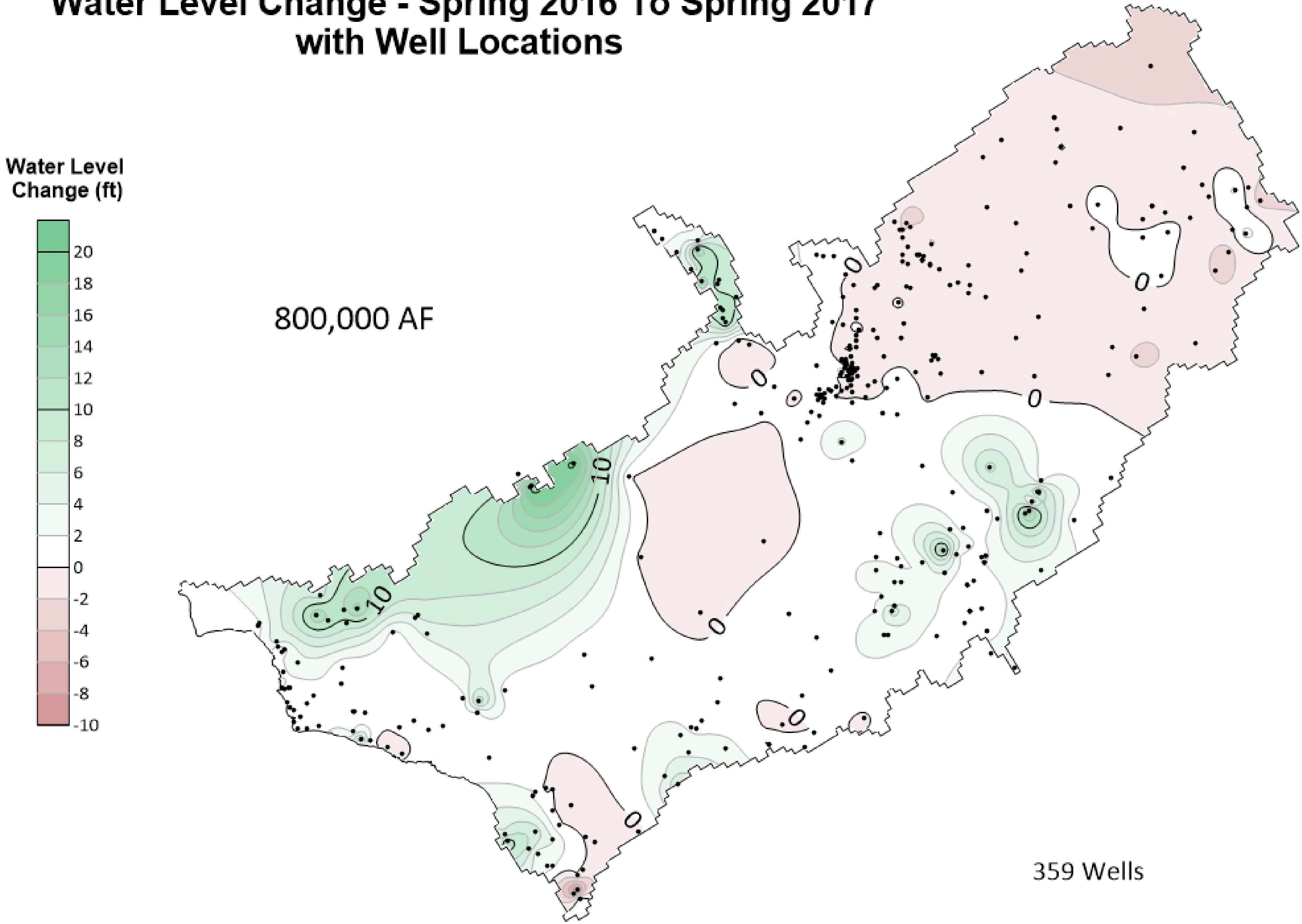

Water Level Change - Spring 1980 To Spring 2023
with Well Locations
Water Level
Change (ft)
5
0
-5
-10
-15
-20
-25
-30
-35
-40
-45
-50
-55
-60
-65
-70
-75
-80
-85
-90
-95
-100
-105
-110
-115
-9,300,000 AF
-15
-15
-15
-15
-15
-15
198 Wells

Annual Measurement Change Maps: 2015 – 2023

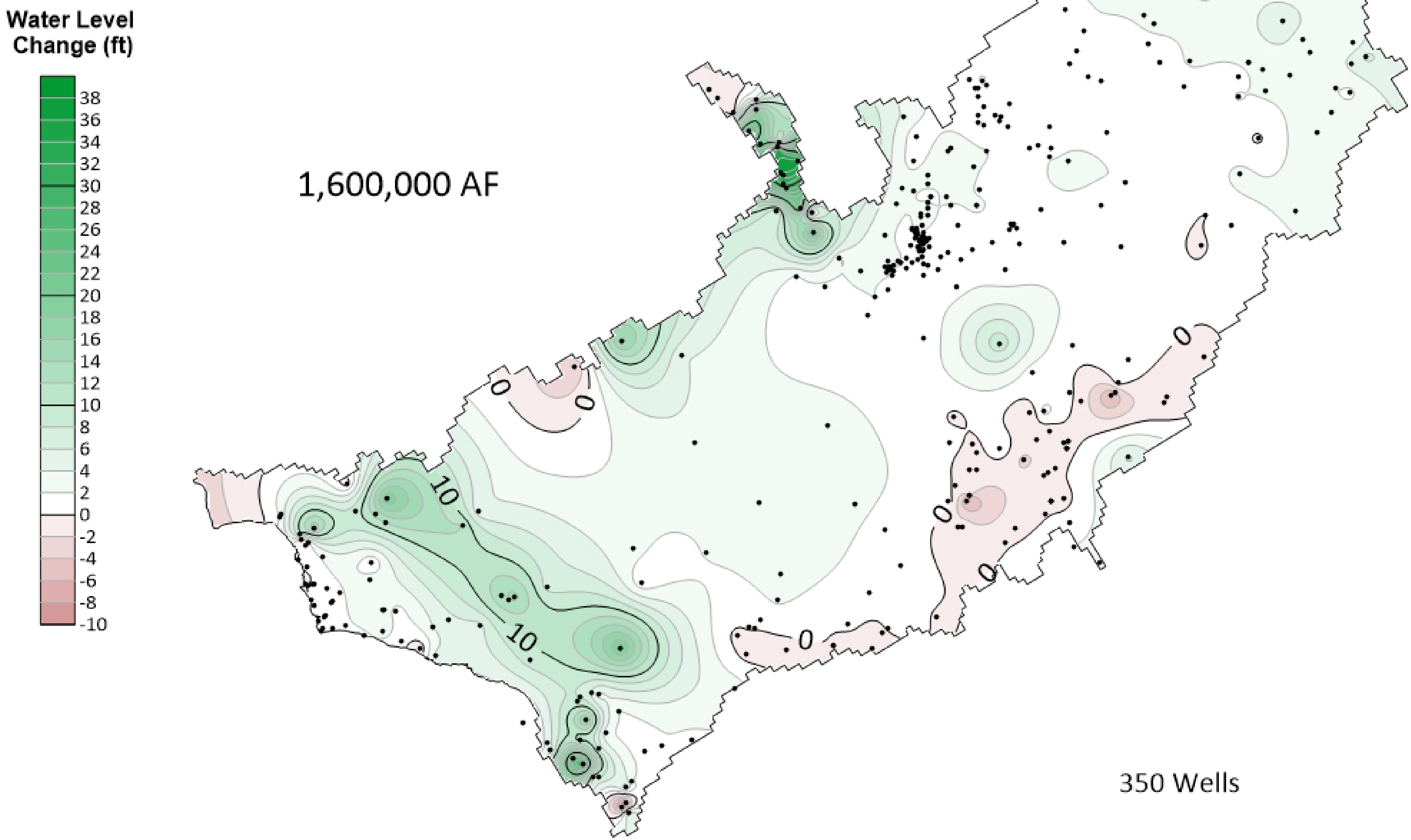
Water Level Change - Spring 2015 To Spring 2016 with Well Locations



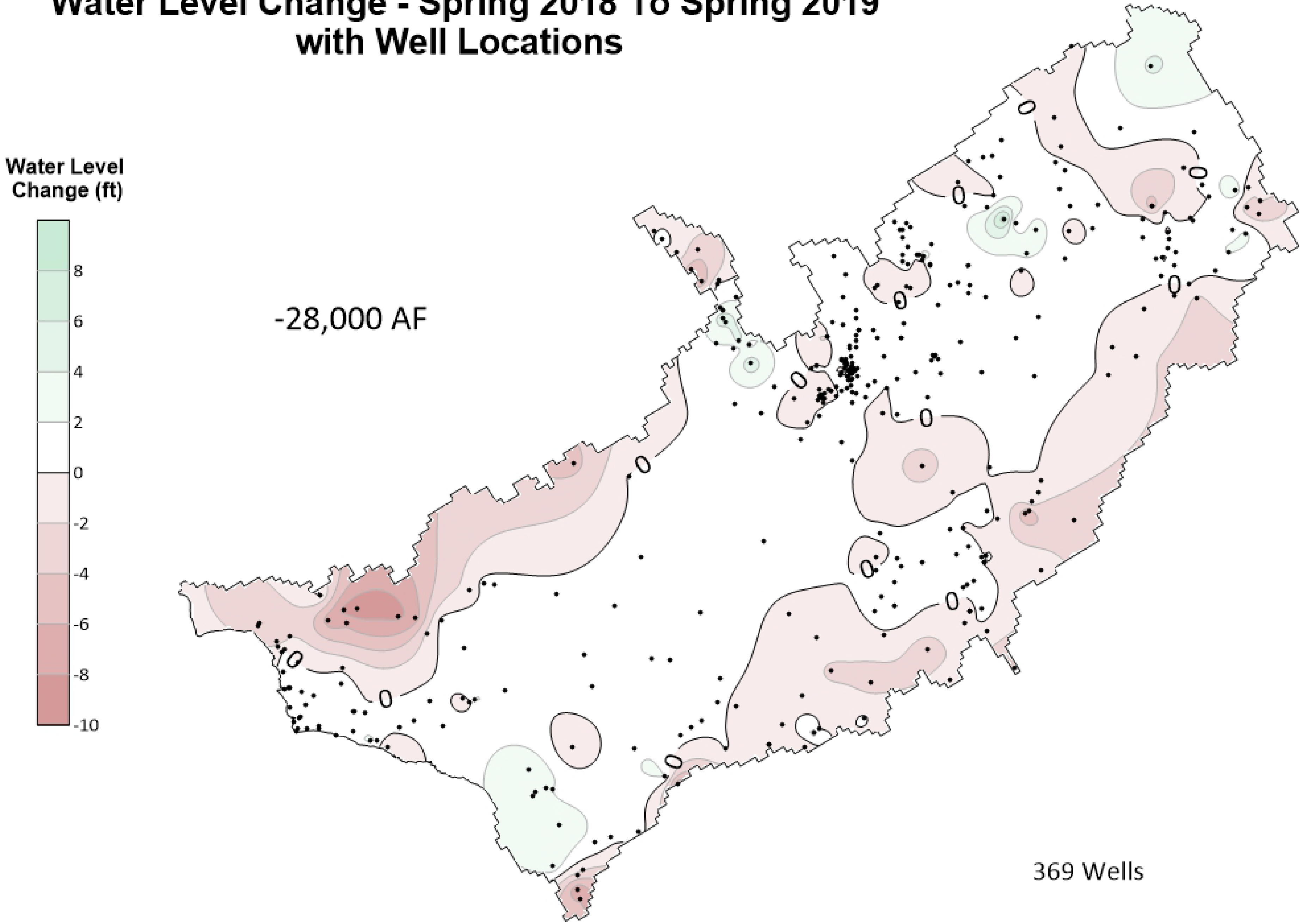
Water Level Change - Spring 2016 To Spring 2017 with Well Locations



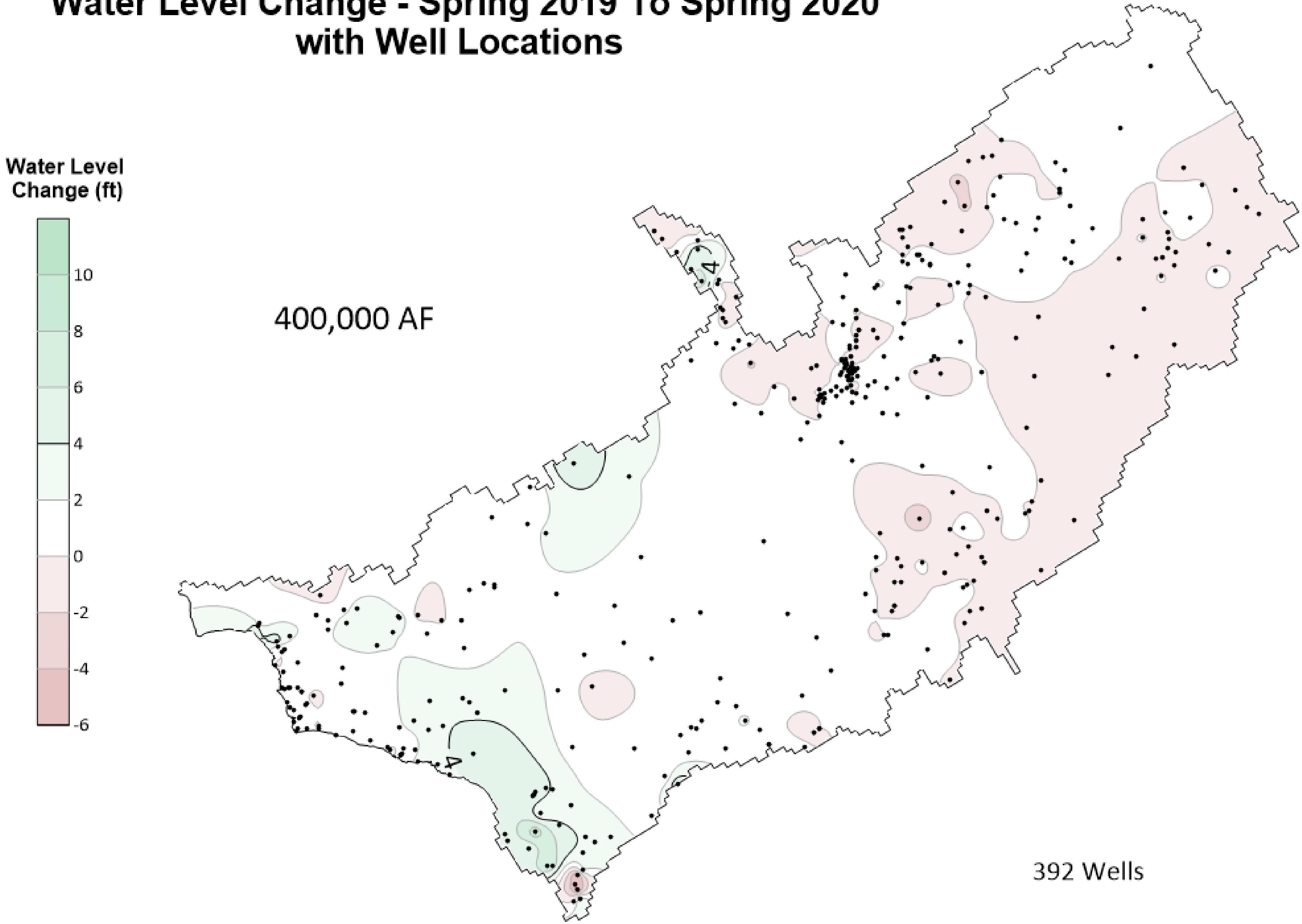
Water Level Change - Spring 2017 To Spring 2018 with Well Locations



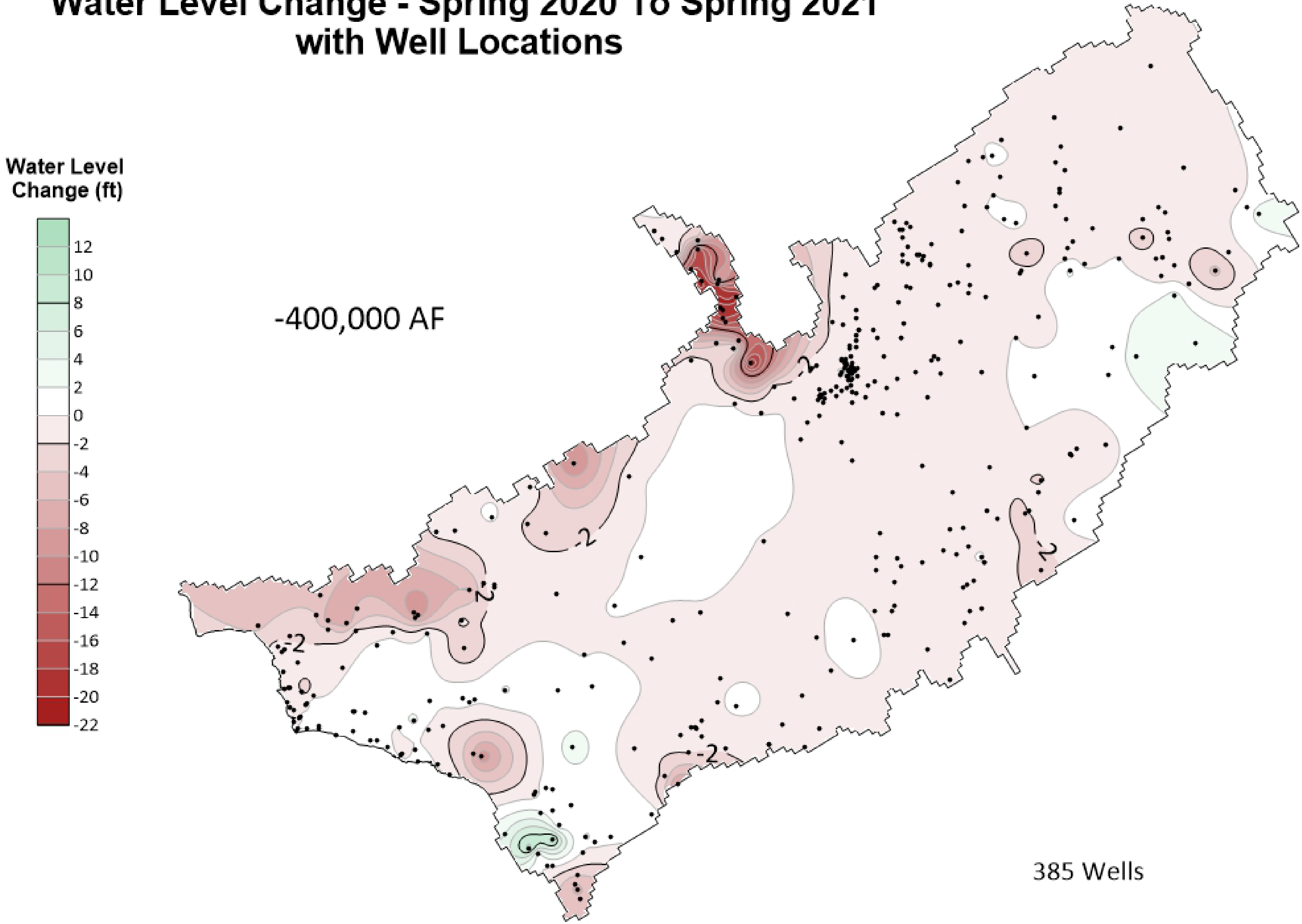
Water Level Change - Spring 2018 To Spring 2019 with Well Locations



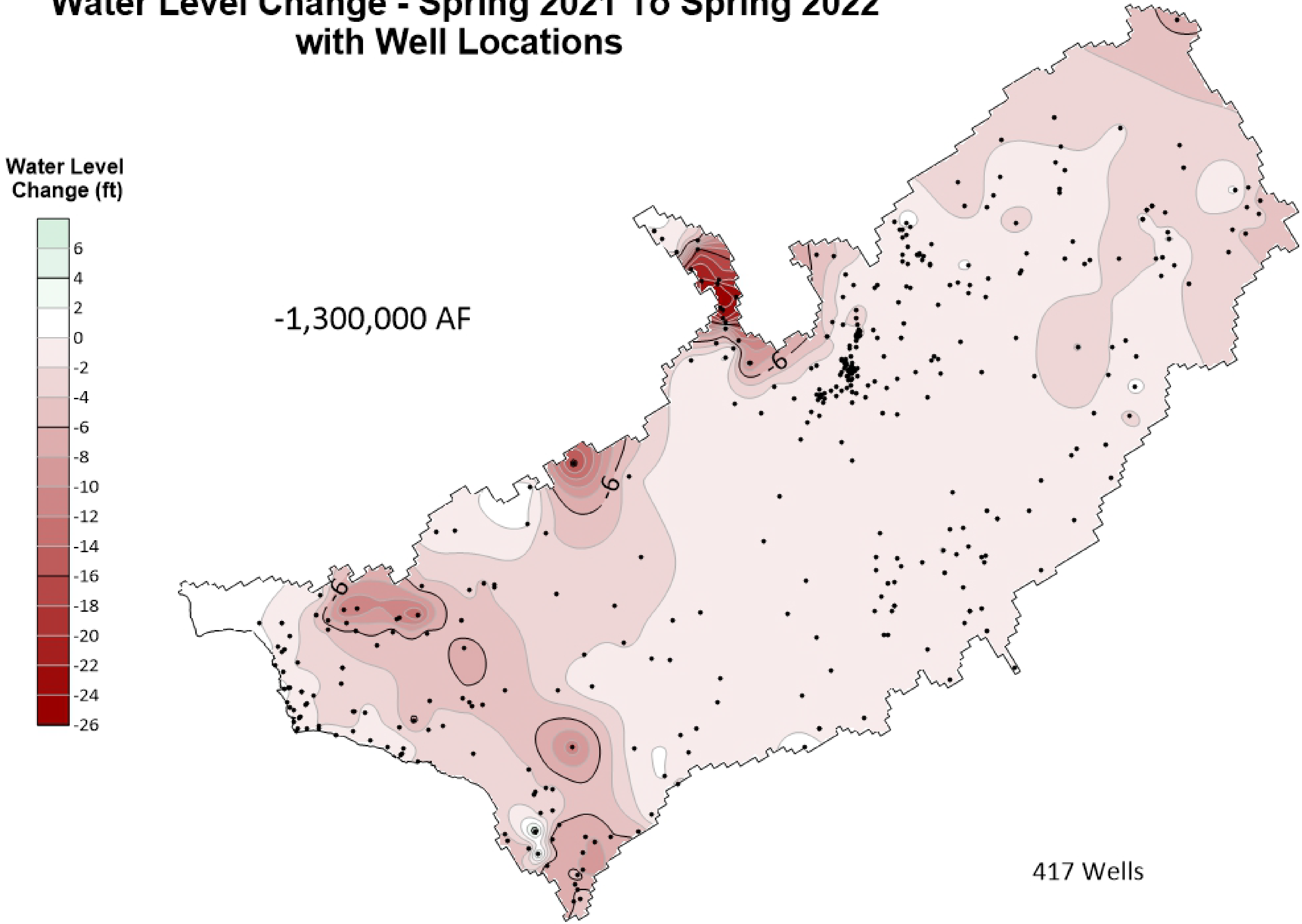
Water Level Change - Spring 2019 To Spring 2020 with Well Locations



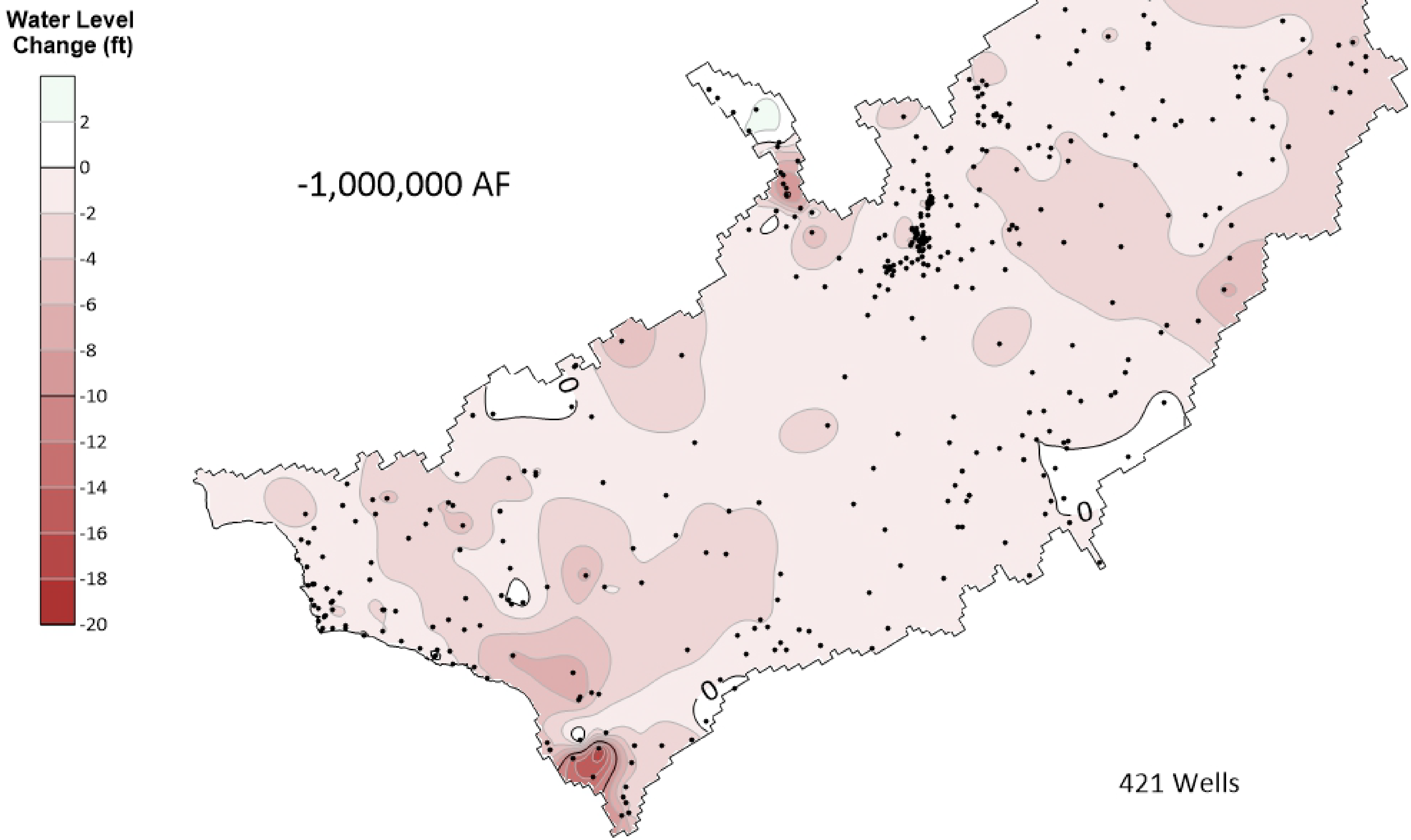
Water Level Change - Spring 2020 To Spring 2021 with Well Locations



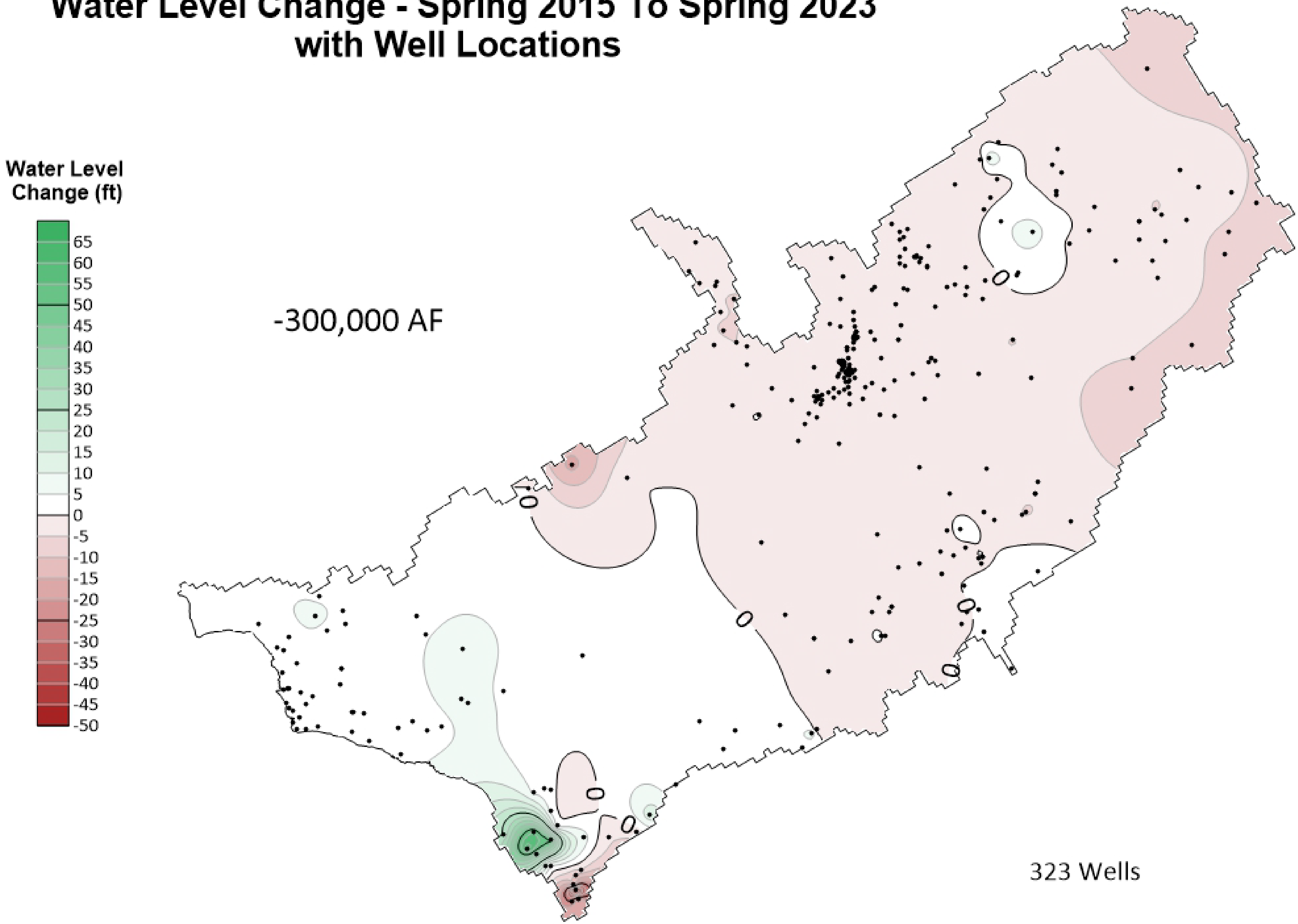
Water Level Change - Spring 2021 To Spring 2022 with Well Locations

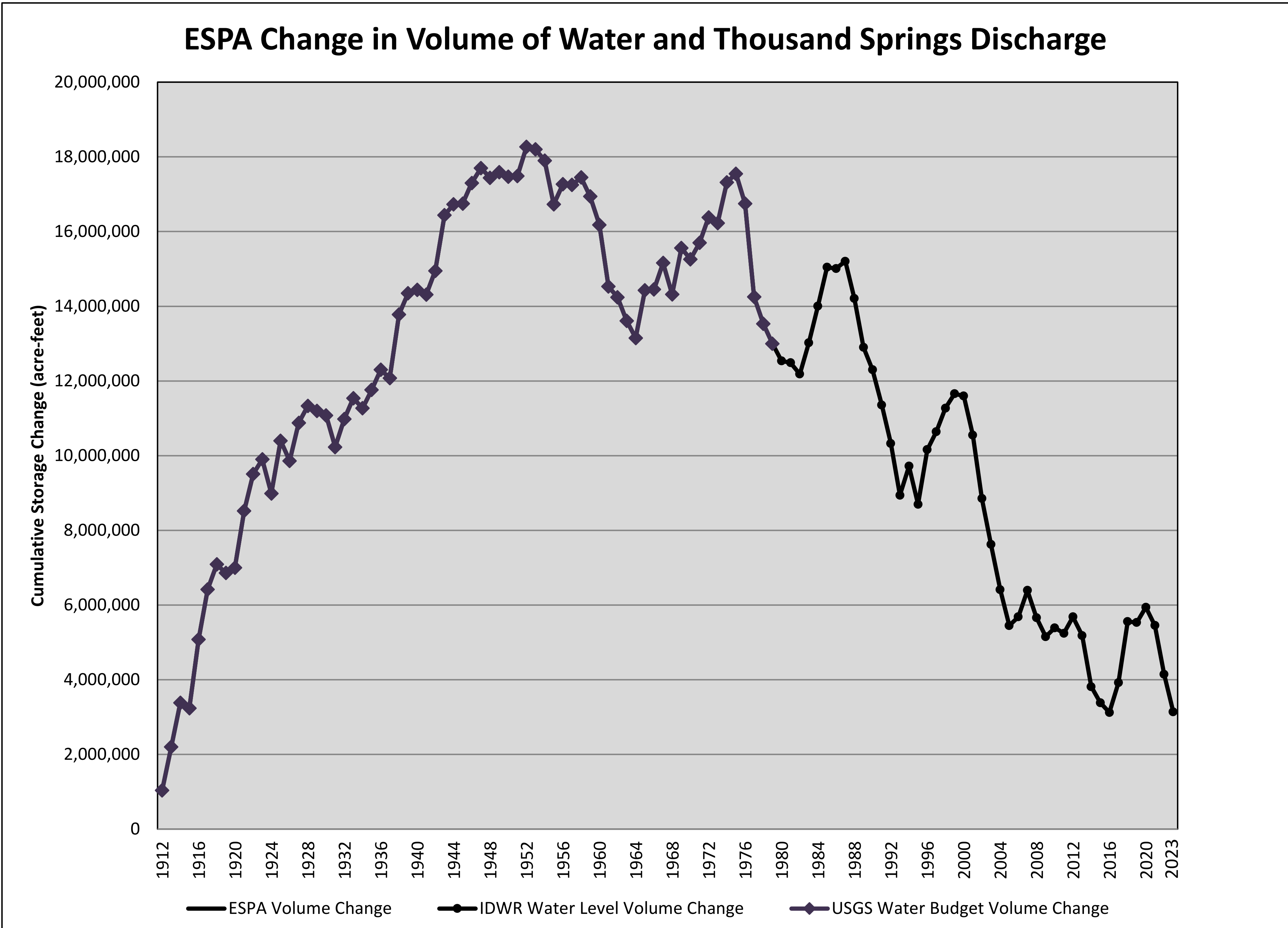


Water Level Change - Spring 2022 To Spring 2023 with Well Locations



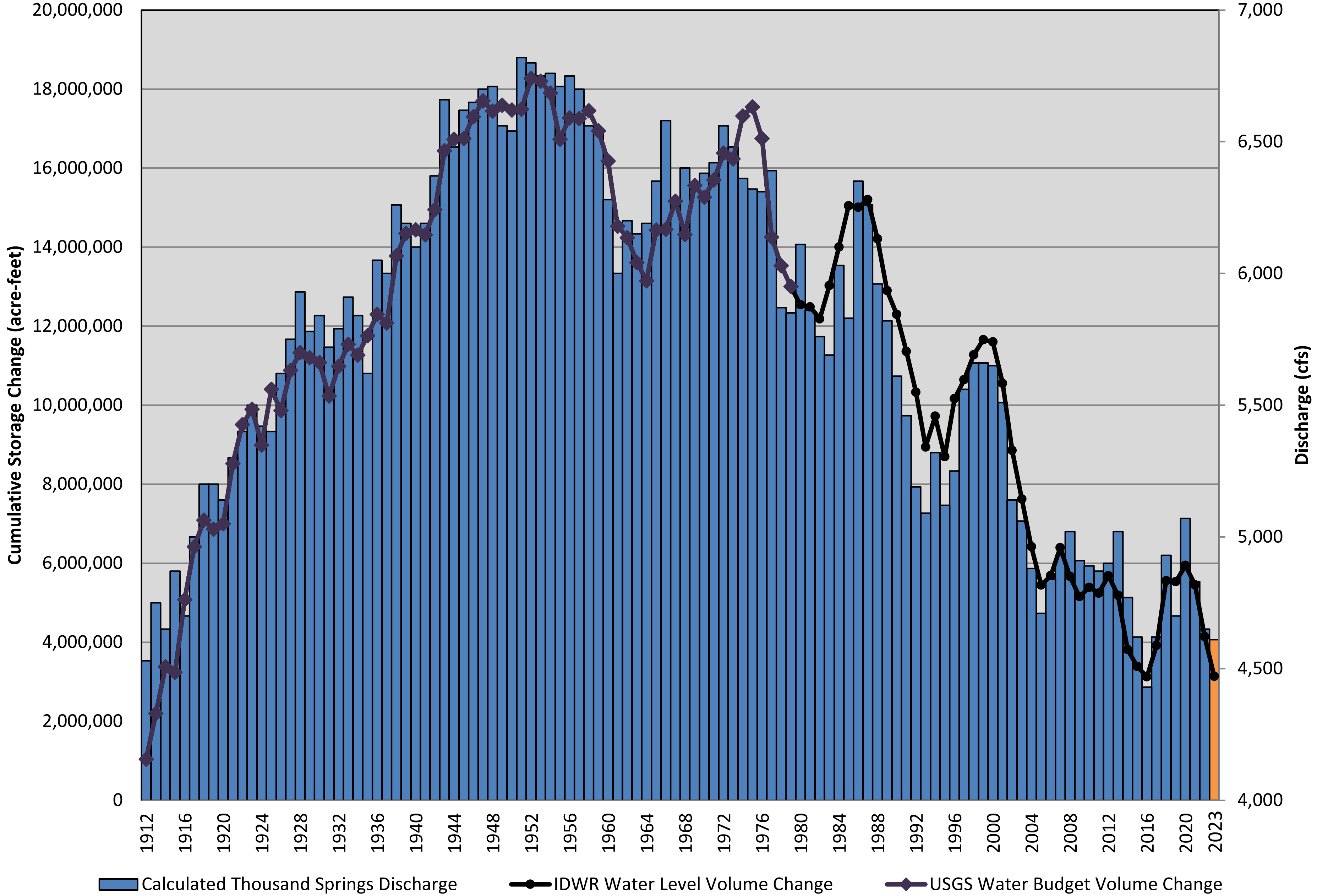
Water Level Change - Spring 2015 To Spring 2023 with Well Locations



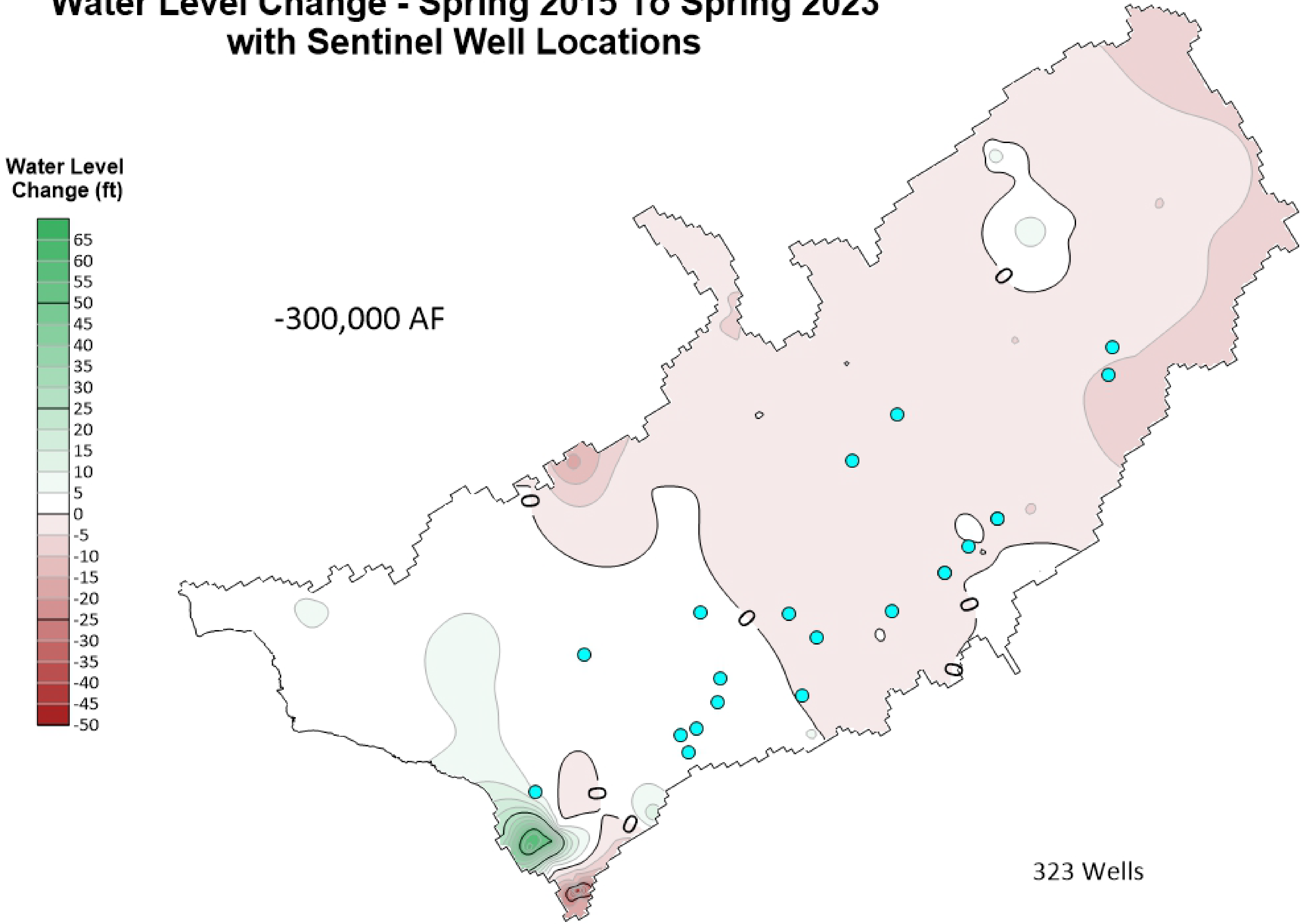


ESPA Change in Volume of Water and Thousand Springs Discharge
Cumulative Storage Change (acre-feet)
20,000,000
18,000,000
16,000,000
14,000,000
12,000,000
10,000,000
8,000,000
6,000,000
4,000,000
2,000,000
0
1912
1916
1920
1924
1928
1932
1936
1940
1944
1948
1952
1956
1960
1964
1968
1972
1976
1980
1984
1988
1992
1996
2000
2004
2008
2012
2016
2020
2023
ESPA Volume Change
IDWR Water Level Volume Change
USGS Water Budget Volume Change

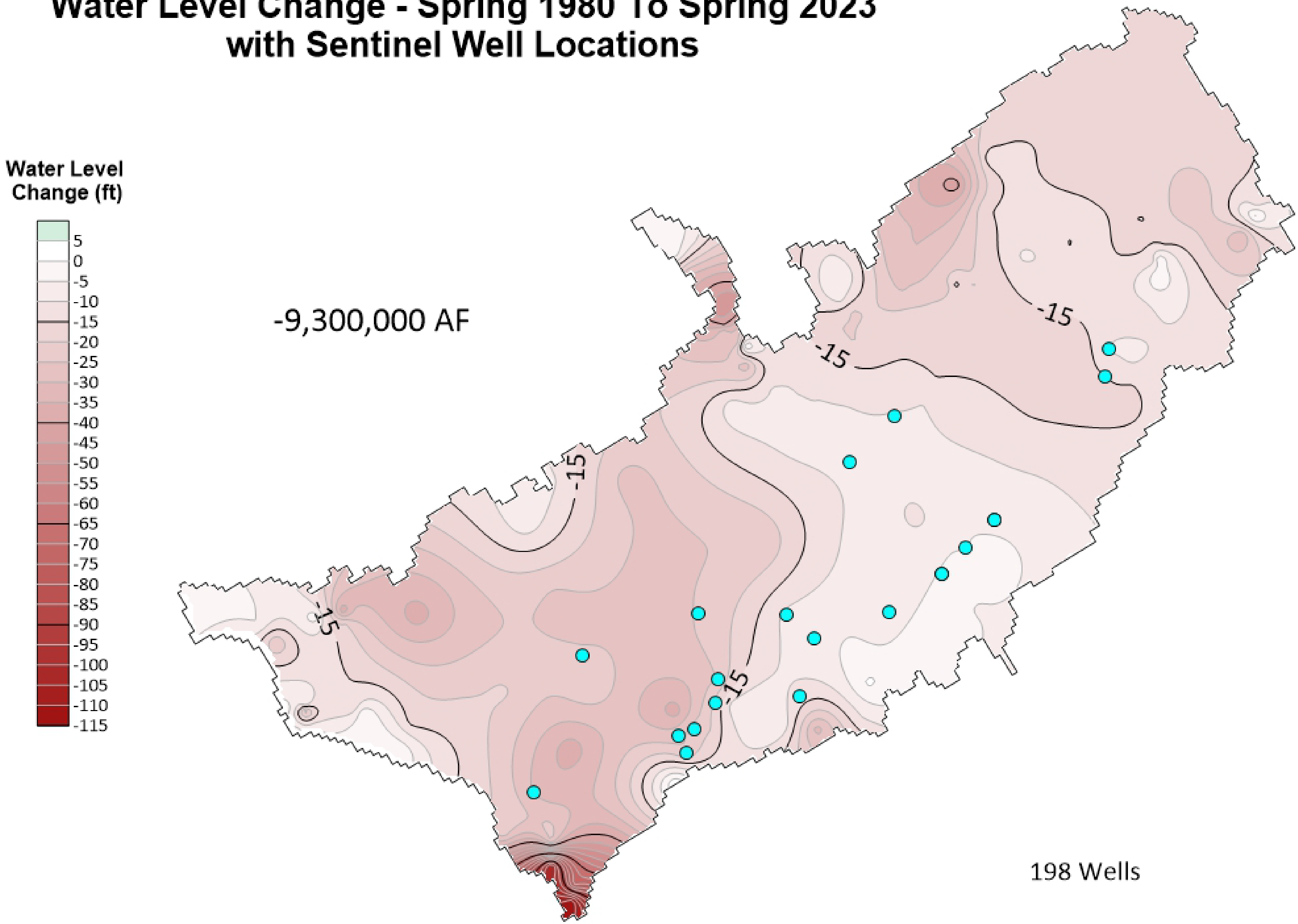
ESPA Change in Volume of Water and Thousand Springs Discharge



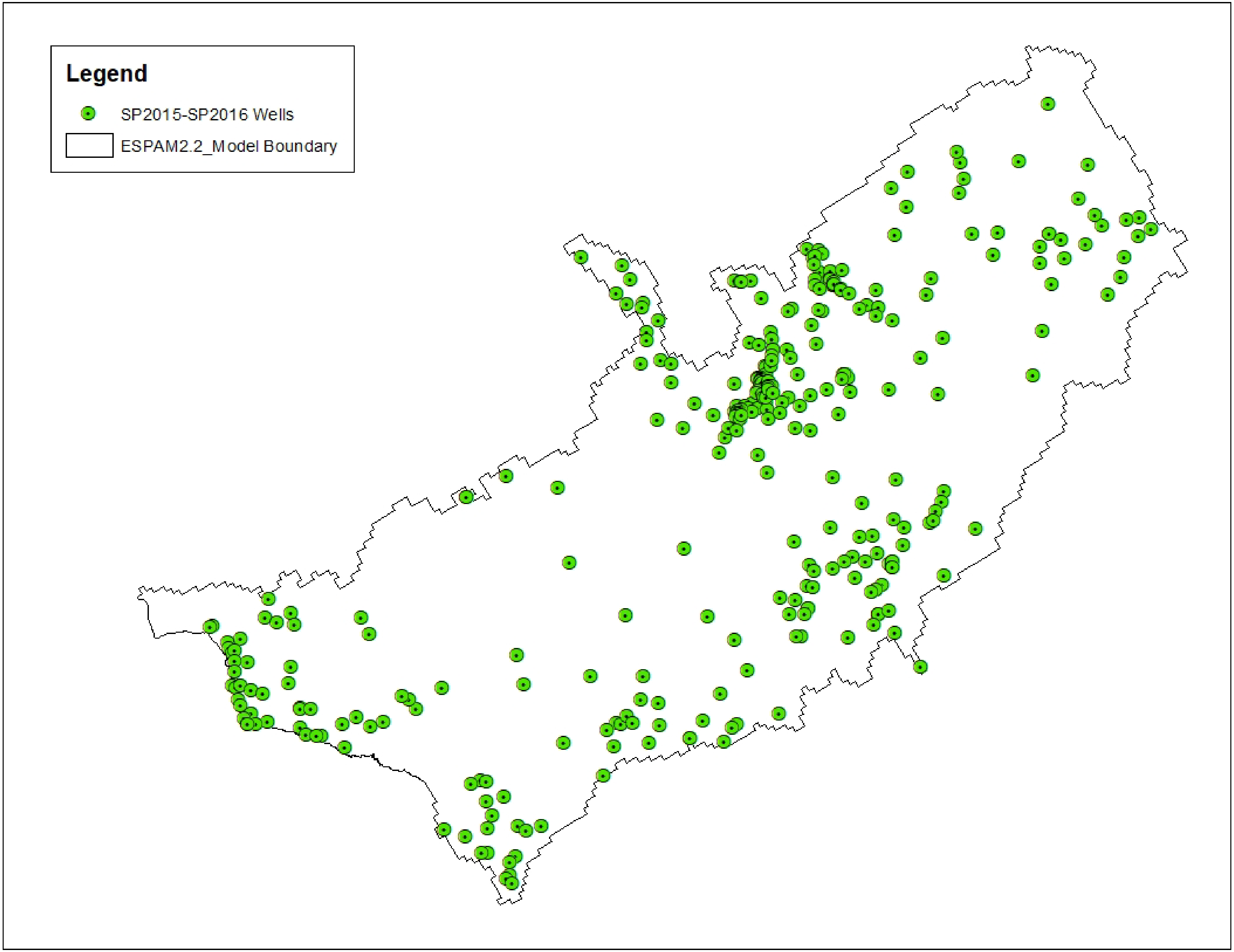
Water Level Change - Spring 2015 To Spring 2023 with Sentinel Well Locations

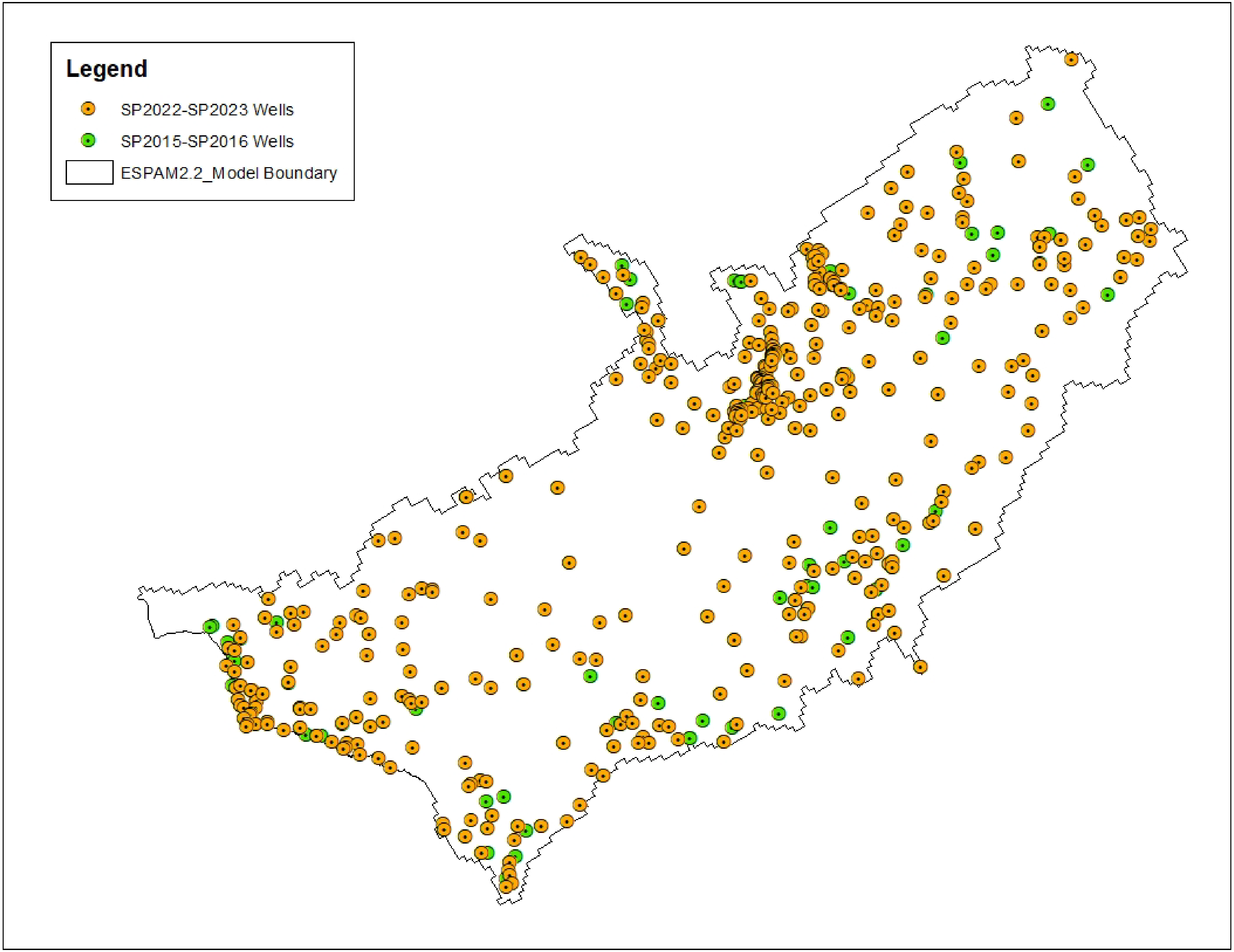


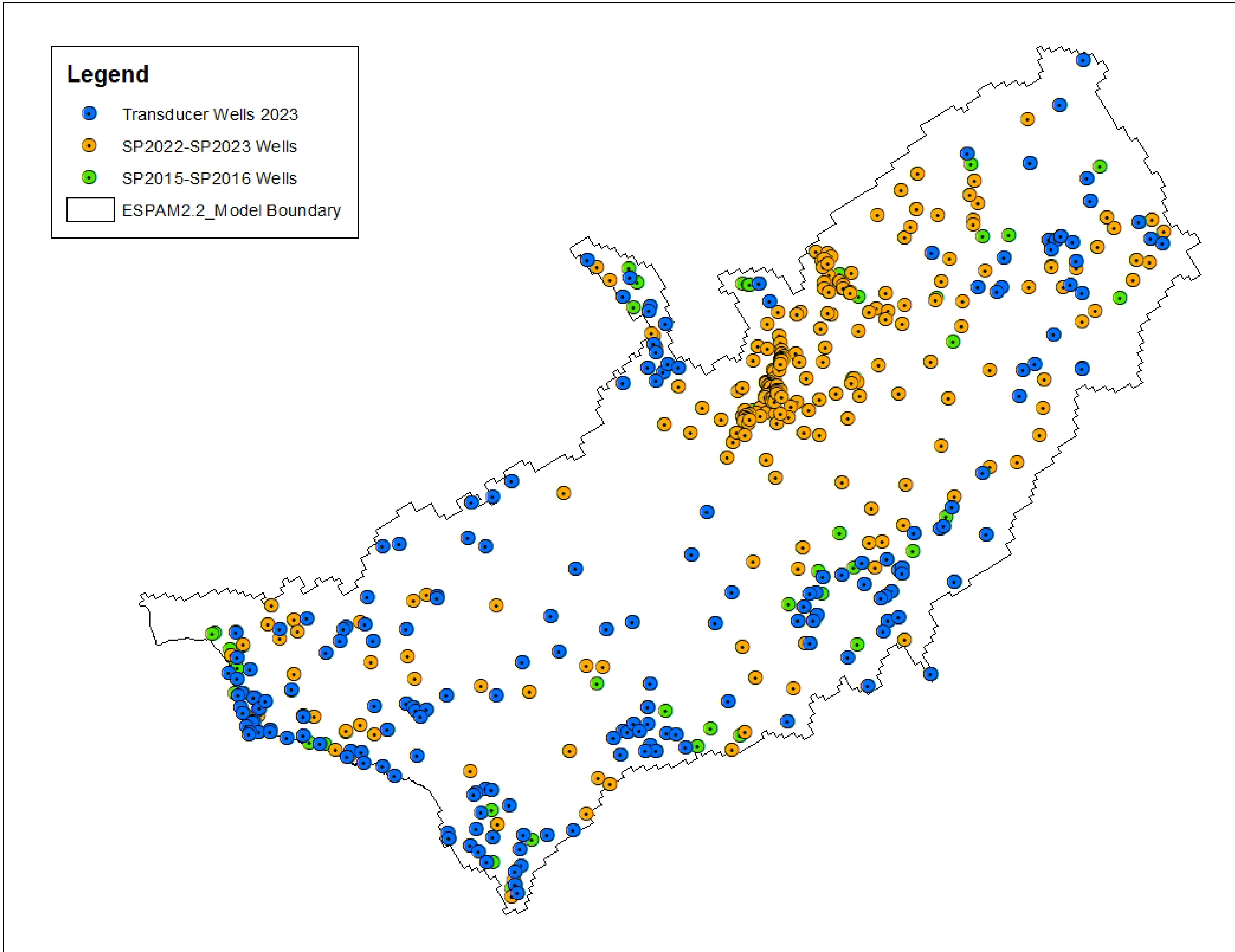
Water Level Change - Spring 1980 To Spring 2023 with Sentinel Well Locations



Water-Level Monitoring Network Continues to Expand


Legend
SP2015-SP2016 Wells
ESPAM2.2_Model Boundary


Legend
SP2022-SP2023 Wells
SP2015-SP2016 Wells
ESPAM2.2_Model Boundary


Legend
Transducer Wells 2023
SP2022-SP2023 Wells
SP2015-SP2016 Wells
ESPAM2.2_Model Boundary

Storage Change Summary

- The aquifer lost 1,000,000 acre-feet from 2022 to 2023.
- The aquifer has lost approximately 300,000 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 and 2022 were dry years
  - The ESPA leaks, and aquifer-storage gains are fleeting.
  - Perseverance through the dry times is vital to success.

Discussion

IDAHO Department of Water Resources

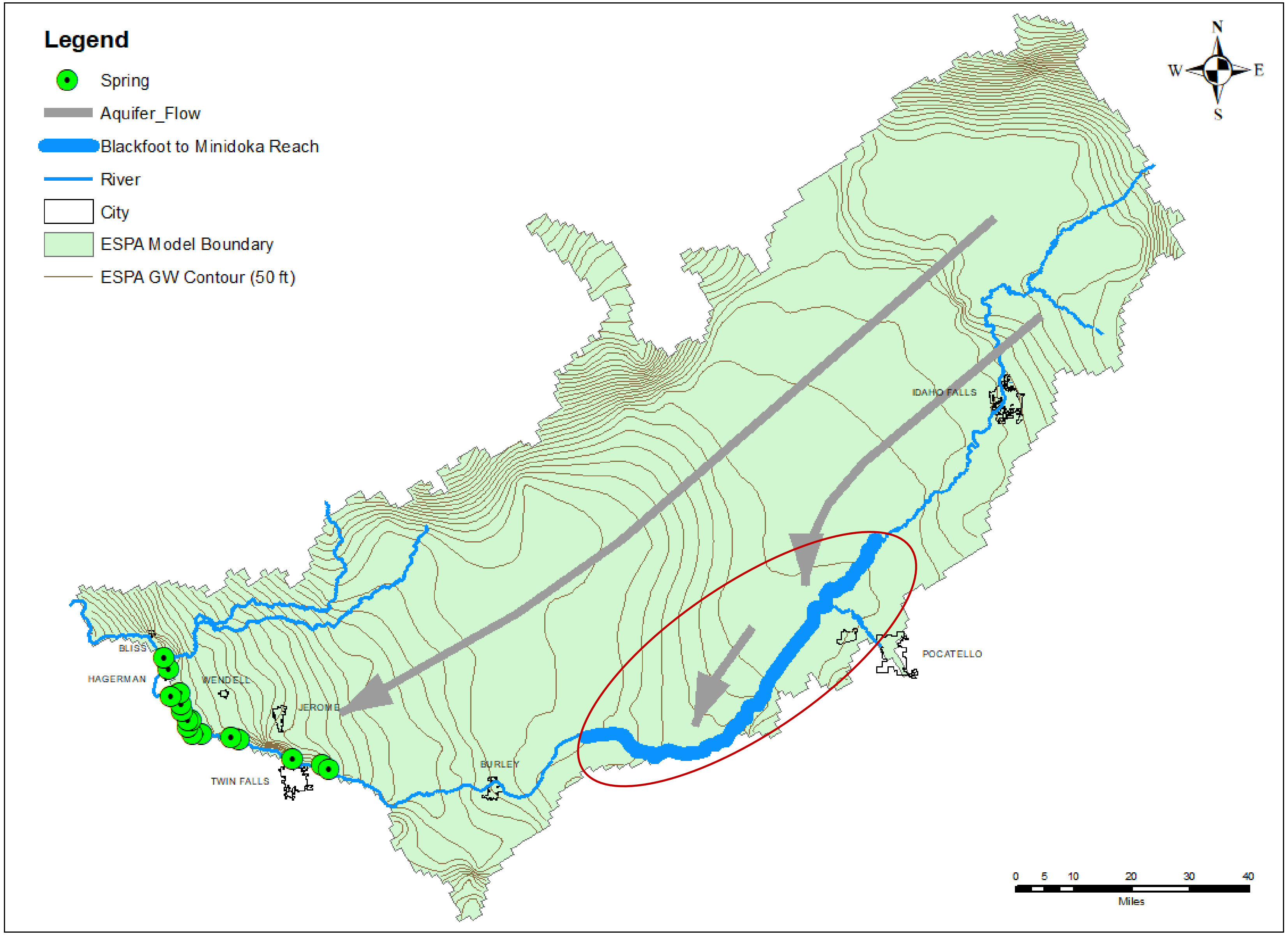
Eastern Snake Plain Aquifer Discharge

Presented by: Ethan Geisler

Date: 7/23/2023

Discharge from ESPA

- Discharge from the springs and to the reach gain is controlled by the water level in the ESPA.
- Higher water levels in the aquifer increase discharge, and vice versa.



Reach Gains

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

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

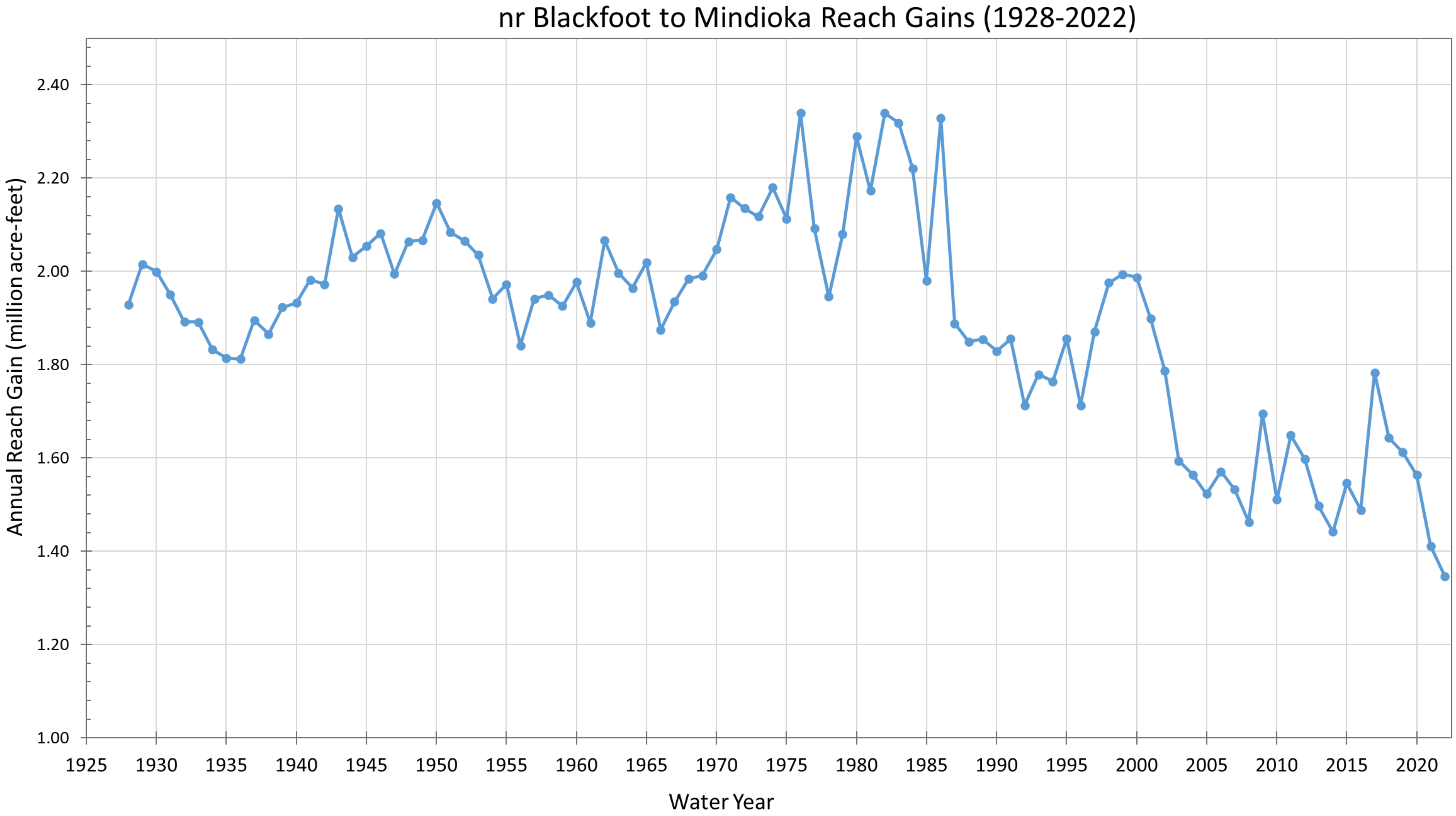
Inflow is the river discharge at the beginning of the river reach.

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

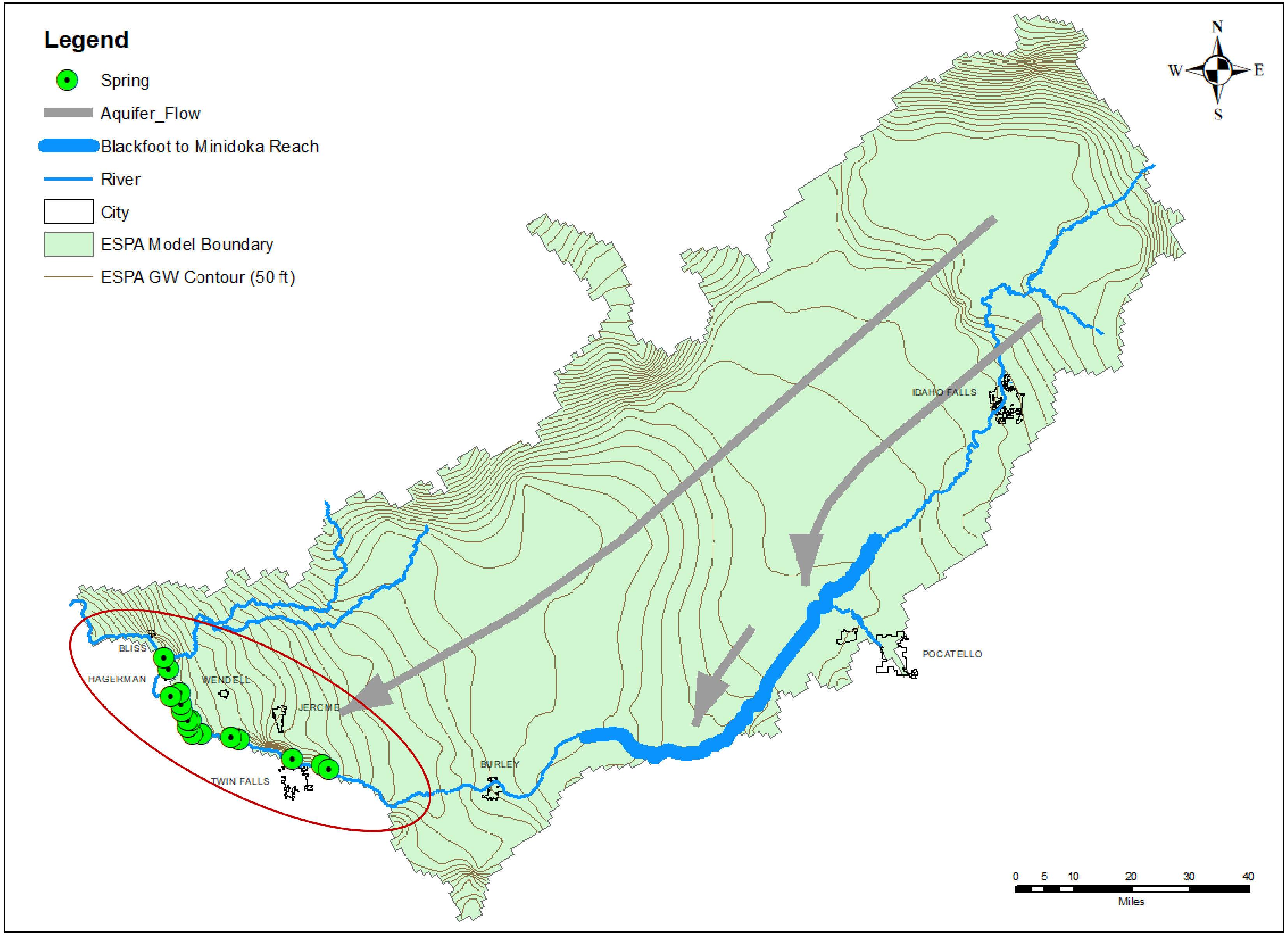
Reservoir Change in Content is the daily increase or decrease in physical content of any reservoirs within the river reach.

Reservoir Evaporation is the calculated evaporative losses from the reservoir.

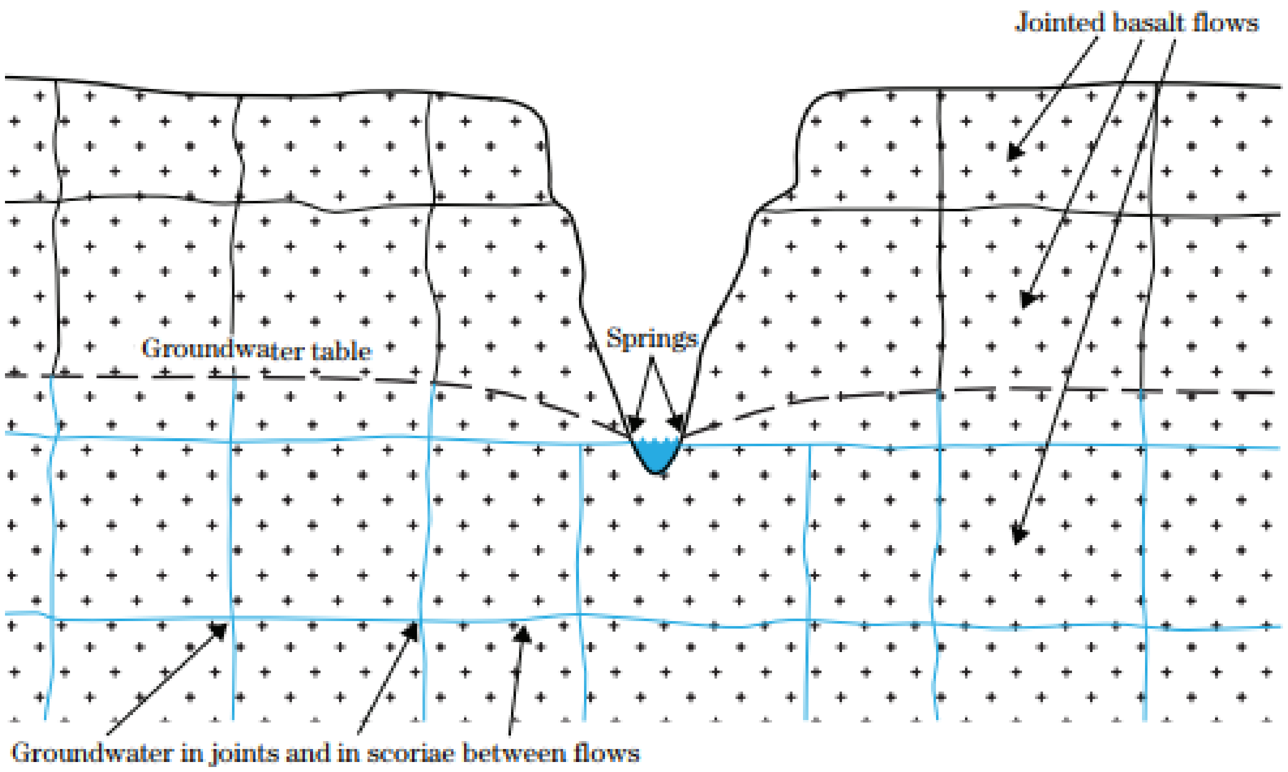
Return Flow is the unused irrigation diversion returning to the river.


nr Blackfoot to Mindioka Reach Gains (1928-2022)
Annual Reach Gain (million acre-feet)
2.40
2.20
2.00
1.80
1.60
1.40
1.20
1.00
1925
1930
1935
1940
1945
1950
1955
1960
1965
1970
1975
1980
1985
1990
1995
2000
2005
2010
2015
2020
Water Year

Discharge from ESPA



Spring Discharge on ESPA



- Springs occur when the groundwater table intersects the land surface or canyon wall.

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.

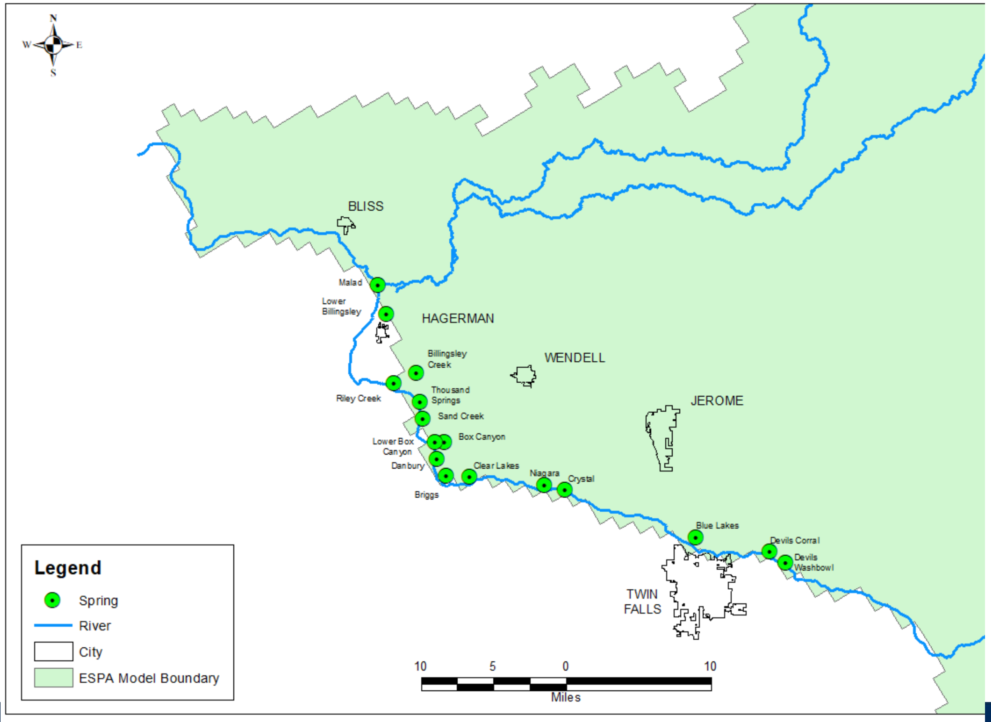
Total Spring Discharge is Difficult to Measure

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

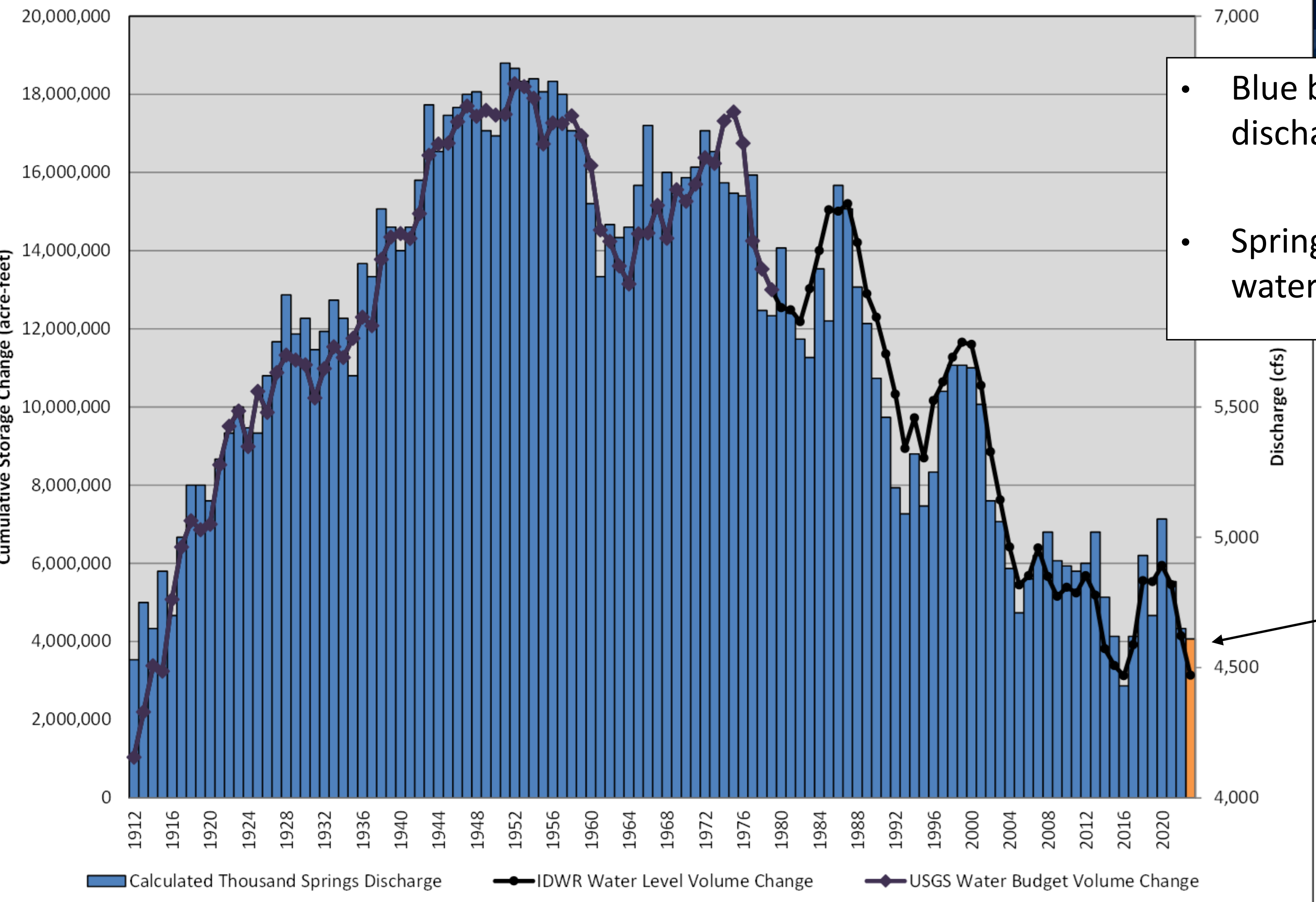
Current Calculation Method

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

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



ESPA Change in Volume of Water and Thousand Springs Discharge

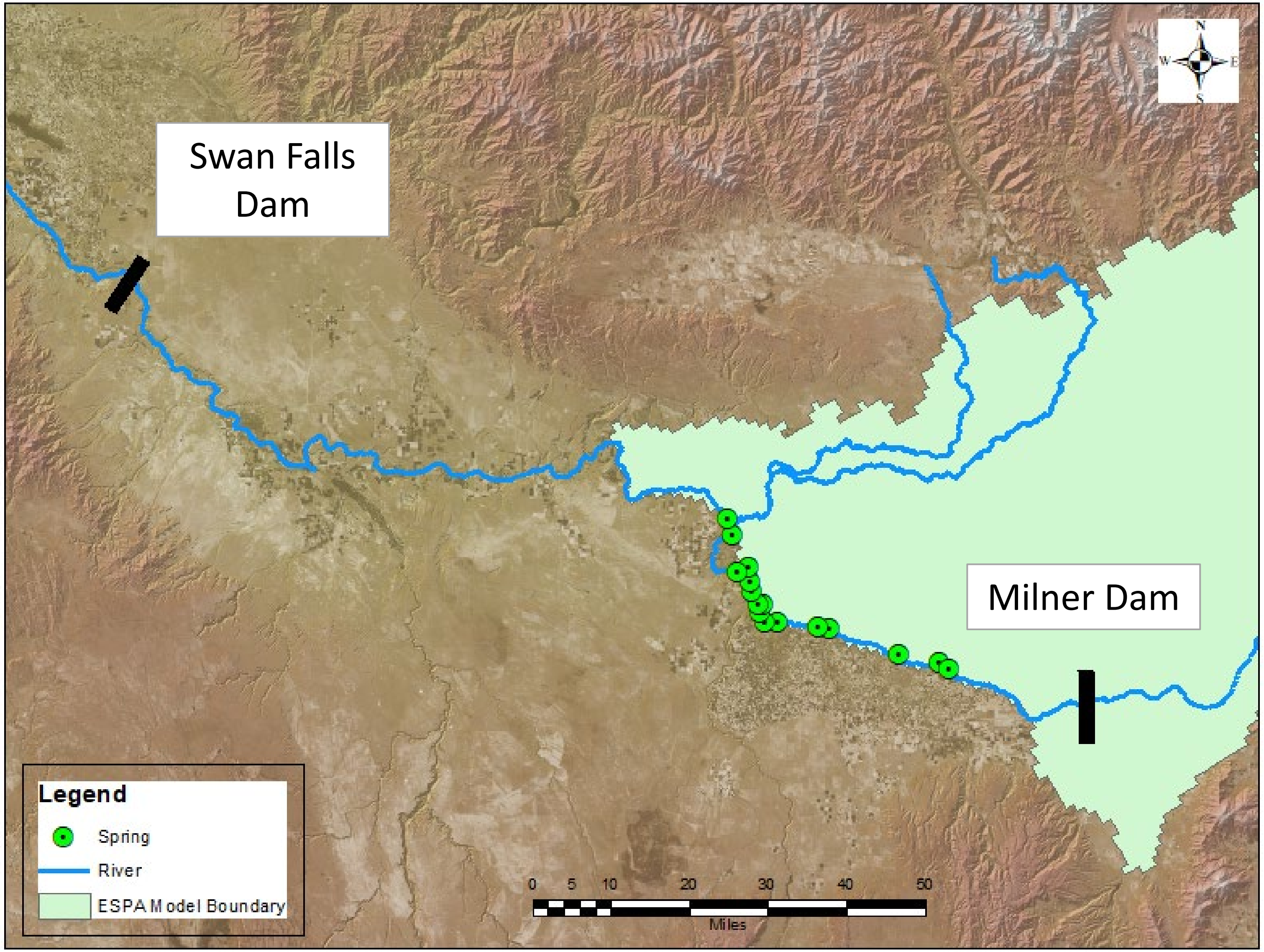


- Blue bars are the calculated discharge from Thousand Springs.
- Spring discharge is an indicator of water storage in the ESPA.

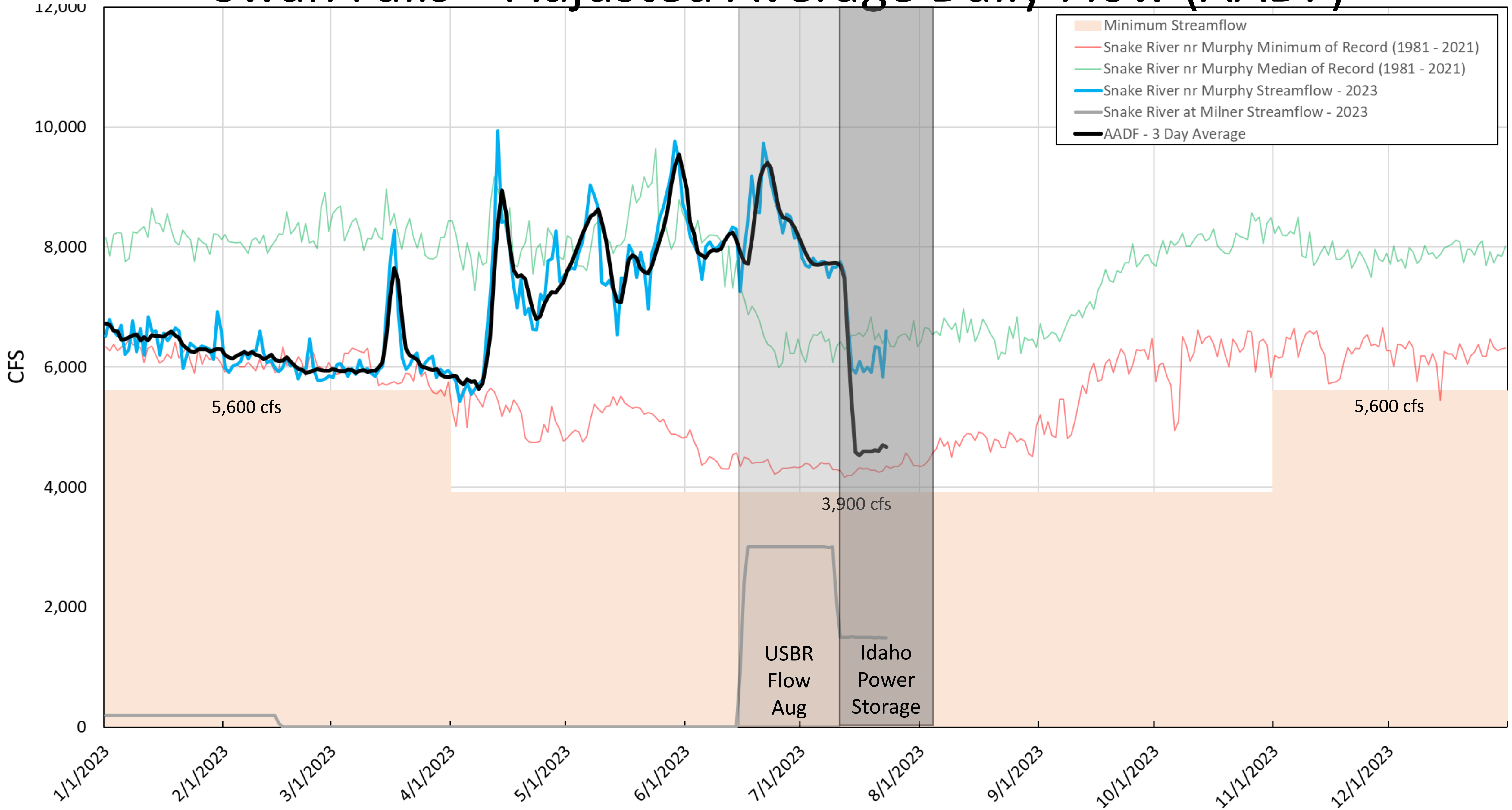
2023 value is preliminary

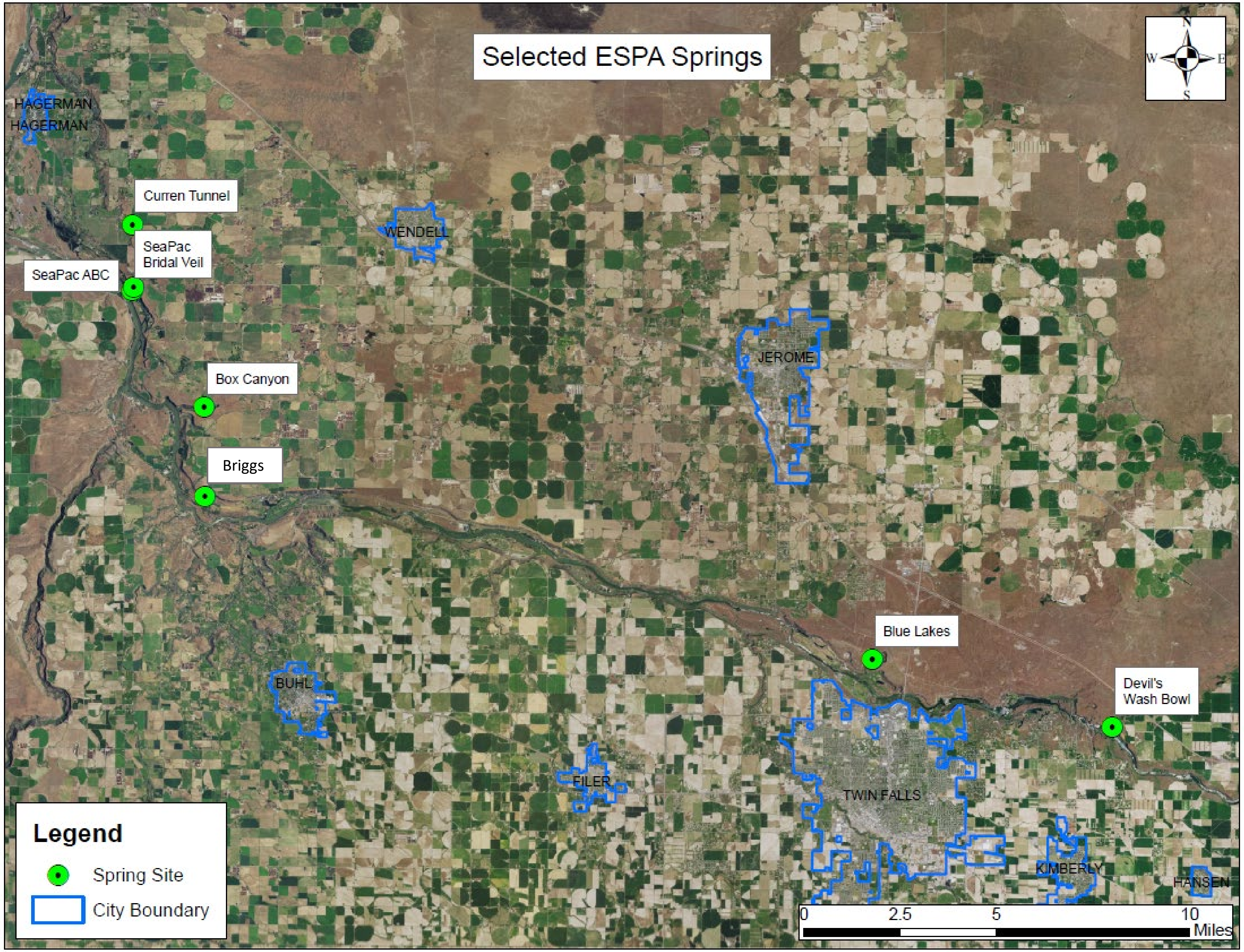
IDAHO DEPARTMENT OF WATER RESOURCES

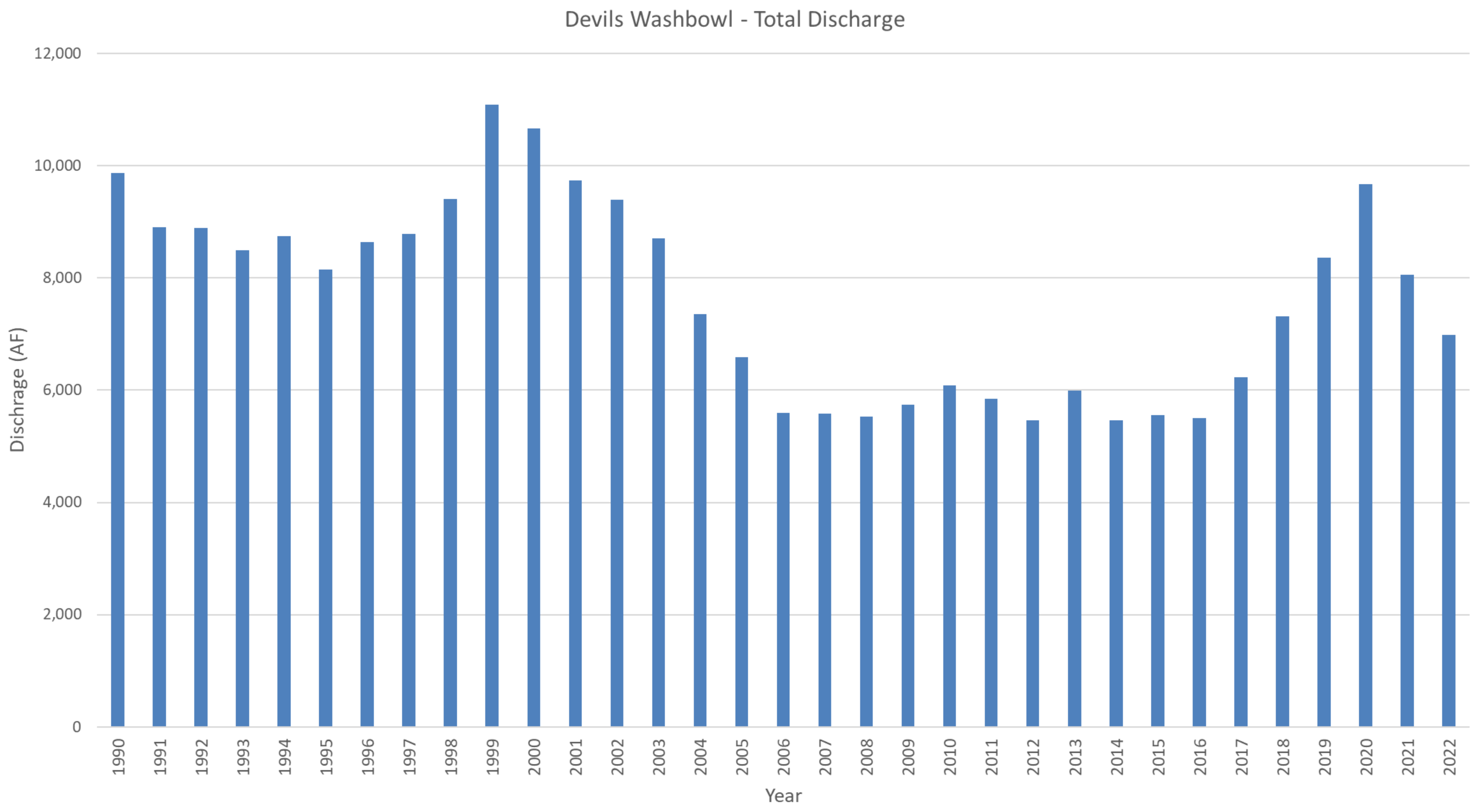
Spring Discharge – Murphy Gage



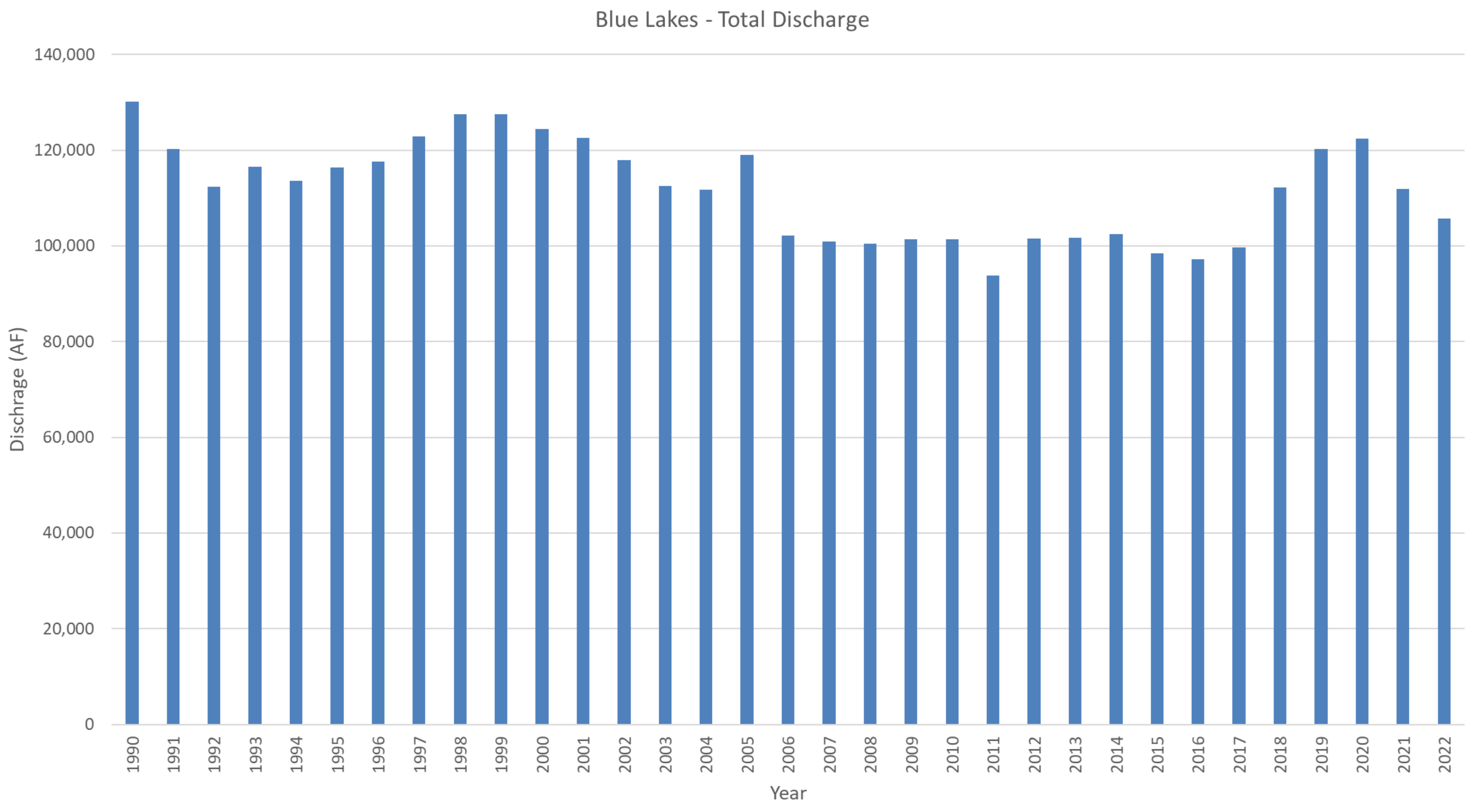
Swan Falls – Adjusted Average Daily Flow (AADF)



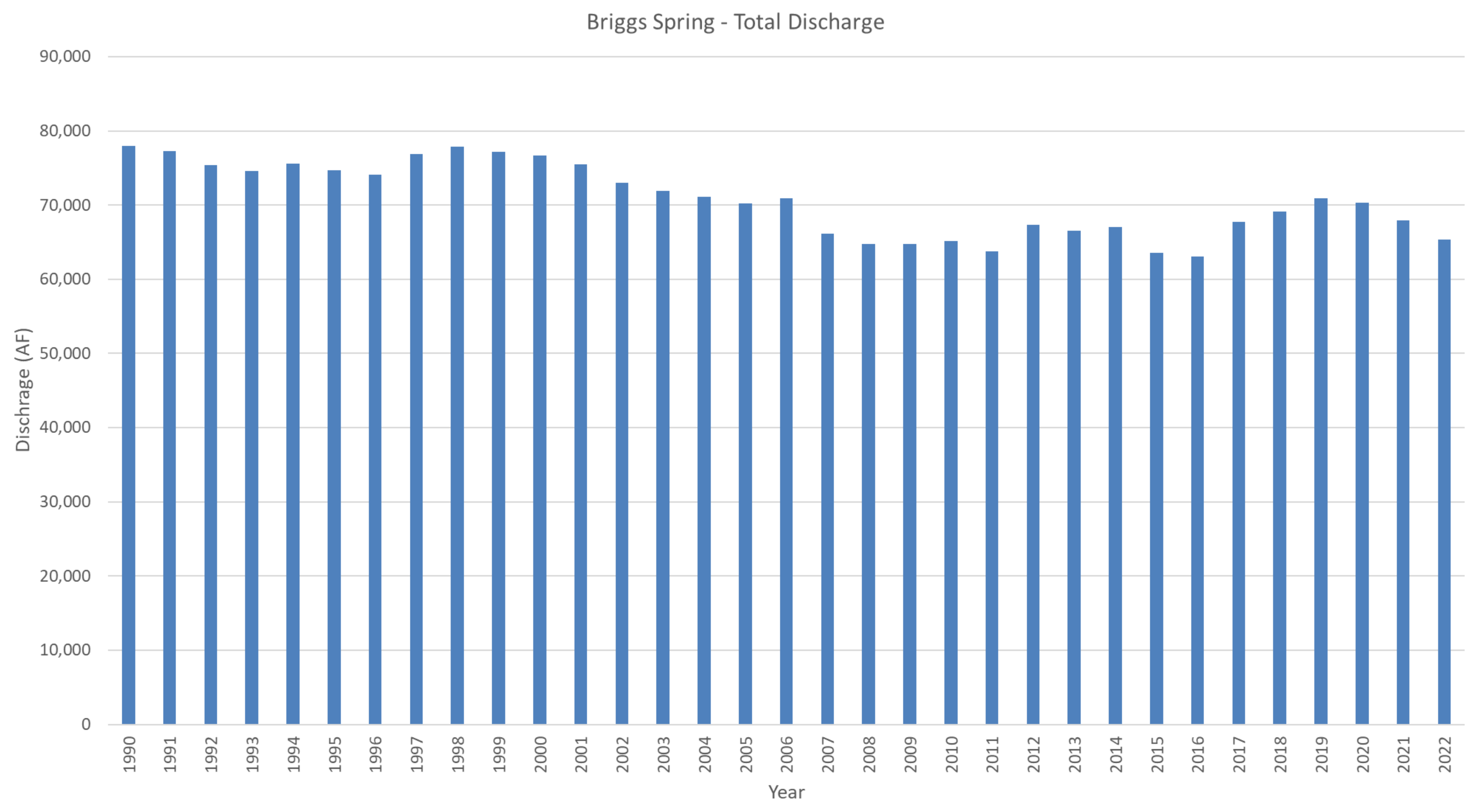

Selected ESPA Springs
N
W
E
S
HAGERMAN
HAGERMAN
Curren Tunnel
SeaPac Bridal Veil
SeaPac ABC
WENDELL
JEROME
Box Canyon
Briggs
Blue Lakes
Devil's Wash Bowl
BUHL
FILER
TWIN FALLS
KIMBERLY
HANSEN
Legend
Spring Site
City Boundary
0
2.5
5
10
Miles



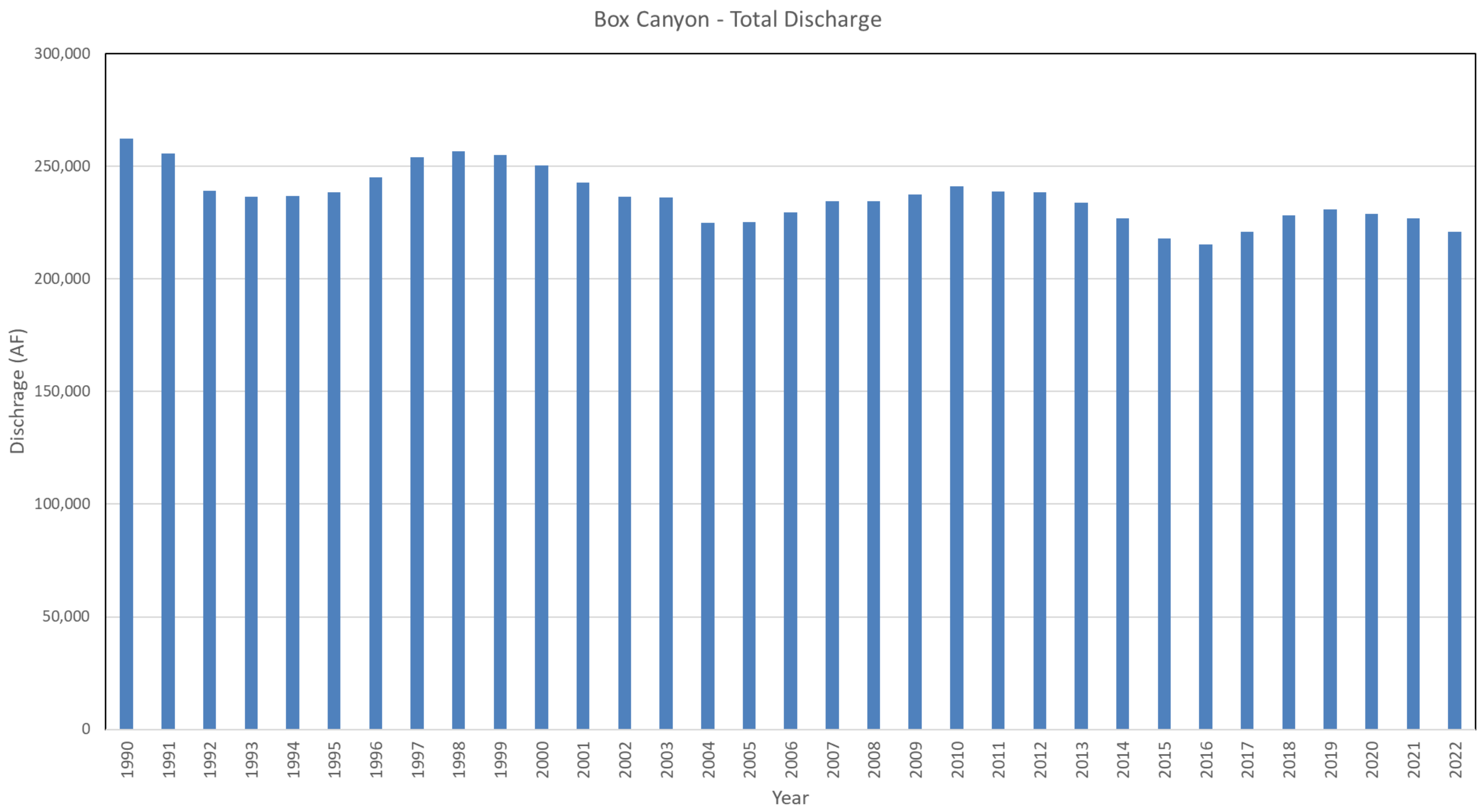
Devils Washbowl - Total Discharge
Dischrage (AF)
12,000
10,000
8,000
6,000
4,000
2,000
0
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022
Year

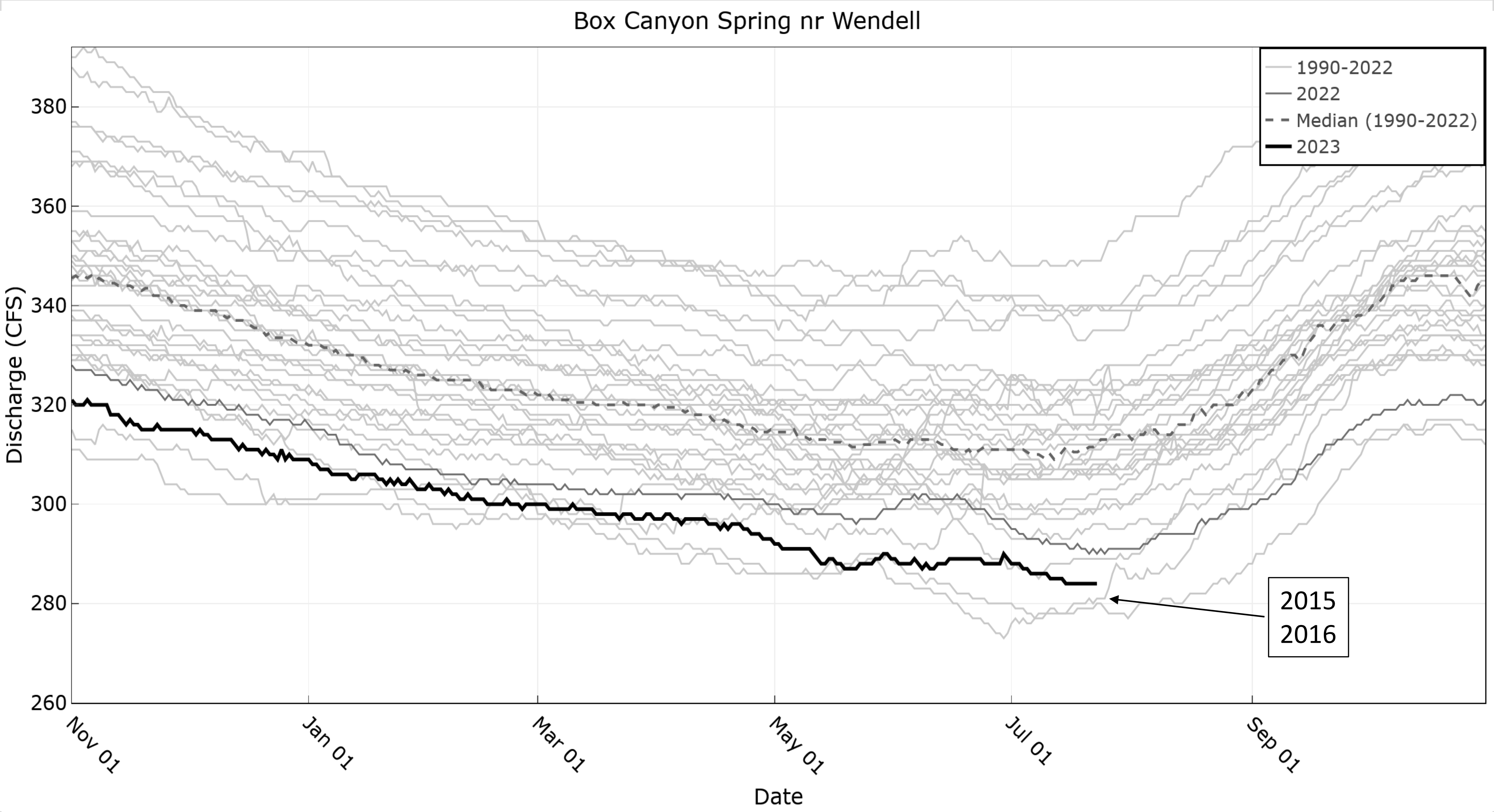


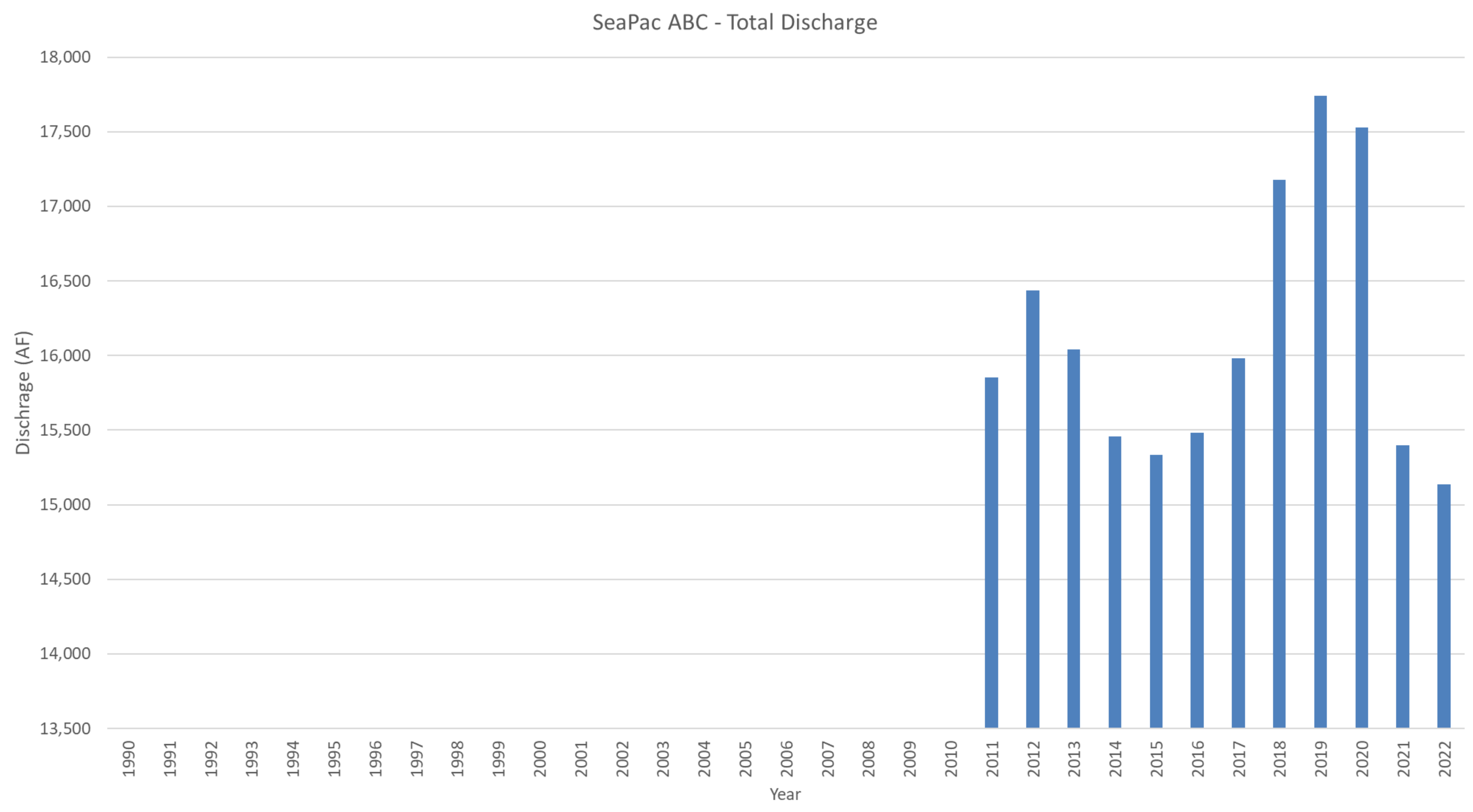
Blue Lakes - Total Discharge
Dischrage (AF)
0
20,000
40,000
60,000
80,000
100,000
120,000
140,000
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022
Year



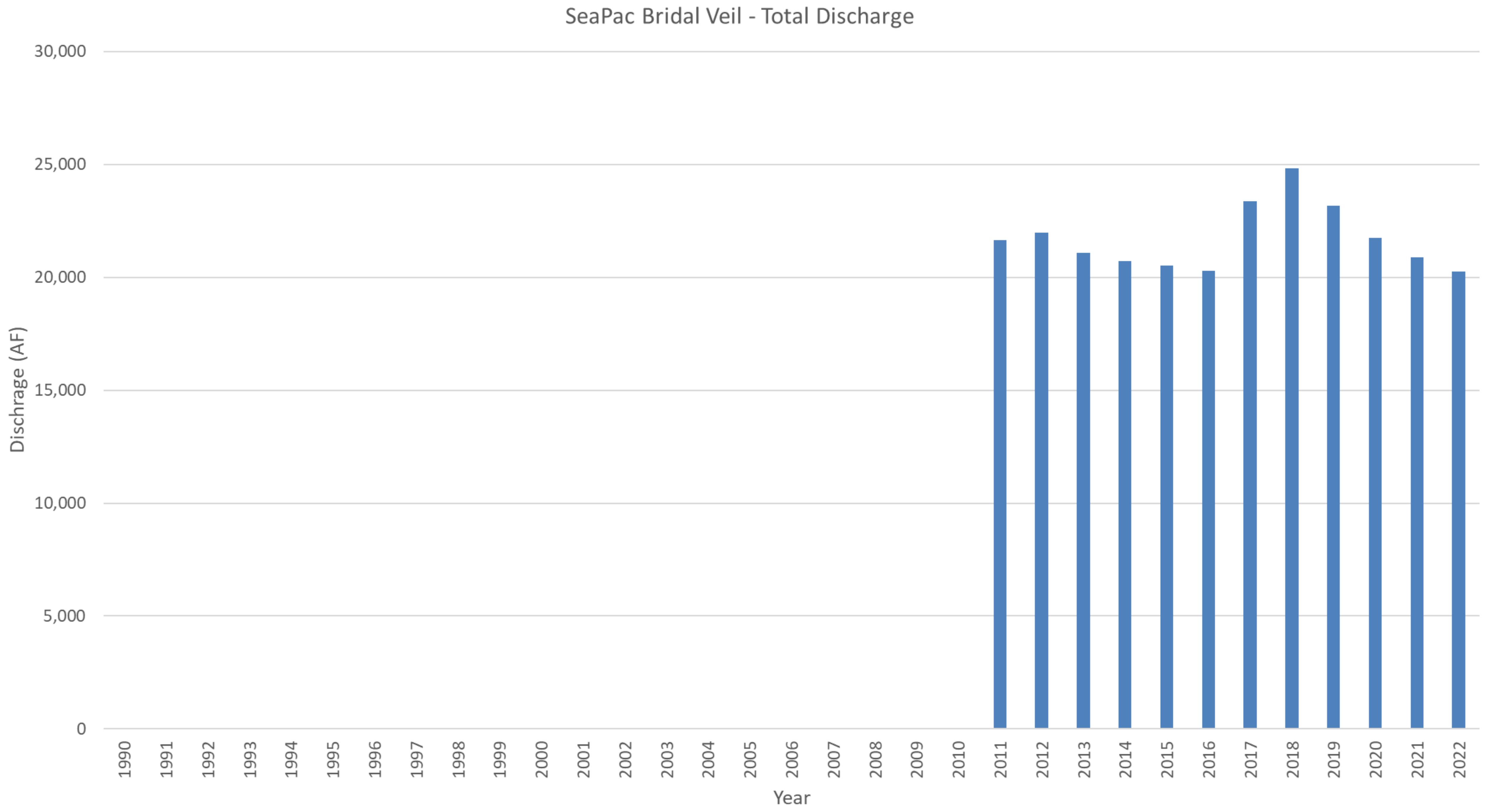
Briggs Spring - Total Discharge
90,000
80,000
70,000
60,000
50,000
40,000
30,000
20,000
10,000
0
Dischrage (AF)
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022
Year

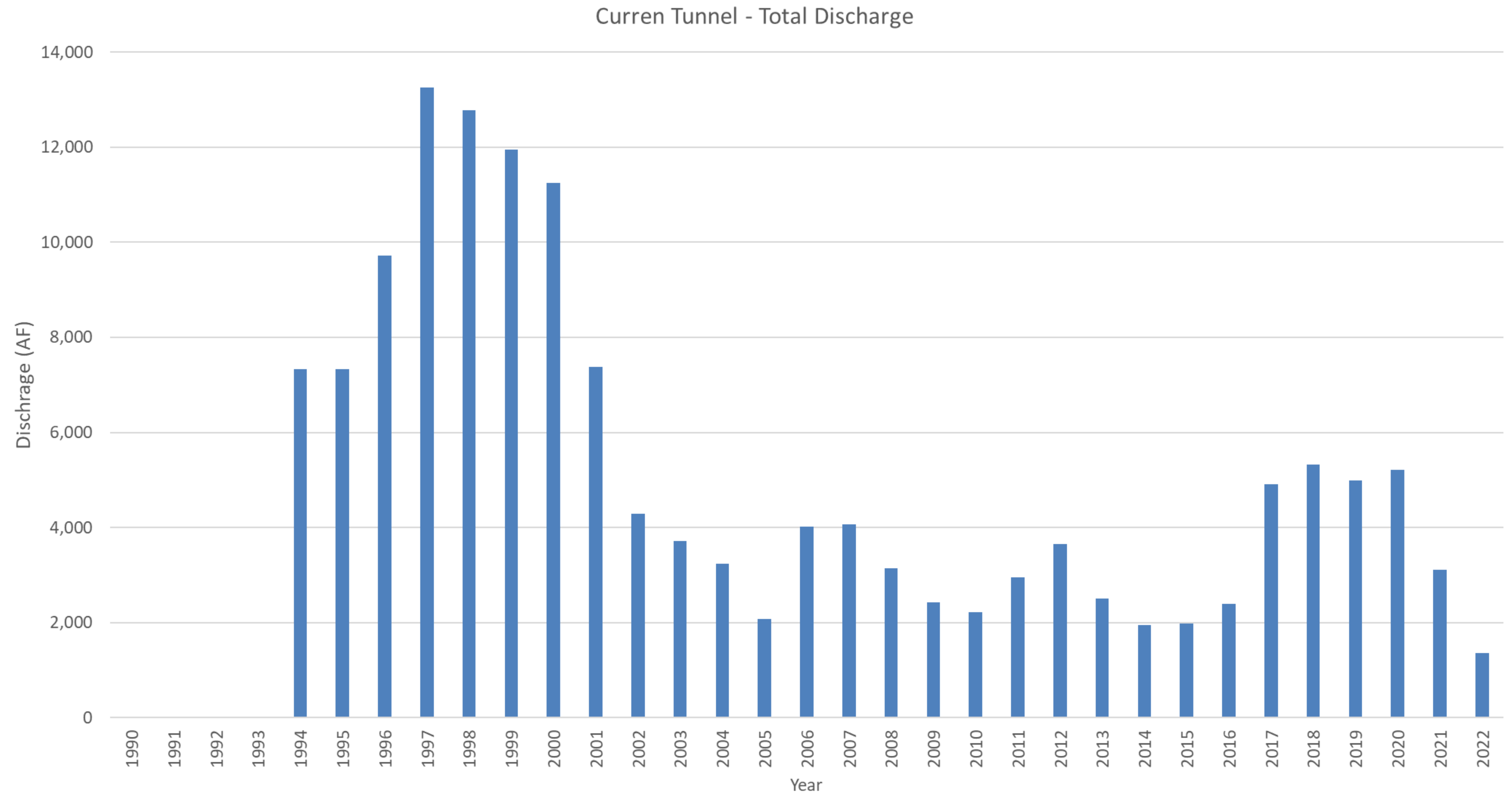

Box Canyon - Total Discharge
Dischrage (AF)
300,000
250,000
200,000
150,000
100,000
50,000
0
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022
Year


Box Canyon Spring nr Wendell
1990-2022
2022
Median (1990-2022)
2023
Discharge (CFS)
380
360
340
320
300
280
260
Nov 01
Jan 01
Mar 01
May 01
Jul 01
Sep 01
Date
2015
2016



SeaPac ABC - Total Discharge
Dischrage (AF)
18,000
17,500
17,000
16,500
16,000
15,500
15,000
14,500
14,000
13,500
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022
Year


SeaPac Bridal Veil - Total Discharge
30,000
25,000
20,000
15,000
10,000
5,000
0
Dischrage (AF)
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022
Year


Curren Tunnel - Total Discharge
Dischrage (AF)
14,000
12,000
10,000
8,000
6,000
4,000
2,000
0
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022
Year

Questions

ESPA Settlement Agreements: 2022 Activities

Brian Ragan

July 25, 2023

OUTLINE

1. Signatory Cities: 2022 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: 2022 Annual Progress Report
   - 240,000 acre feet annual reduction in ground water diversion

3. Sentinel Well 2023 Ground Water Level Index

City Settlement Agreement

2022 Annual Mitigation

7,631.1 AF

Source of Mitigation Water	Location	Activity Date	Is location authorized? Does location meet Agreement criteria?	Mitigation Amount (acre-feet)
City of Pocatello's Palisades Reservoir Storage	NA: Direct delivery to American Falls Reservoir District #2	-	Yes. See "2022 Agreement for Direct Delivery in Lieu of Aquifer Enhancement Activities"	6,290.2
Source 1. City of Idaho Falls storage allocation in Palisades Water Users, Inc.(504 acre-feet)	Sand Creek Site	8/2 - 9/18	Yes. ESPAM2.1 modeled 5-year retention of 17.8% (row 77, columns 160 and 161)	865.2
Source 2. Ground water to surface water conversion	Pinecrest Golf Course & College of Eastern Idaho	2022	Yes. Section II.A.2.c of Agreement allows for GW to SW conversion	
Rexburg Teton River surface water rights 22-203 and 22-204C	Walters Pond	4/15 - 4/29	Yes. ESPAM2.1 modeled 5-year retention of 44.3% (row 59, column 183)	475.7

Average Annual Mitigation

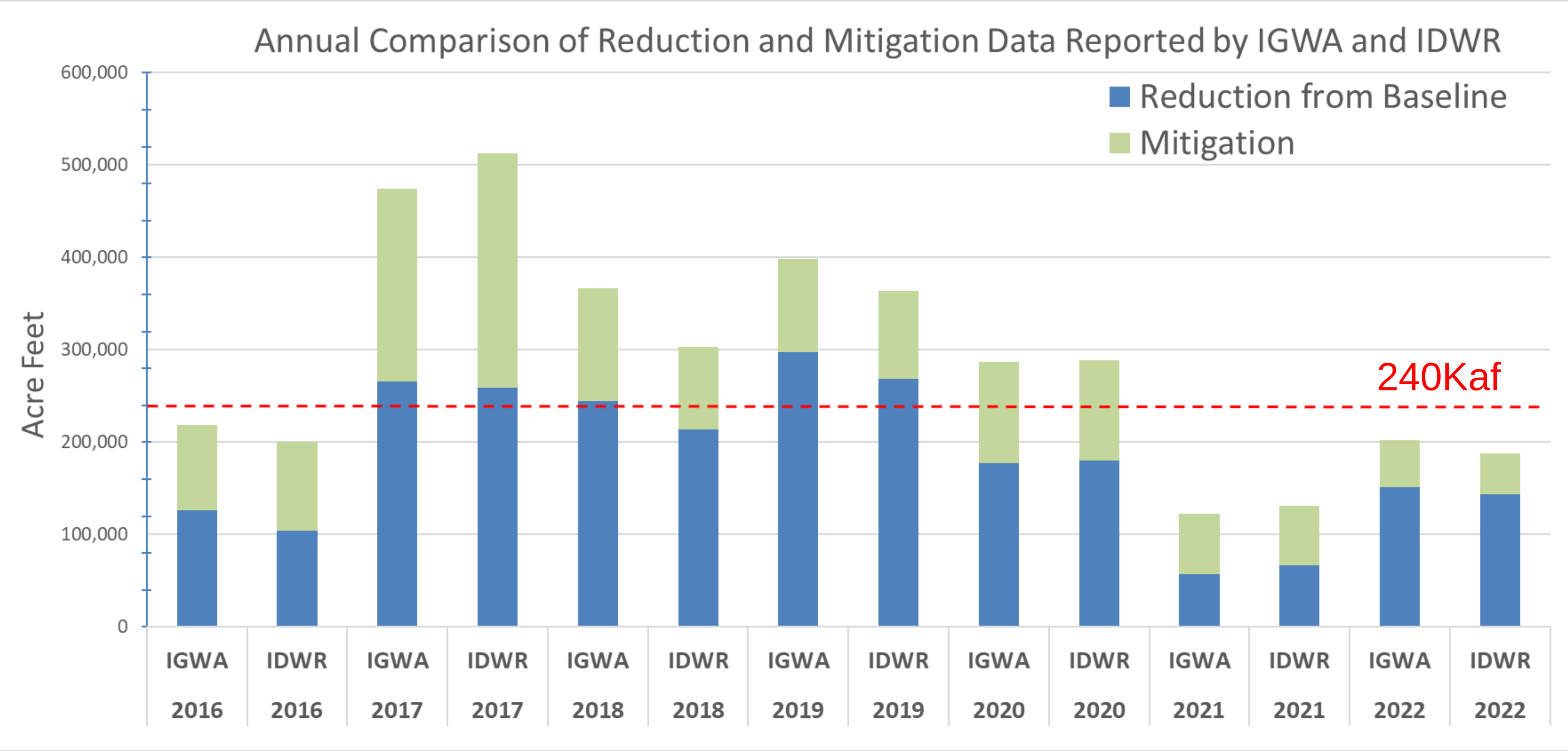
7,816.1 AF

	2019	2020	2021*	2022	2023
Total City Mitigation Amount (acre-feet)	8,169.4	7,813.8	7,650 (7247.4)	7,631.1	

Five Year Average
7,816.1

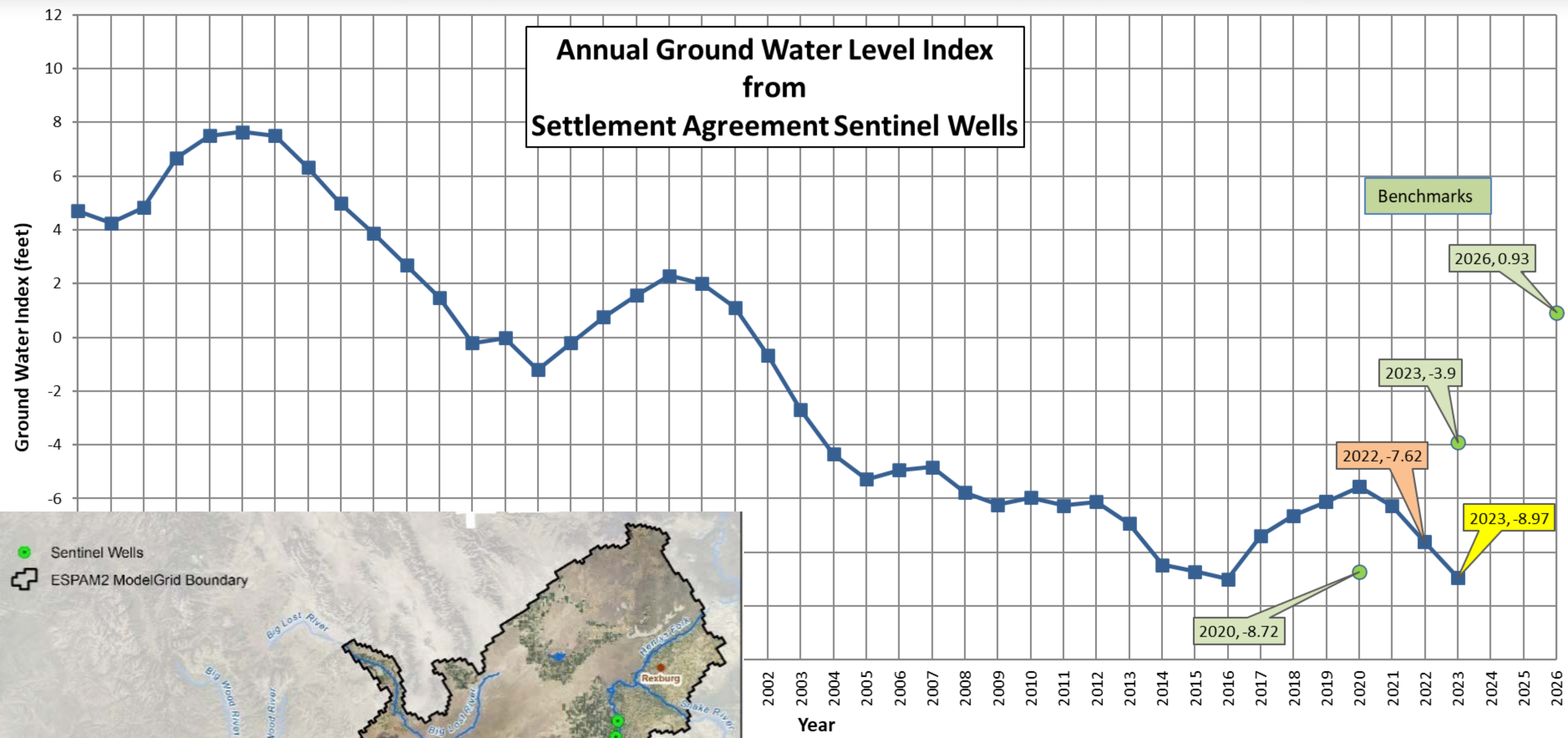
IGWA 2022 Progress Report

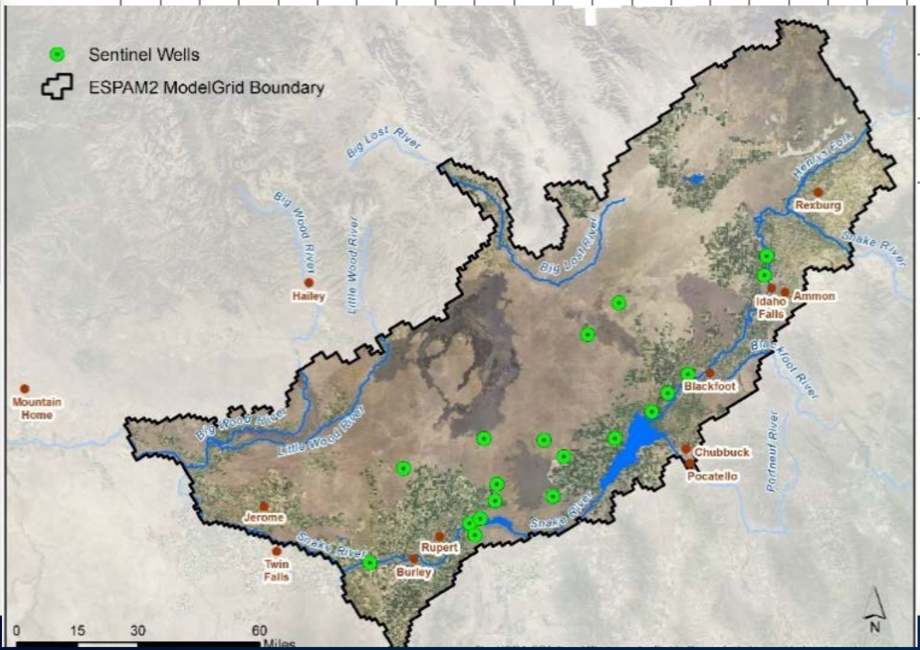
	IGWA	IDWR	IDWR Relative to IGWA
5-Year Baseline	1,787,002	1,778,055	-0.5%
	-		
2022 Usage (AF)	1,635,349	1,634,224	-0.1%
	=		
2022 Reduction (AF)	151,653	143,831	-5.2%
	+		
2022 Mitigation/Recharge (AF)	50,948	44,264	-13.1%
	=		
Total Conservation (AF)	202,601	188,095	-7.2%
240,000 AF Short by:	(37,399)	(51,905)	38.8%



Annual Comparison of Reduction and Mitigation Data Reported by IGWA and IDWR
Reduction from Baseline
Mitigation
Acre Feet
600,000
500,000
400,000
300,000
200,000
100,000
0
240Kaf
IGWA 2016
IDWR 2016
IGWA 2017
IDWR 2017
IGWA 2018
IDWR 2018
IGWA 2019
IDWR 2019
IGWA 2020
IDWR 2020
IGWA 2021
IDWR 2021
IGWA 2022
IDWR 2022

IDAHO Department of Water Resources






Questions?

Modeled Aquifer Management Impacts, 2022-2023

Alex Moody,IDWR,P.G.

Presented July 25, 2023

IDAHO DEPARTMENT OF WATER RESOURCES

IDAHO WATER RESOURCE BOARD

1

ESPAM 2.2

How are recharge and conservation represented in the model

2

Quantifying aquifer recovery

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

3

Visualizing water level change

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

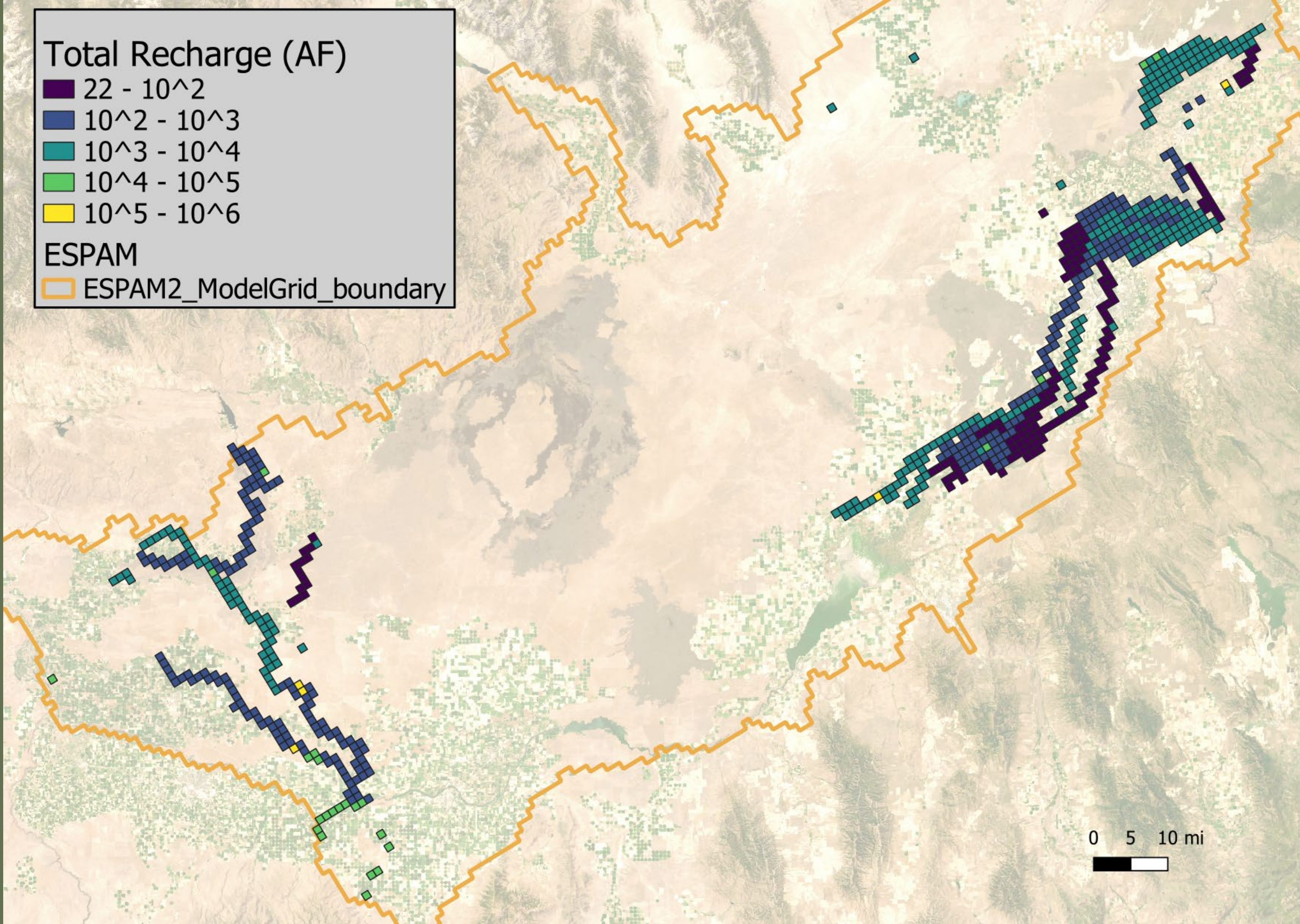
1

ESPAM 2.2

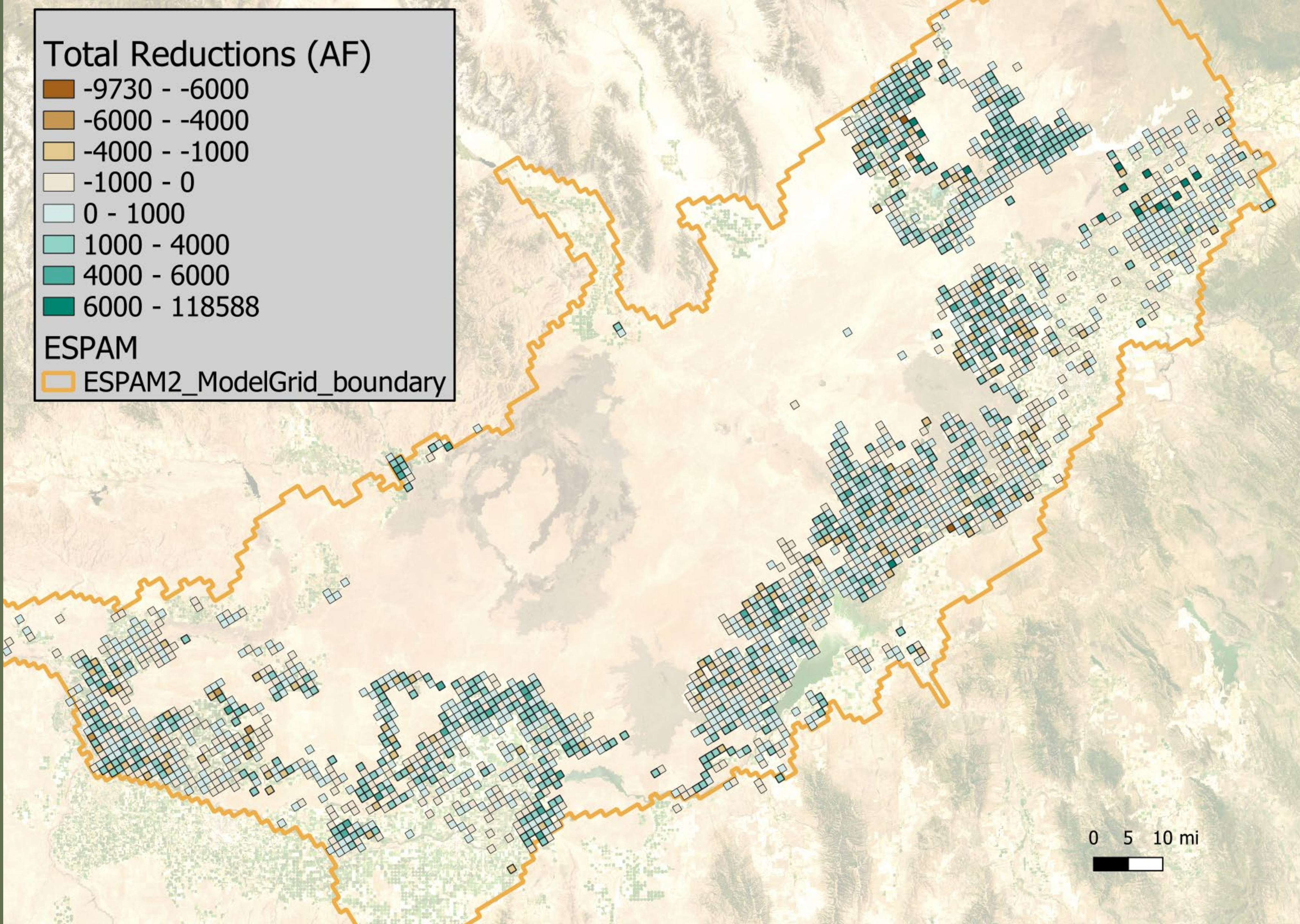
Model Inputs

- Monthly time steps
- Model Runs
  - Board recharge
    - Daily records summed to monthly
  - IGWA-City recharge
    - Annual total and timeframe to monthly
  - Pumping reductions
    - Annual total converted to monthly

ESPAM model
cell recharge



ESPAM model cell recharge

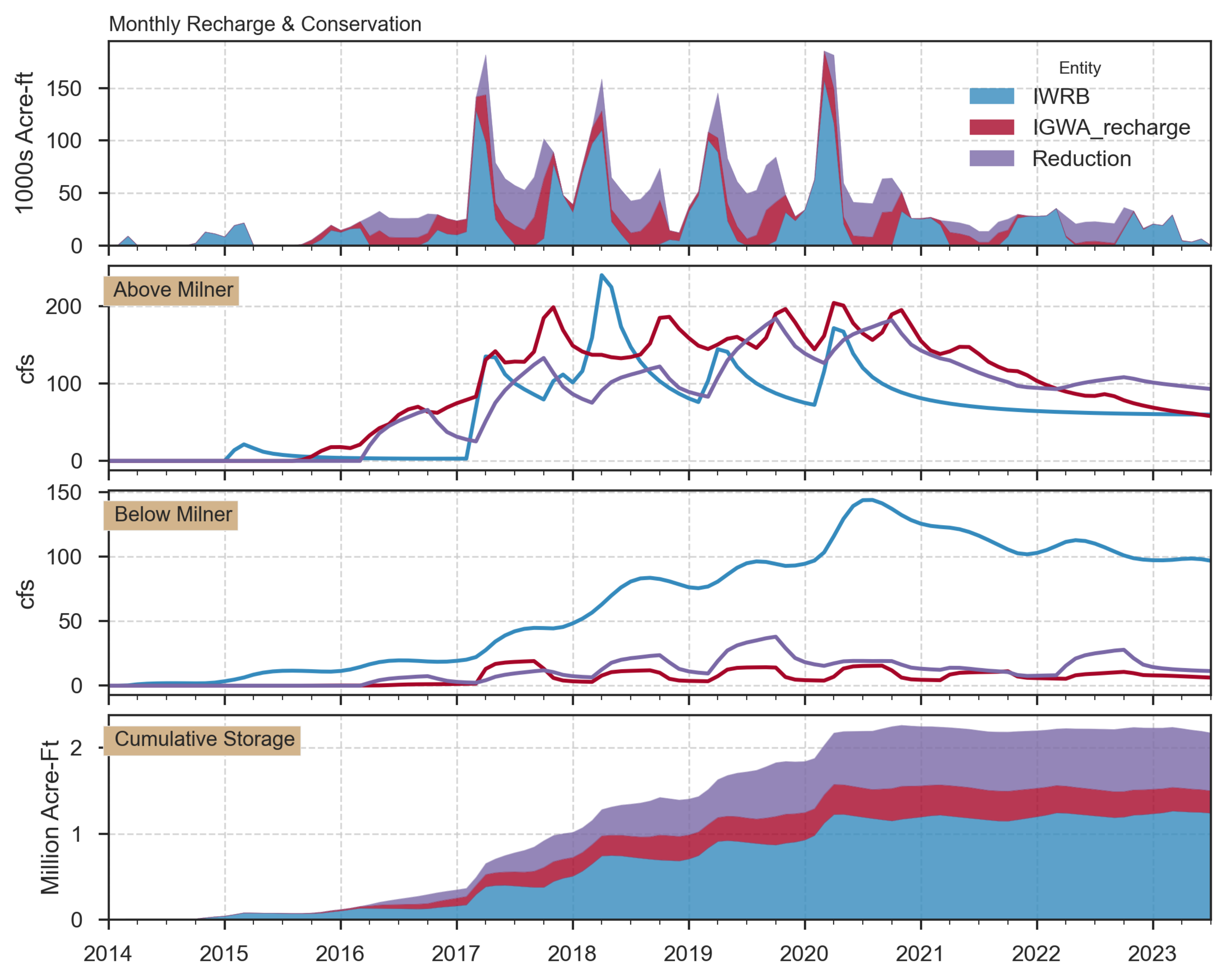


2

Quantifying aquifer recovery

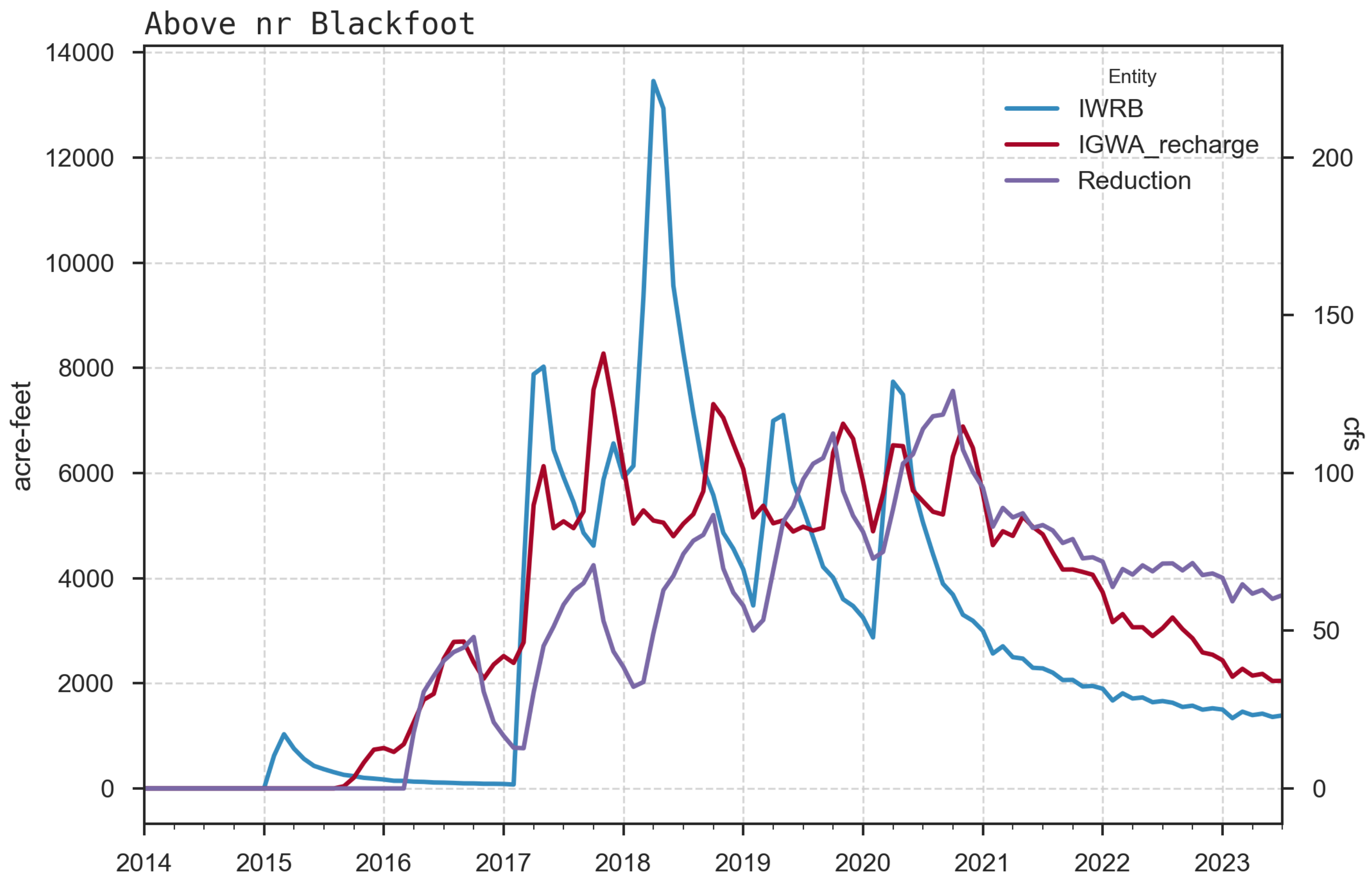
Aquifer Recharge and Discharge

- Pumping reductions yielding largest gains above Milner
- Majority of below Milner gains from Board recharge
- Current activities sustaining storage around 2.17 MAF



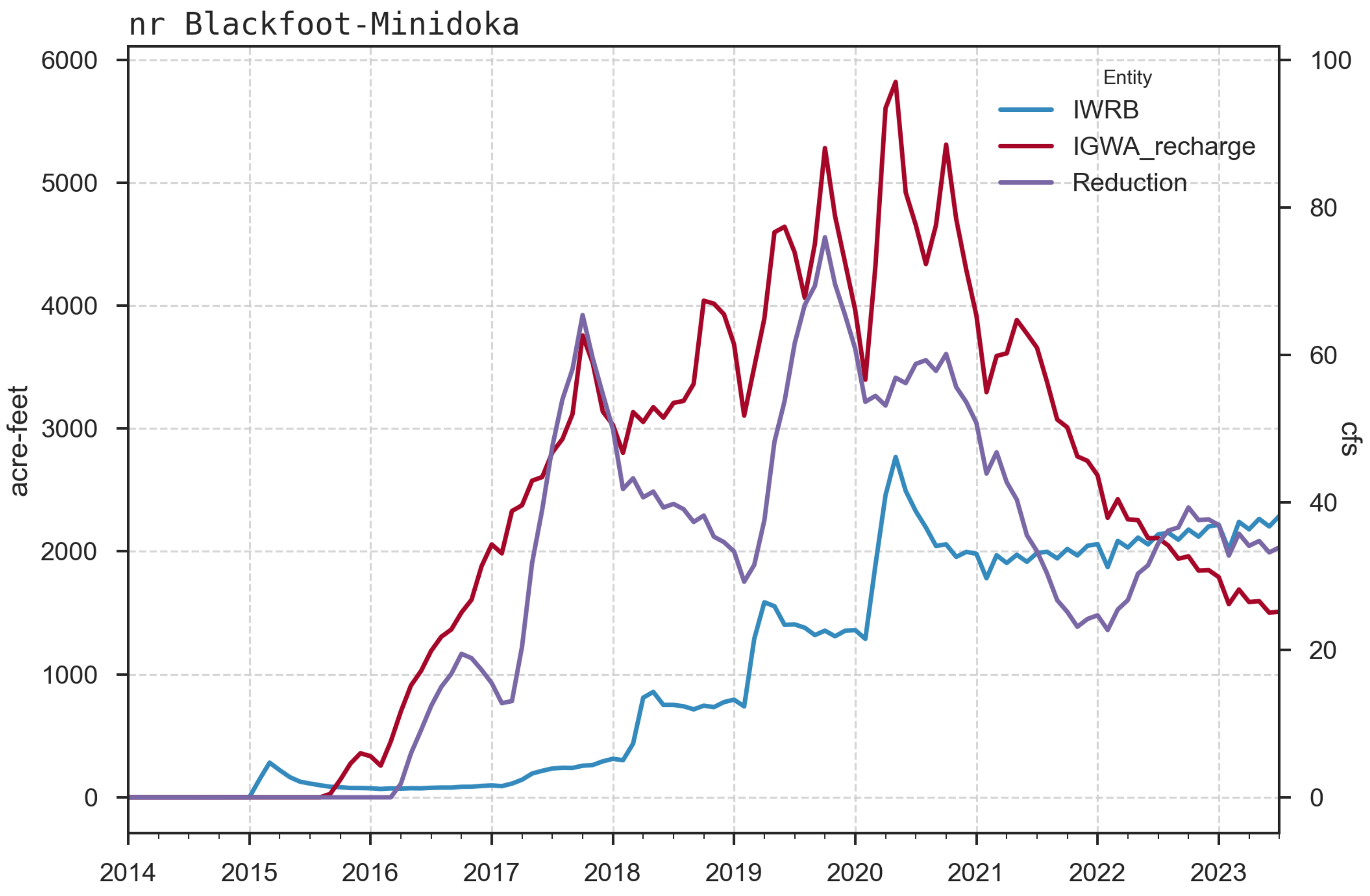
Above near Blackfoot

- Gain impacts decreasing
- Board recharge and IGWA pumping reductions have lower rate of decrease



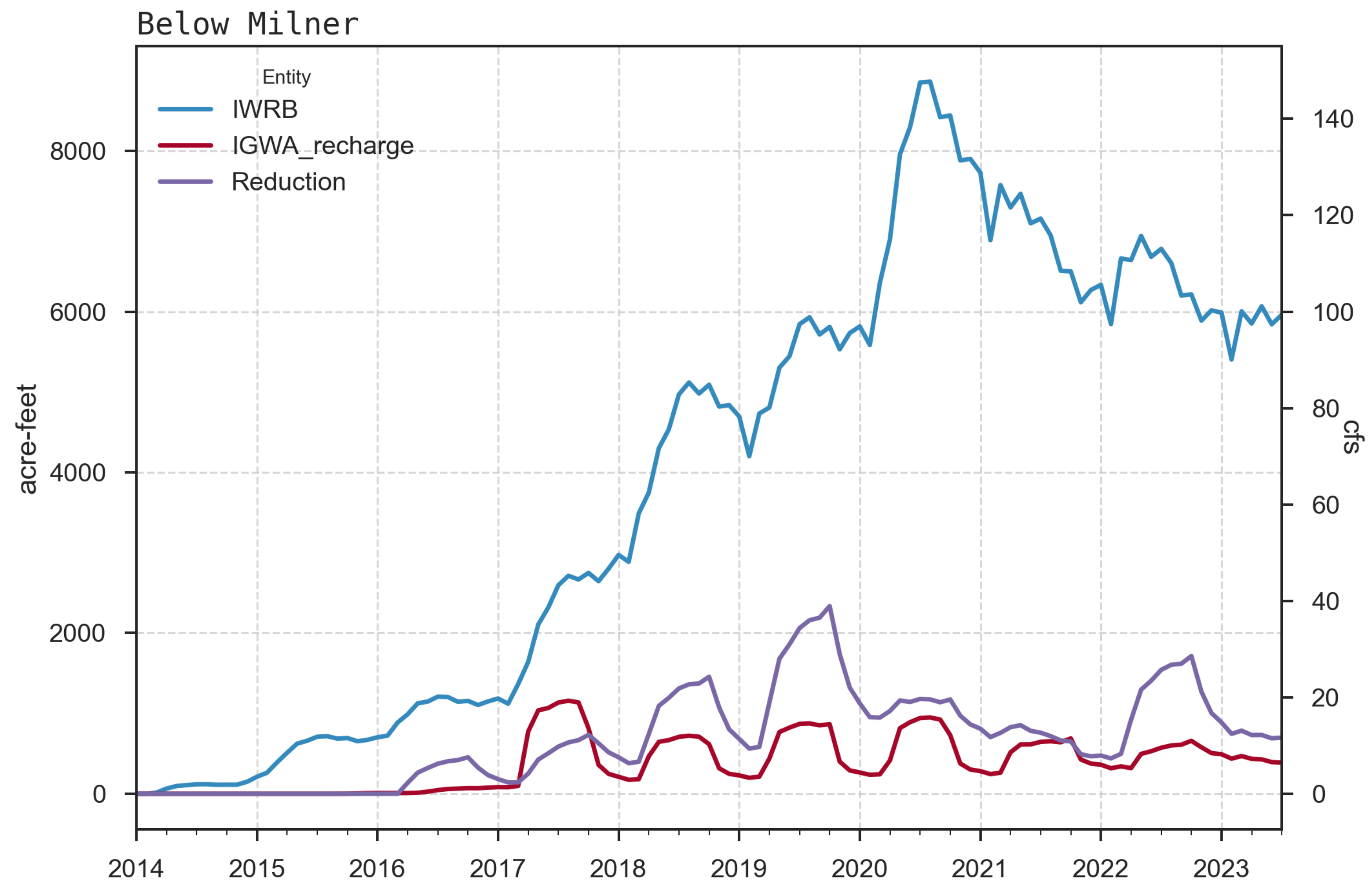
Near Blackfoot to Minidoka

- Gains from Board recharge continue a steady increase



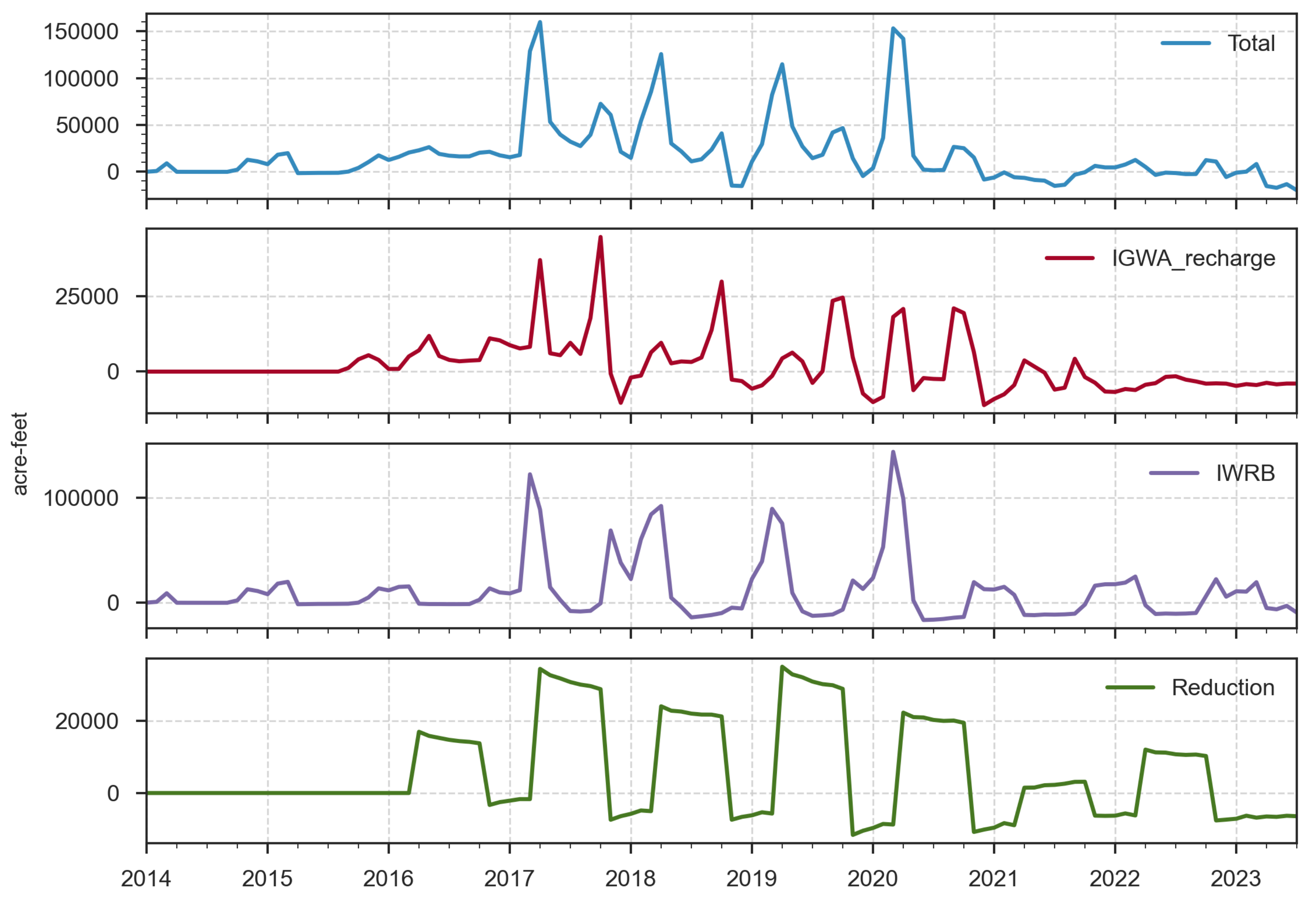
Below Milner

- Recent Board recharge has maintained ~100 cfs gains



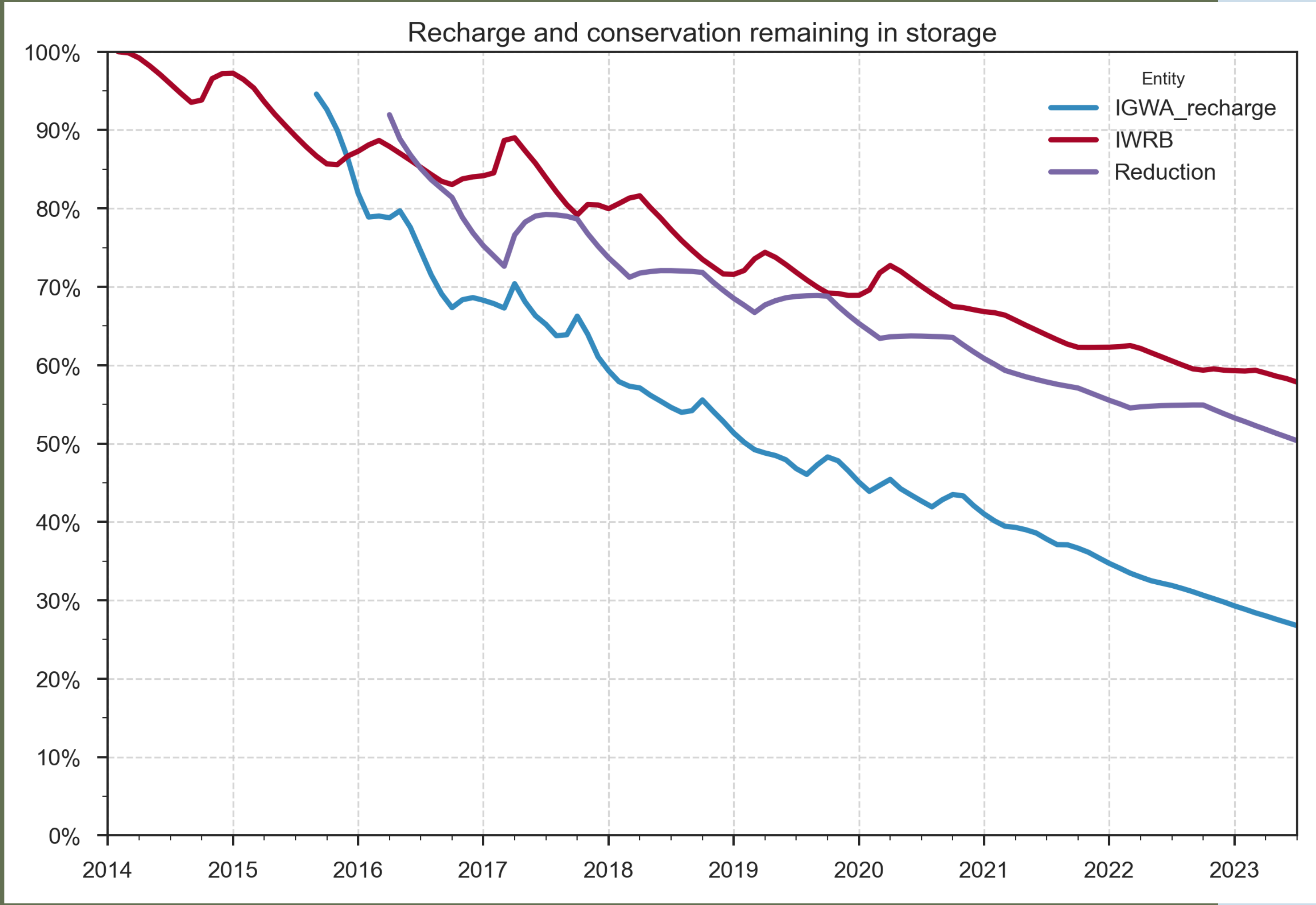
Storage change

- Board recharge filling storage while IGWA releasing and vice-versa
- IGWA recharge leaving storage since late 2021



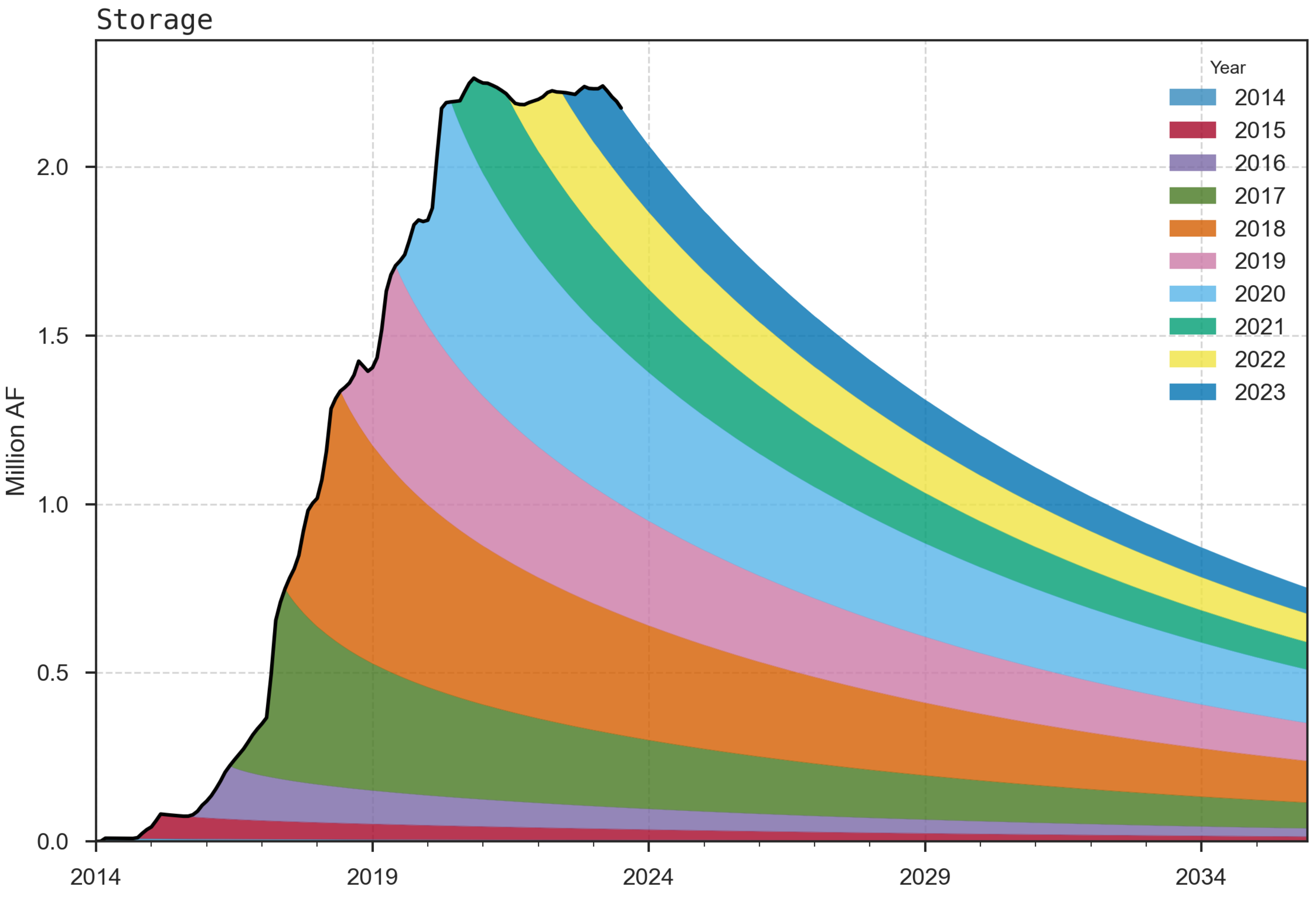
Storage retention

- Board: 58%
- Pumping: 50%
- IGWA-Cities: 27%

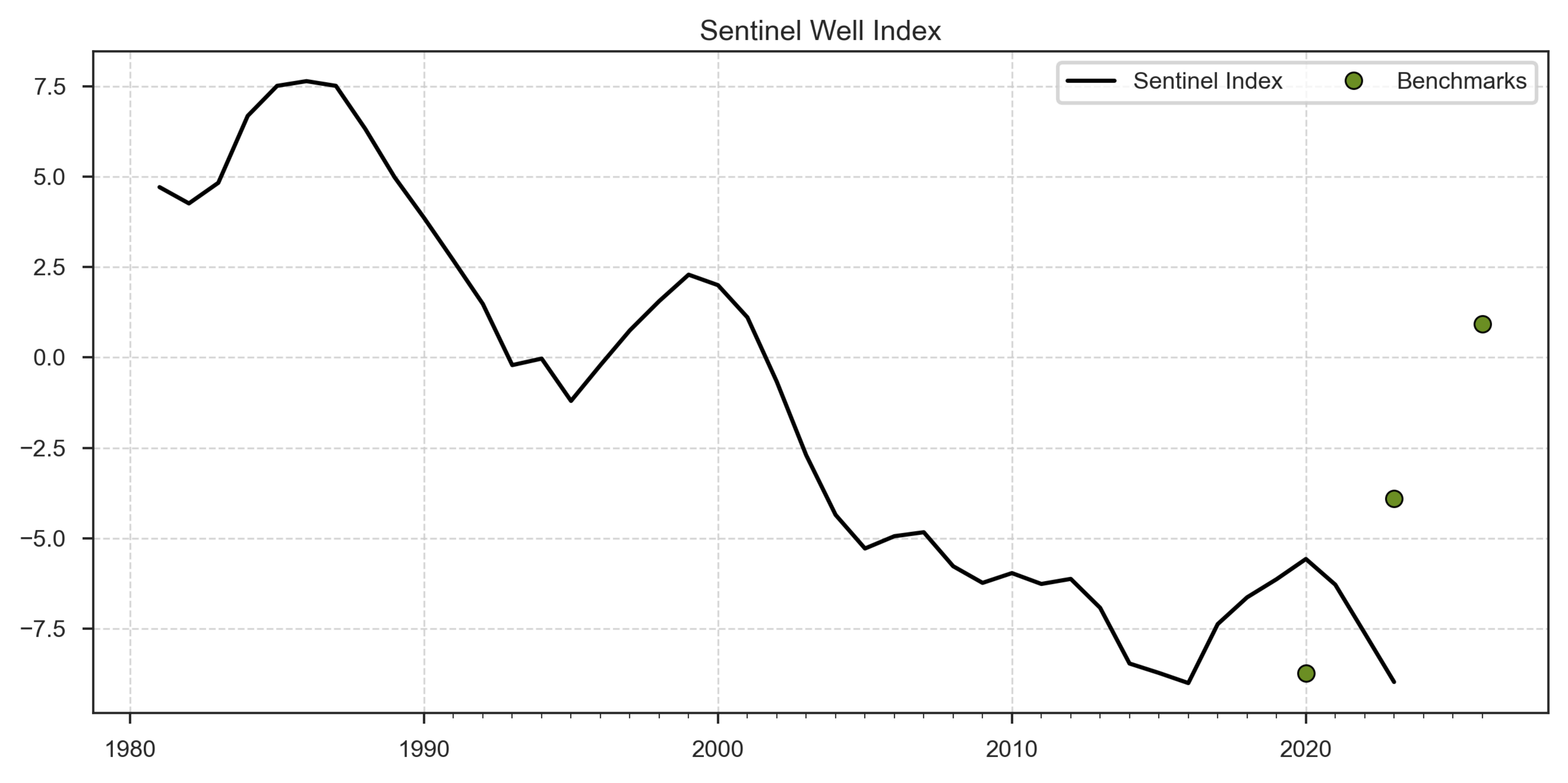


Storage Retention

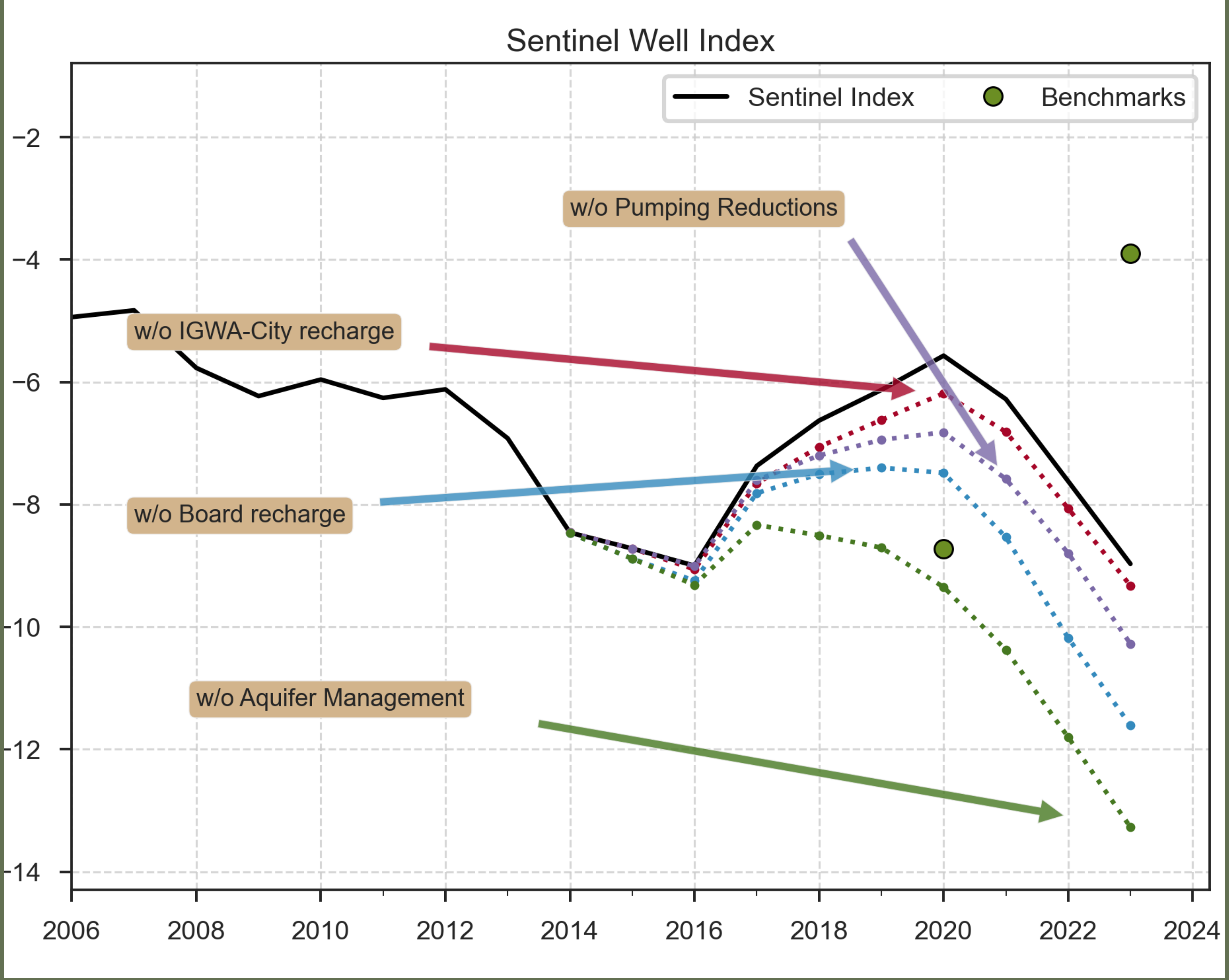
What volume of water from a given year* remains in aquifer storage?



** July-June*



- Sentinel well index 4.3 feet higher with recharge and conservation



- Sentinel well index 4.3 feet higher with recharge and conservation

3

Visualizing water level change

Observed data

Interpolations based on 309 wells with at least 4 measurements per year.

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

IGWA impacts

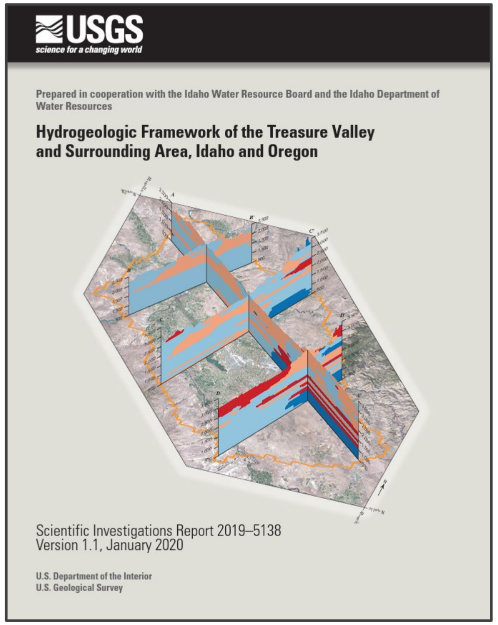
Conclusions

Sentinel well index is 4.3 ft higher due to aquifer management

2019 to 2020 management is largest proportion of storage, but all management since July 2014 is contributing to storage

Added 2.17 MAF to storage and 2.26 MAF to reach gains since start of program

Treasure Valley Model Recharge Scenarios

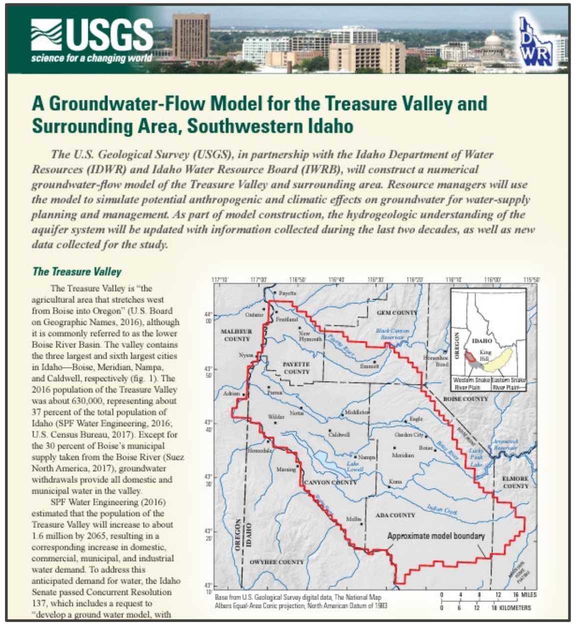

USGS
science for a changing world

Prepared in cooperation with the Idaho Water Resource Board and the Idaho Department of Water Resources

Hydrogeologic Framework of the Treasure Valley and Surrounding Area, Idaho and Oregon

Scientific Investigations Report 2019–5138
Version 1.1, January 2020

U.S. Department of the Interior
U.S. Geological Survey


USGS
science for a changing world

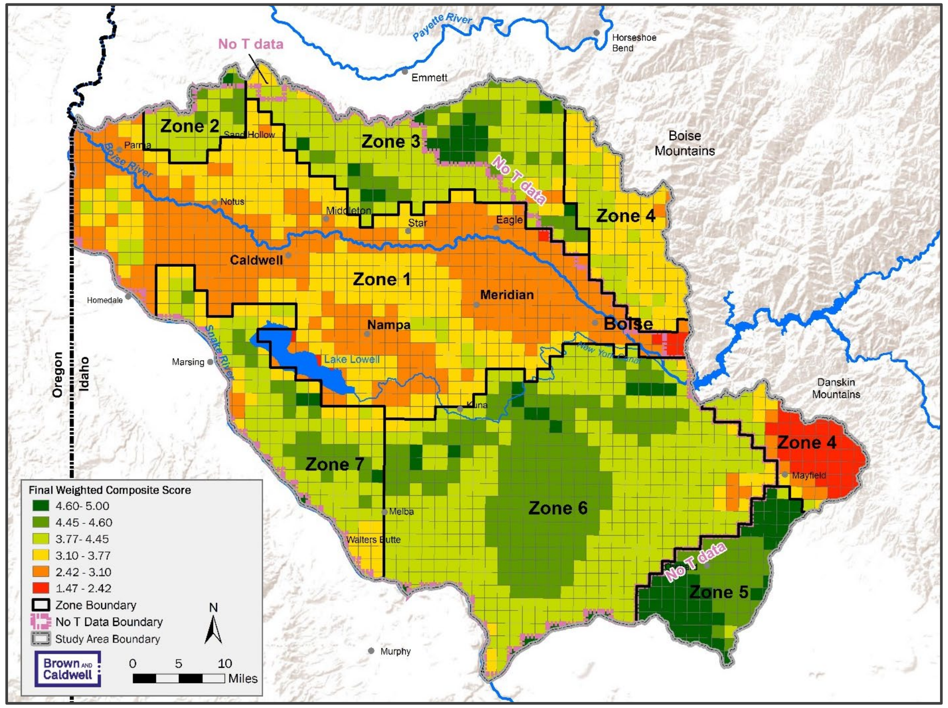
A Groundwater-Flow Model for the Treasure Valley and Surrounding Area, Southwestern Idaho

The U.S. Geological Survey (USGS), in partnership with the Idaho Department of Water Resources (IDWR) and Idaho Water Resource Board (IWRB), will construct a numerical groundwater-flow model of the Treasure Valley and surrounding area. Resource managers will use the model to simulate potential anthropogenic and climatic effects on groundwater for water-supply planning and management. As part of model construction, the hydrogeologic understanding of the aquifer system will be updated with information collected during the last two decades, as well as new data collected for the study.

The Treasure Valley

The Treasure Valley is "the agricultural area that stretches west from Boise into Oregon" (U.S. Board on Geographic Names, 2016), although it is commonly referred to as the lower Boise River Basin. The valley contains the three largest and sixth largest cities in Idaho—Boise, Meridian, Nampa, and Caldwell, respectively (fig. 1). The 2016 population of the Treasure Valley was about 630,000, representing about 37 percent of the total population of Idaho (SPF Water Engineering, 2016; U.S. Census Bureau, 2017). Except for the 30 percent of Boise's municipal supply taken from the Boise River (Suez North America, 2017), groundwater withdrawals provide all domestic and municipal water in the valley.

SPF Water Engineering (2016) estimated that the population of the Treasure Valley will increase to about 1.6 million by 2065, resulting in a corresponding increase in domestic, commercial, municipal, and industrial water demand. To address this anticipated demand for water, the Idaho Senate passed Concurrent Resolution 137, which includes a request to "develop a ground water model, with



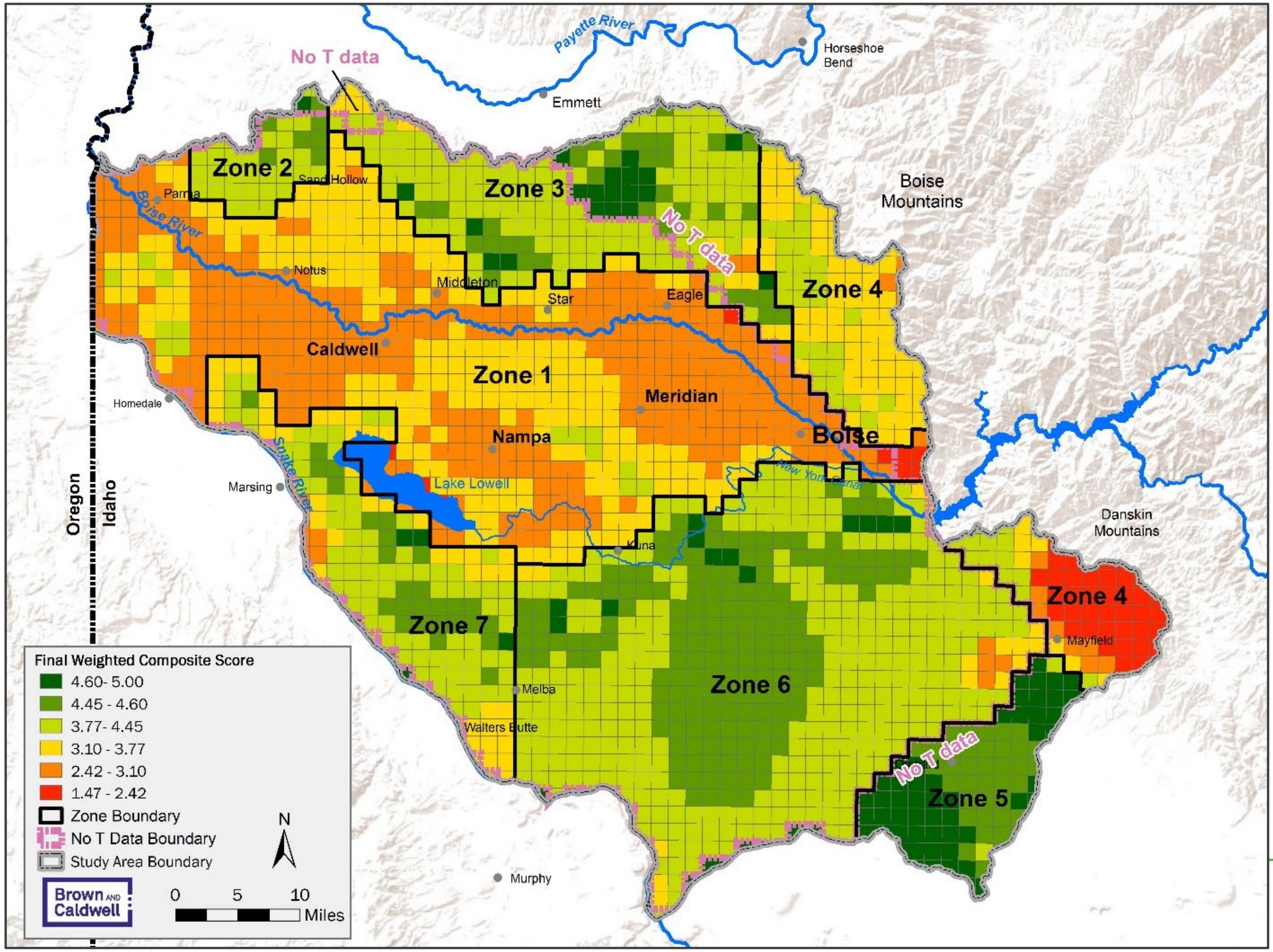
Presented by Craig Tesch, P.G.
Idaho Water Resource Board Aquifer Stabilization Committee
July 25, 2023

IDAHO DEPARTMENT OF WATER RESOURCES

Treasure Valley Modeling Efforts

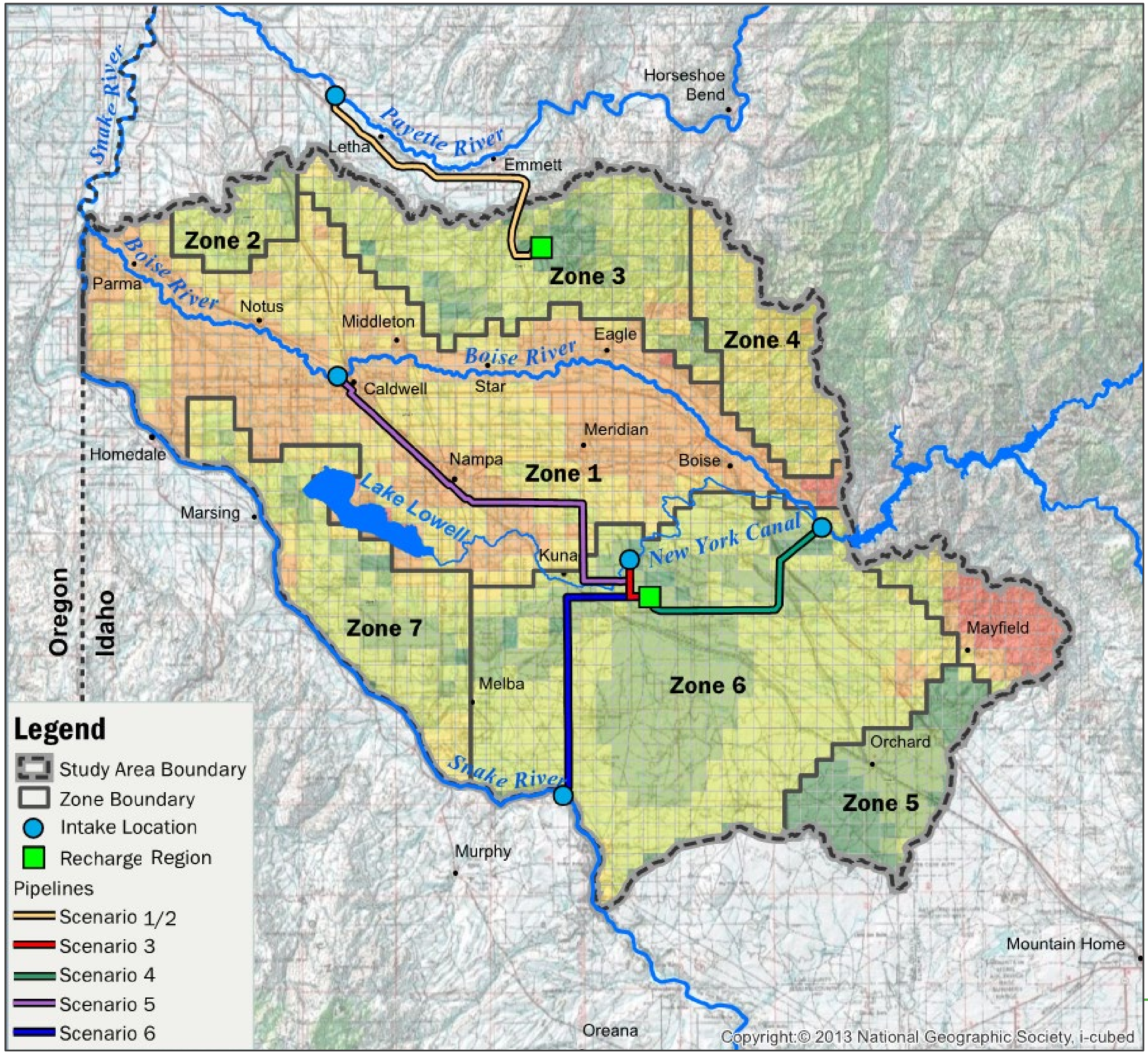
- June 2017 – IDWR/IWRB collaboration with the USGS to construct a new transient groundwater model started
    - IWRB funded, 5-year project
    - USGS built upon the steady-state TVHP model
    - IDWR chaired MTAC for stakeholder input and data sharing
- January 2020 – Hydrogeologic framework completed, USGS
- March 2020 – Recharge feasibility study completed, Brown & Caldwell
- January 2023 – TV groundwater flow model completed, USGS
- May 2023 – Begin recharge scenario work w/ new TV model, B&C

2020 MAR Feasibility Study



- GIS-based model with composite scores based on:
  - ✓Depth to water
  - ✓Aquifer T
  - ✓Land slope
  - ✓Surface geology
  - ✓Land use
  - ✓Surface water
  - ✓Contaminated sites
  - ✓Flood risk

IDAHO DEPARTMENT OF WATER RESOURCES



2020 MAR Feasibility Scenario Focus

Boise River water to Zone 6

- Scenario 3 – NY Canal, existing infrastructure
- Scenario 4 – New pipeline
- Scenario 5 – New pipeline

Snake River water to Zone 6

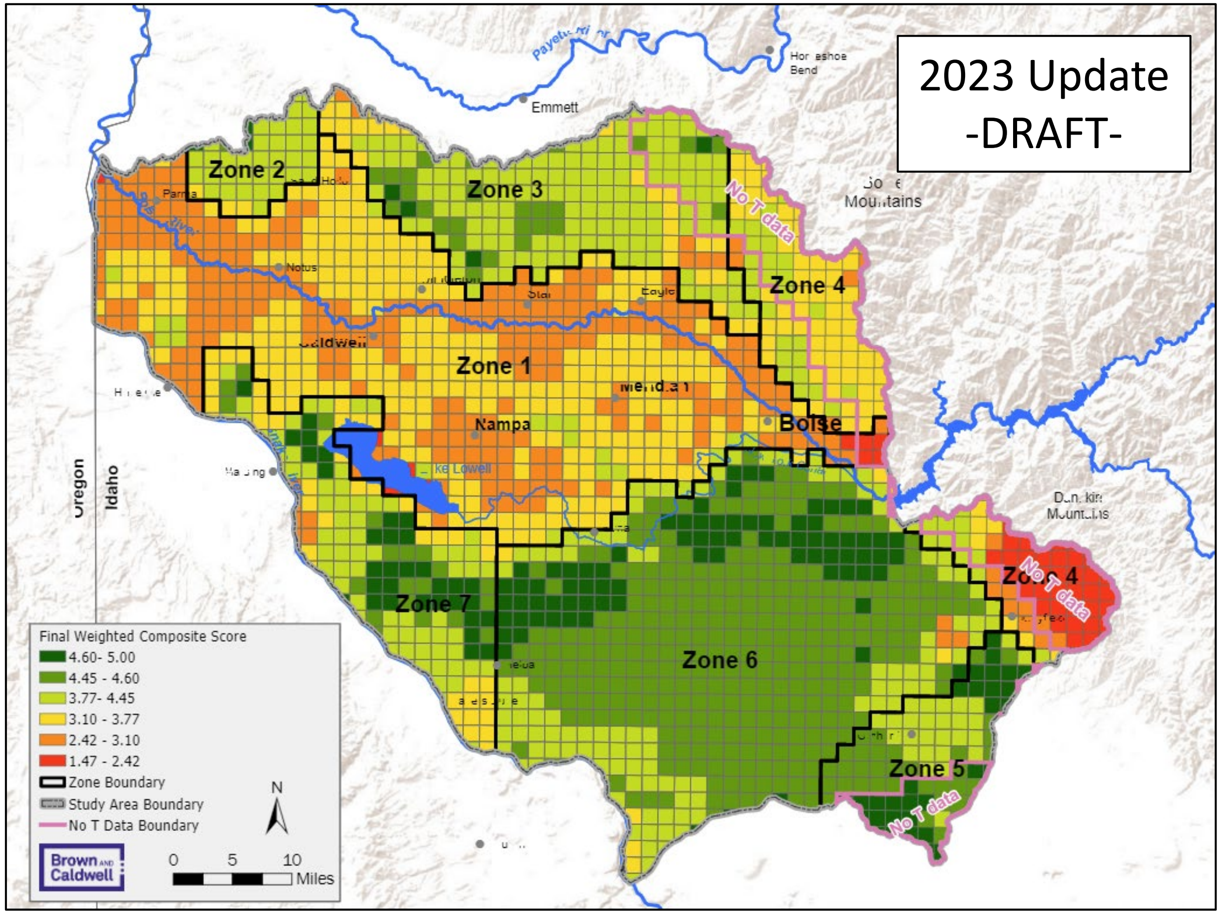
- Scenario 6 - New pipeline

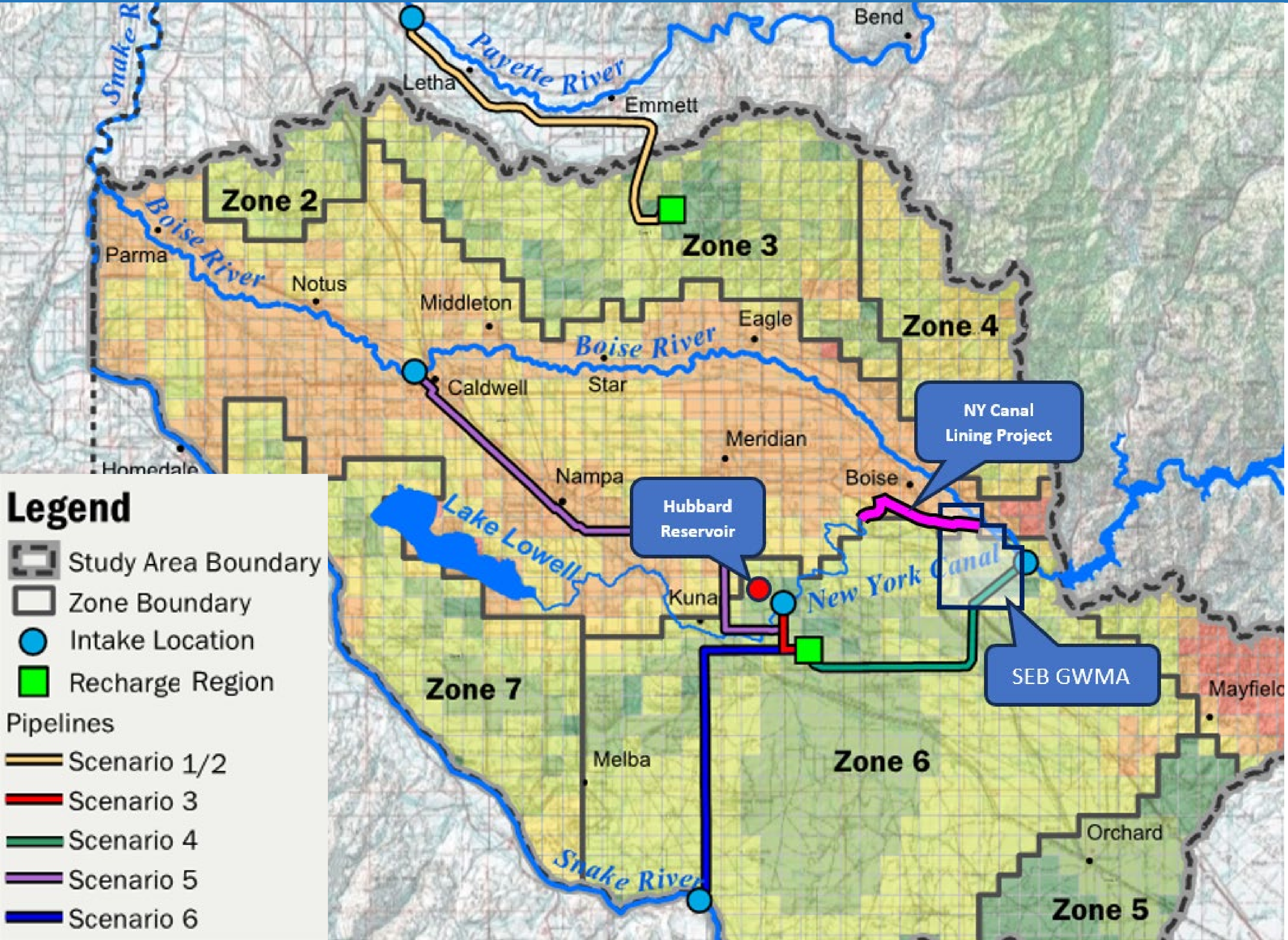
IDAHO DEPARTMENT OF WATER RESOURCES

2023 MAR Scenarios Contract

Main Components

1. Update 2020 GIS layers - draft
2. Develop work plan
   - Currently finalizing
   - Determining 6-8 scenarios
3. Run aquifer recharge scenarios
4. Reporting – May 2024
   - Effects on gw levels, river flow, drain discharge, aquifer interactions





2023 Proposed TV Model MAR Scenarios

- B&C Scenario 3
- B&C Scenario 4
- B&C Scenario 5
- B&C Scenario 6
- NY Canal lining
- SEB GWMA
- Hubbard Reservoir
- Undetermined


ZIONS BANK
us bank
GROVE HOTEL
Questions?