AGENDA

IDAHO WATER RESOURCE BOARD

Aquifer Stabilization Committee Meeting No. 2-24
Thursday, August 8, 2024
1:00 p.m. (MT) / Noon (PT)

Water Center
Conference Rooms 602 C & D
322 E. Front St.
BOISE

Livestream available at https://www.youtube.com/@iwrb

1. Introductions and Attendance
2. ESPA Aquifer Storage Update
3. ESPA Spring Discharge and Reach Gains Update
4. ESPA Aquifer Impacts
5. Raft River Hydrogeologic and Water Budget Analysis
6. ESPA Recharge Conveyance Contracts*
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.

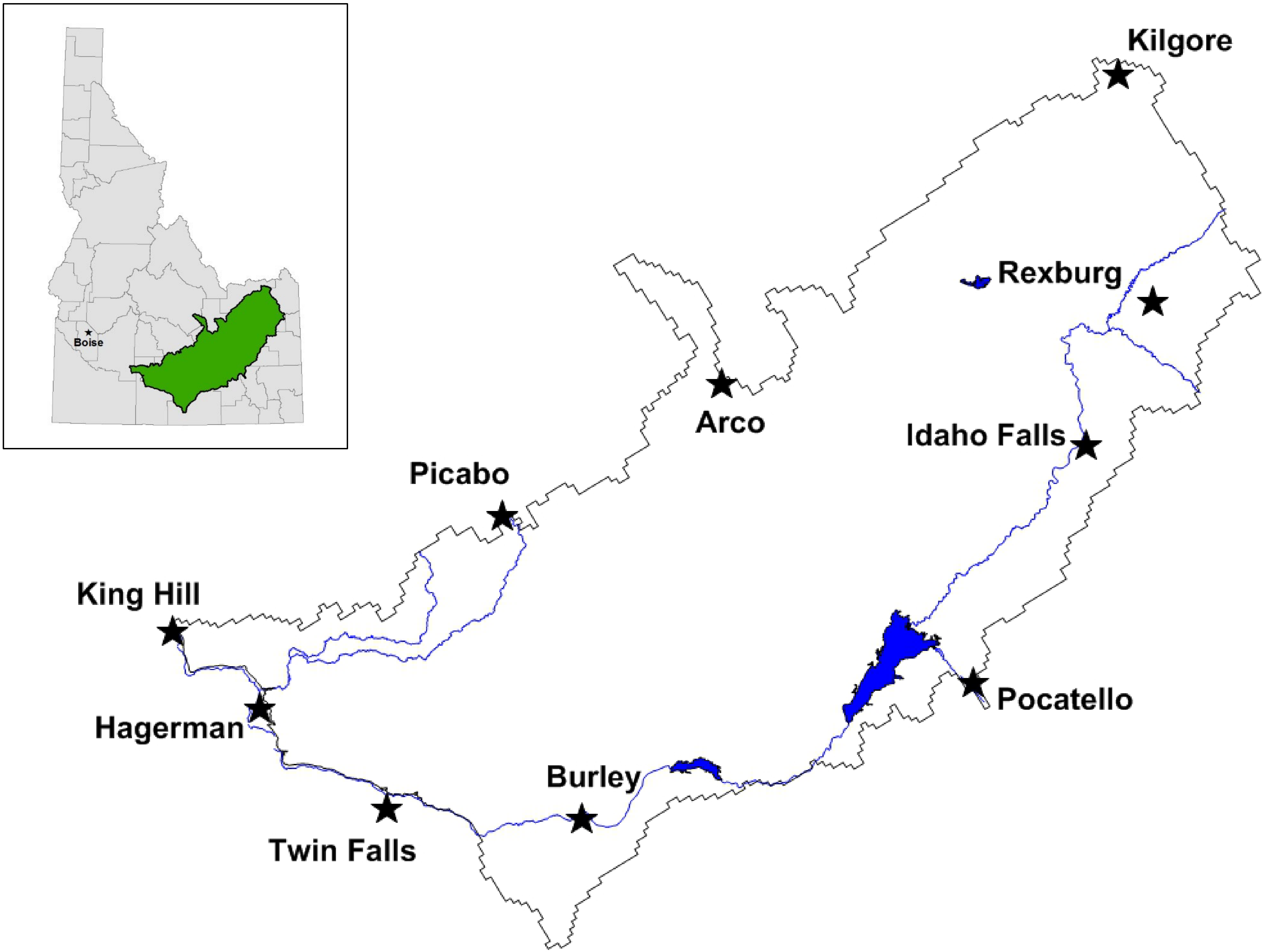
Americans with Disabilities
The meeting will be held in person and online. If you require special accommodations to attend, participate in, or understand the meeting, please make advance arrangements by contacting Department staff by email jennifer.strange@idwr.idaho.gov or by phone at (208) 287-4800.

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/

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.

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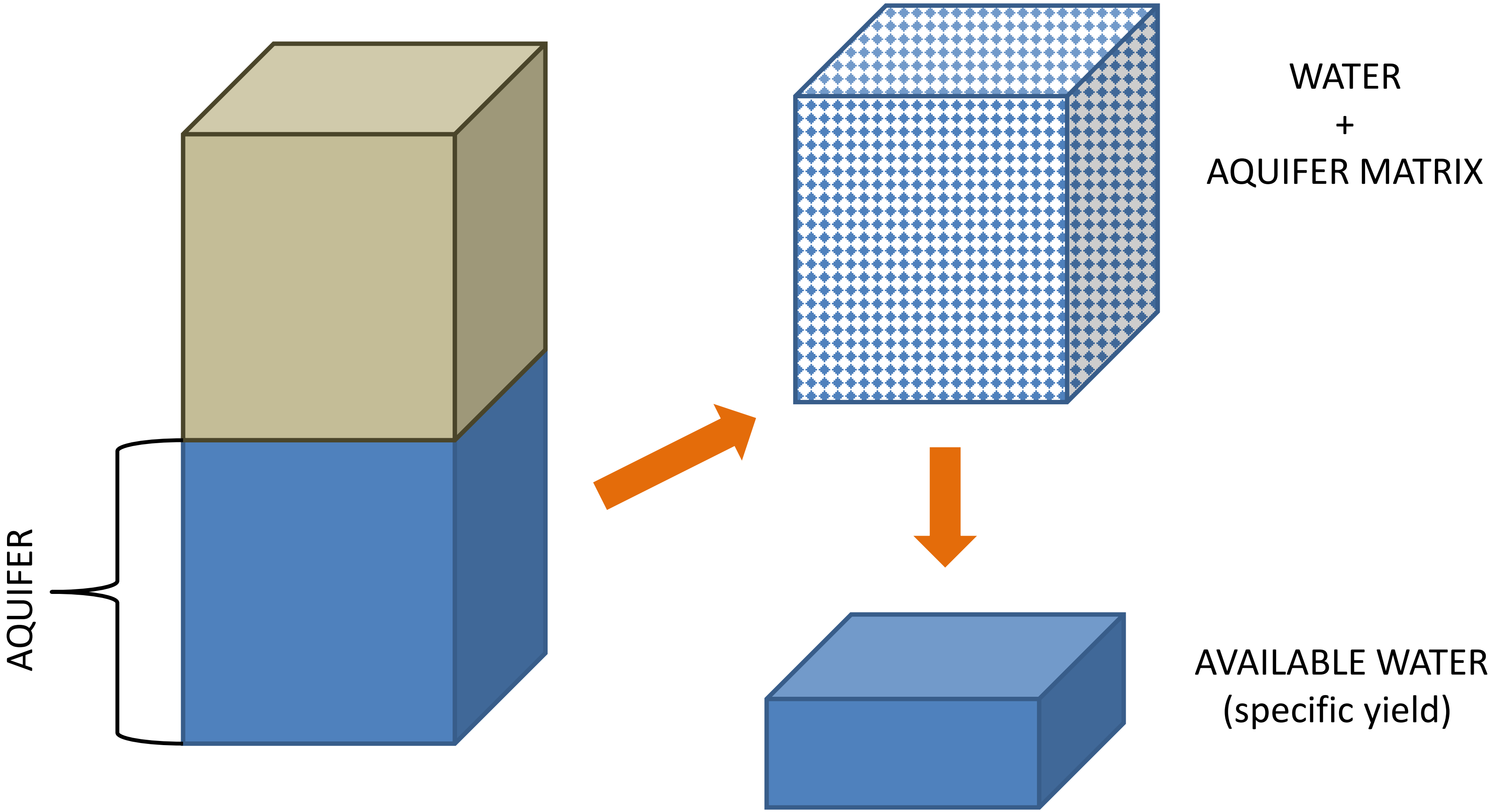
Using Water-Level Data to Estimate Changes in Aquifer Storage

- 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.

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Mass Measurements and Aquifer Storage Changes

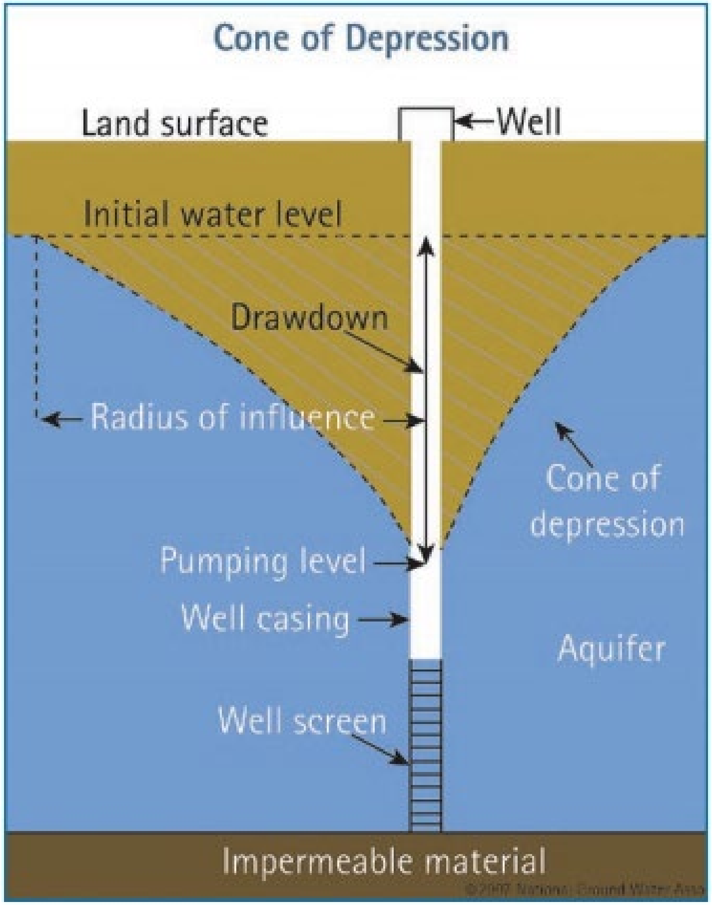
- Storage change calculations are based on data collected during mass measurement events.
- Mass measurement events are designed to collect as much data as possible during a brief window of time.
    - Provides a snapshot of the aquifer.
- Mass measurement events take place annually in the **spring**.
- Previous mass measurement events took place in the spring of 1980, 2001, 2002, 2008, 2013, 2018, 2023 and are now conducted every 5 years.

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).

Water-Level Impacts due to Local Water Use

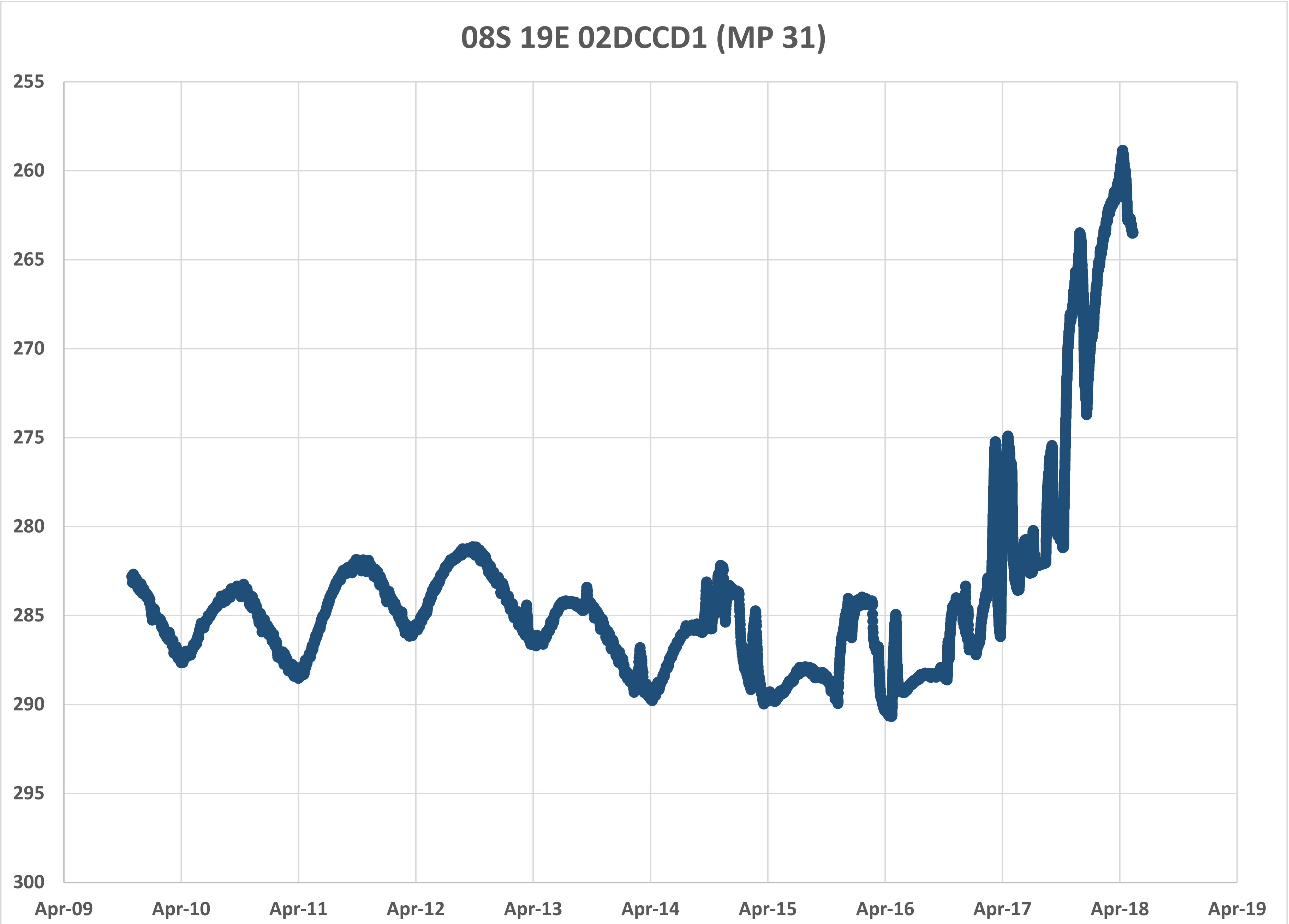
- Example: Short-term pumping in a well can produce water-level changes that do not represent the regional conditions. We don't want these water levels.
- What if a water level is impacted by increased areal recharge from a wet winter?
- Managed recharge also impacts water levels...



Source: National Groundwater Association,2007

The Value of Transducer-Data Loggers

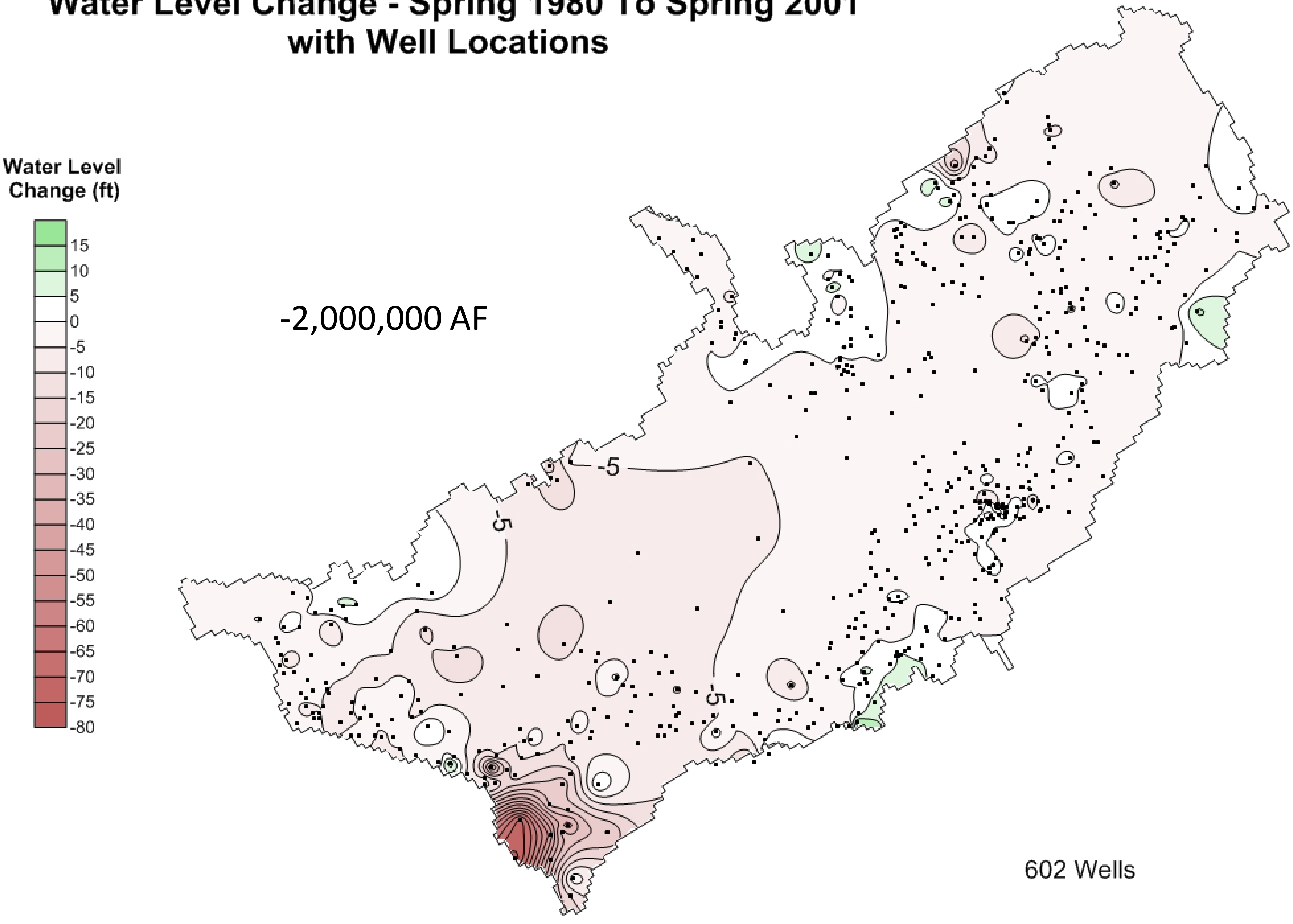
- Transducers measure the pressure of water above the probe.
  - Manual measurements are used to relate the pressure to depth-of-water.
- Data loggers record the pressure measurements.
- We collect much more data using transducers.
- Able to collect measurements even if the well is inaccessible during the synoptic measurement event.
- Allows for understanding of well behavior.
- Data collected via transducer allows for the selection of the most appropriate water level.



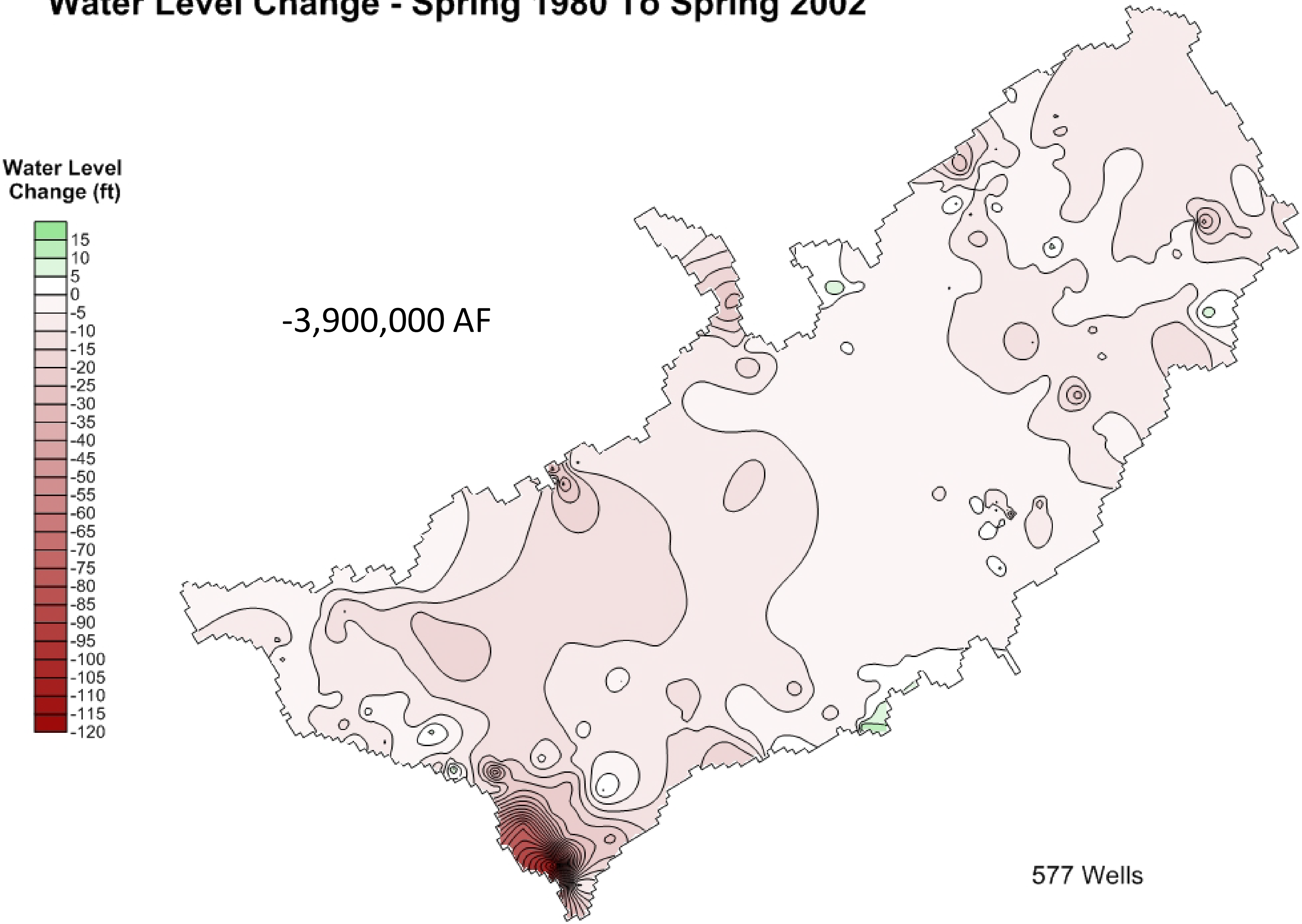
08S 19E 02DCCD1 (MP 31)
255
260
265
270
275
280
285
290
295
300
Apr-09
Apr-10
Apr-11
Apr-12
Apr-13
Apr-14
Apr-15
Apr-16
Apr-17
Apr-18
Apr-19

Mass Measurement Change Maps

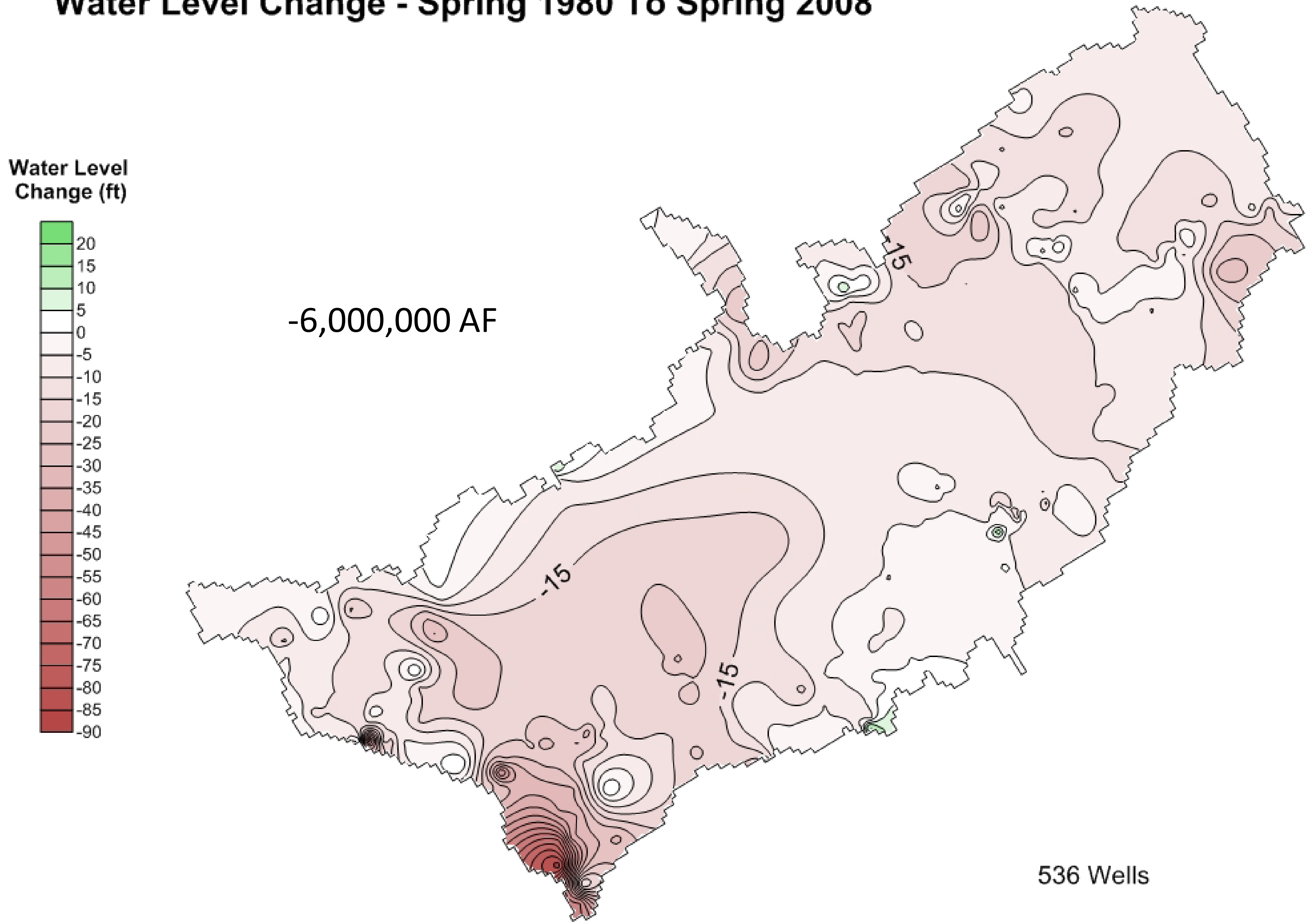
Water Level Change - Spring 1980 To Spring 2001 with Well Locations



Water Level Change - Spring 1980 To Spring 2002

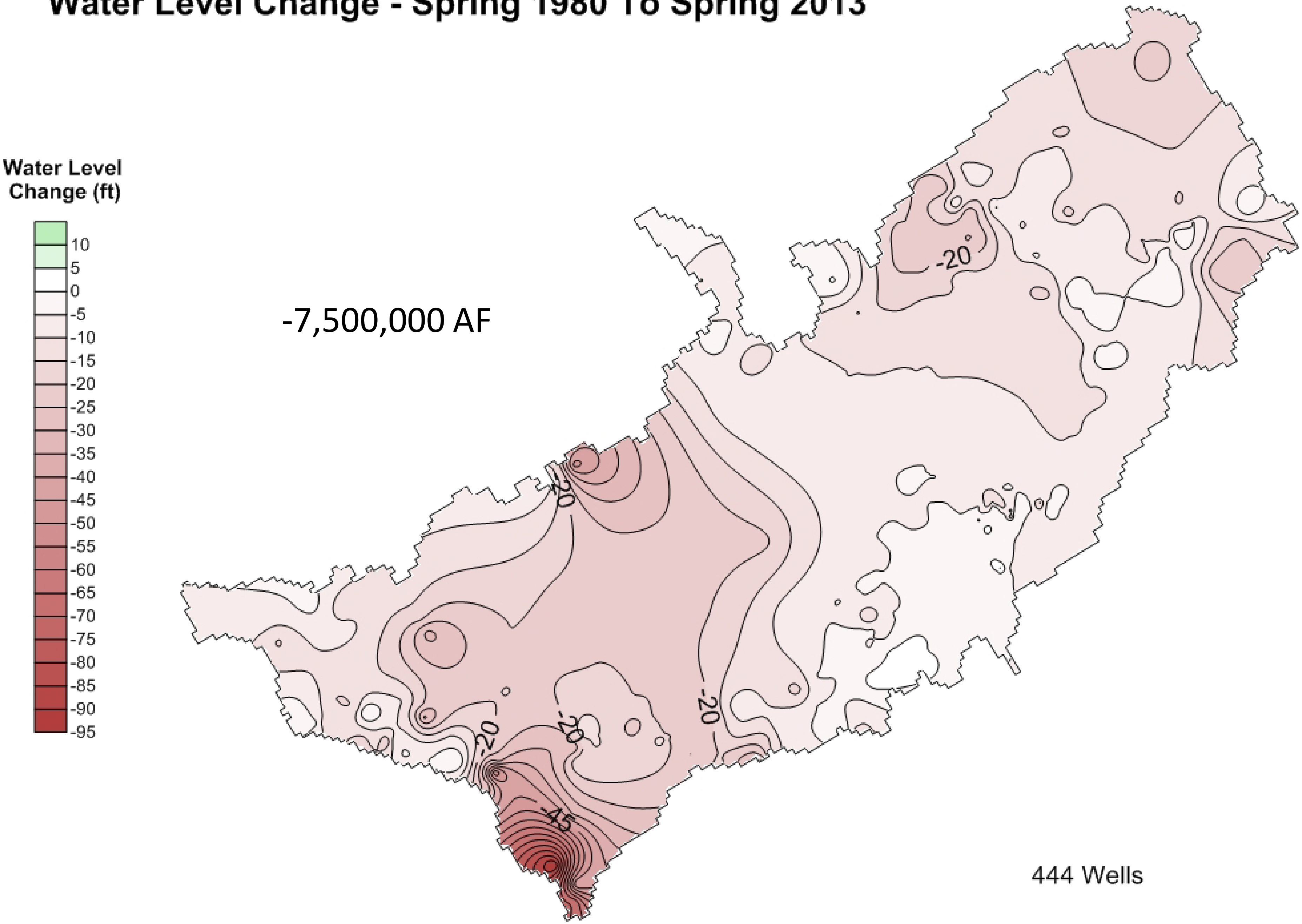


Water Level Change - Spring 1980 To Spring 2008

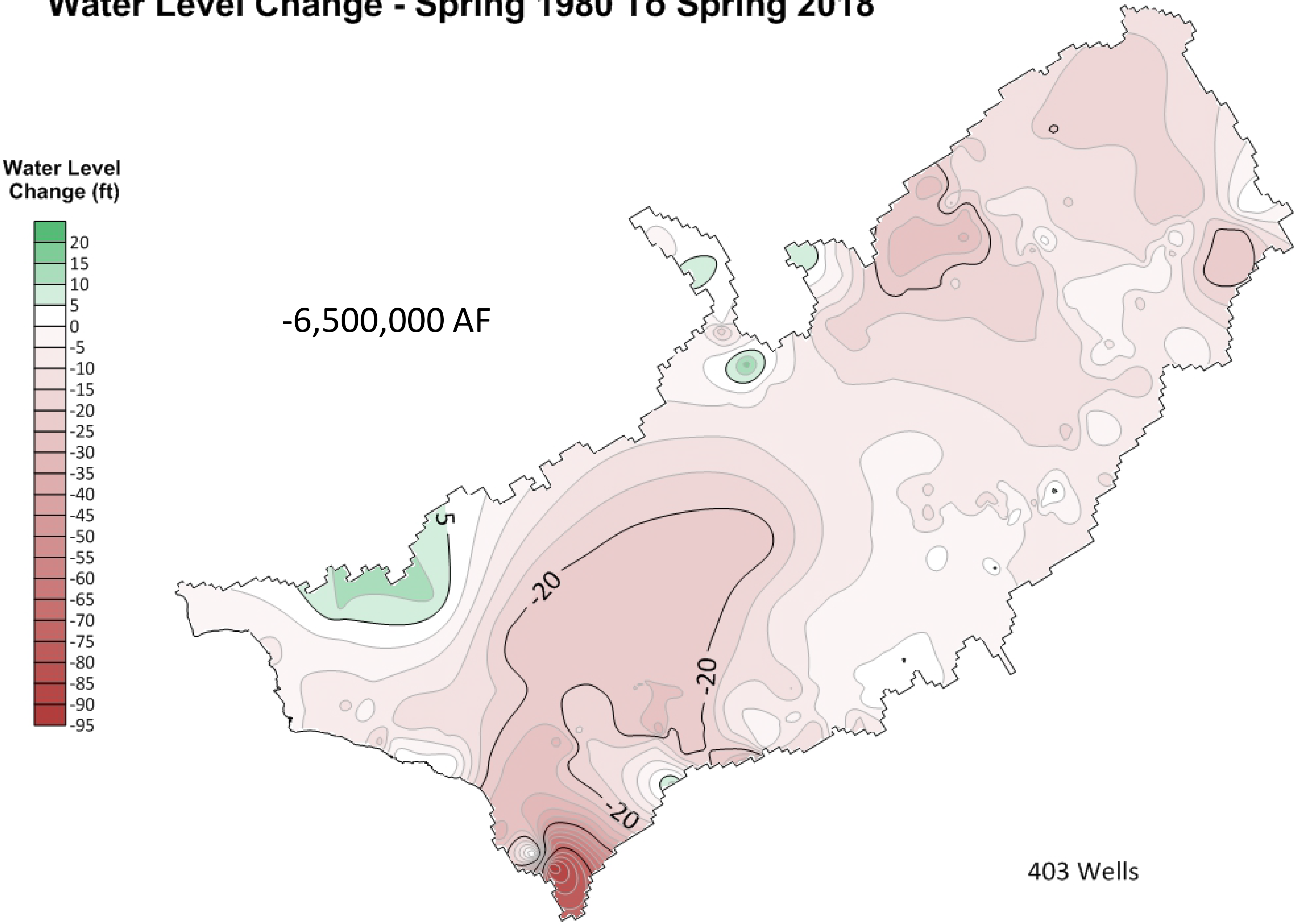


-6,000,000 AF

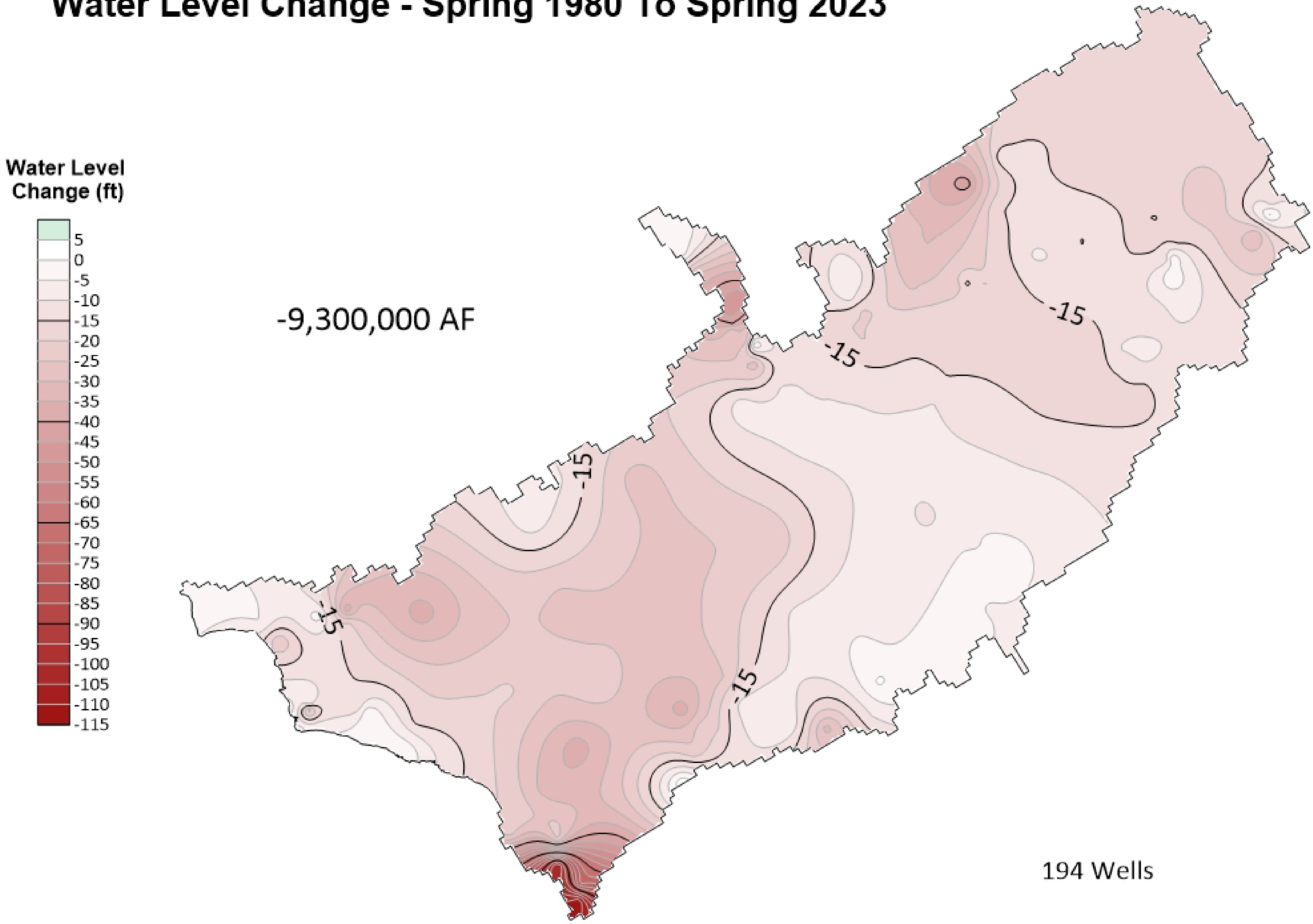
Water Level Change - Spring 1980 To Spring 2013



Water Level Change - Spring 1980 To Spring 2018



Water Level Change - Spring 1980 To Spring 2023



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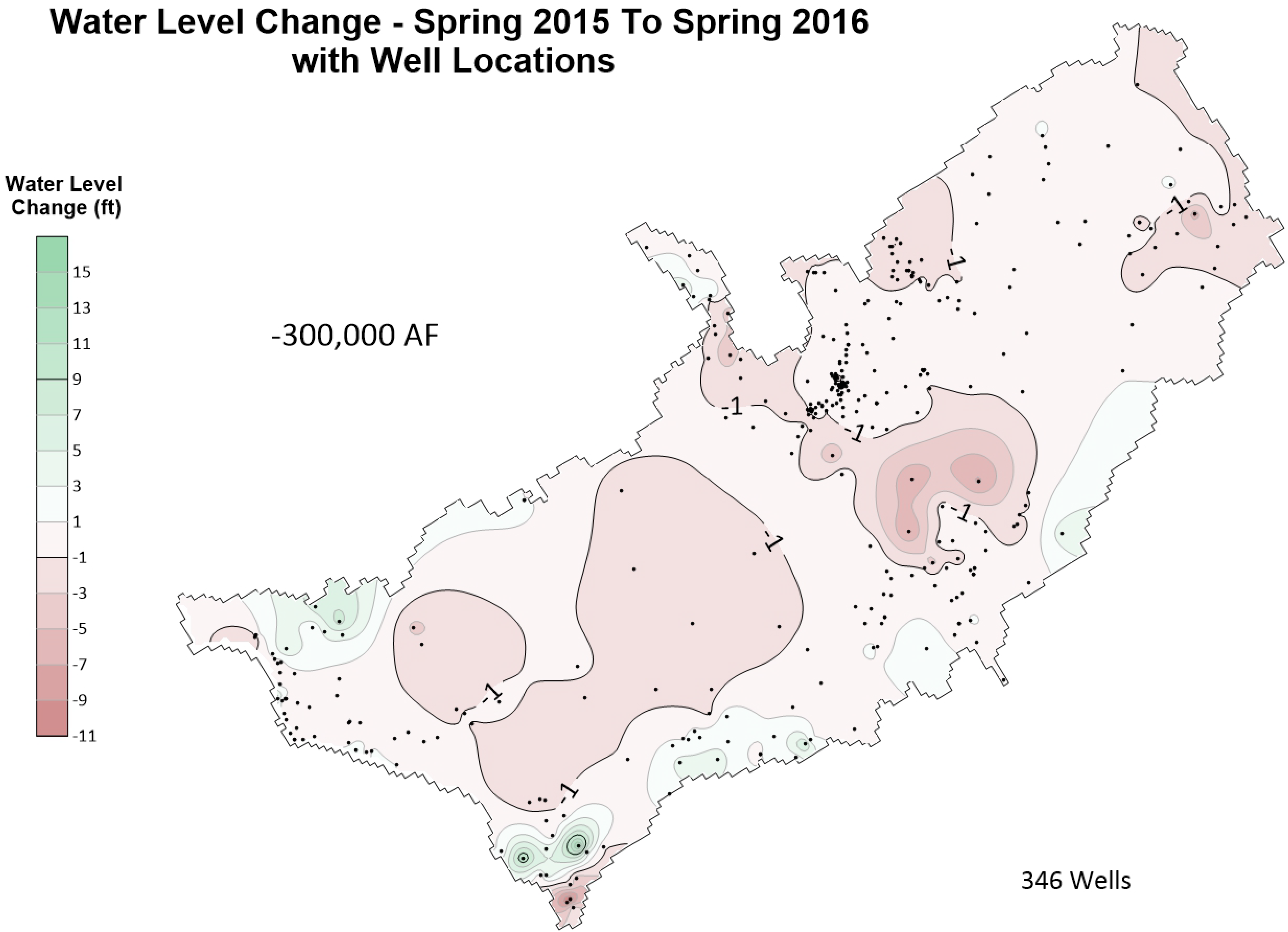
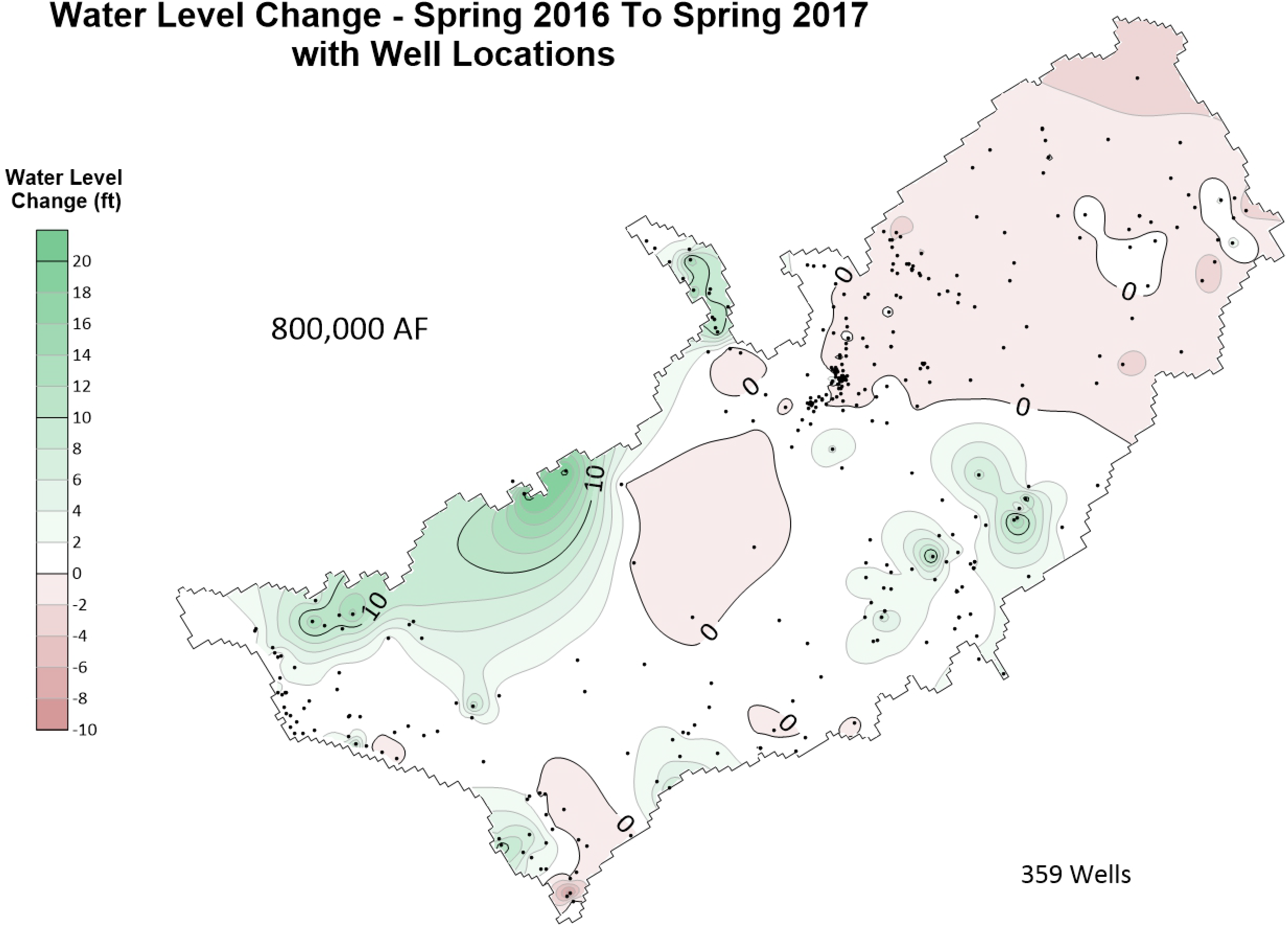
Storage Change between Mass Measurements

- 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.

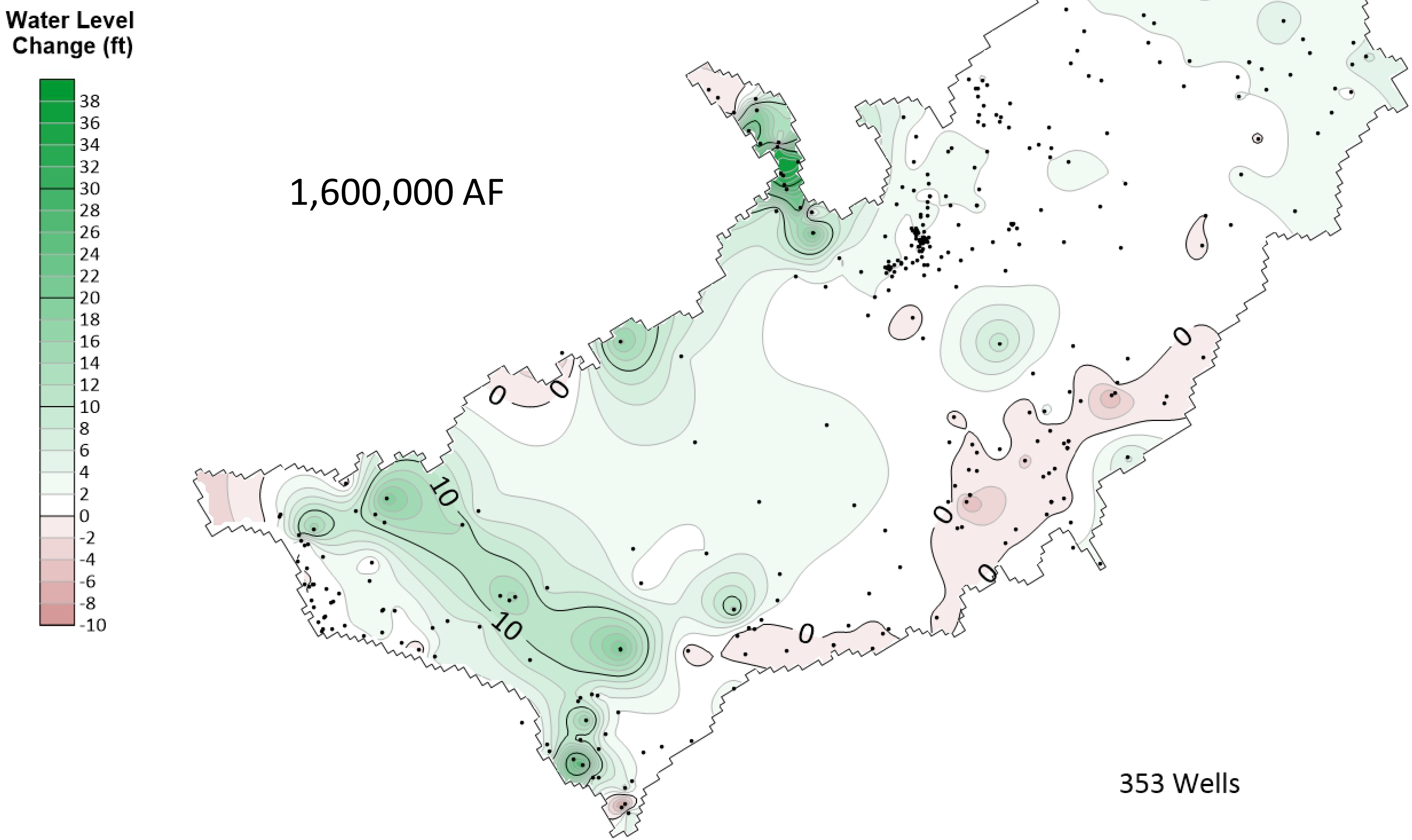
Annual Measurement Change Maps:
2015 – 2024


Water Level Change - Spring 2015 To Spring 2016
with Well Locations
Water Level Change (ft)
15
13
11
9
7
5
3
1
-1
-3
-5
-7
-9
-11
-300,000 AF
346 Wells

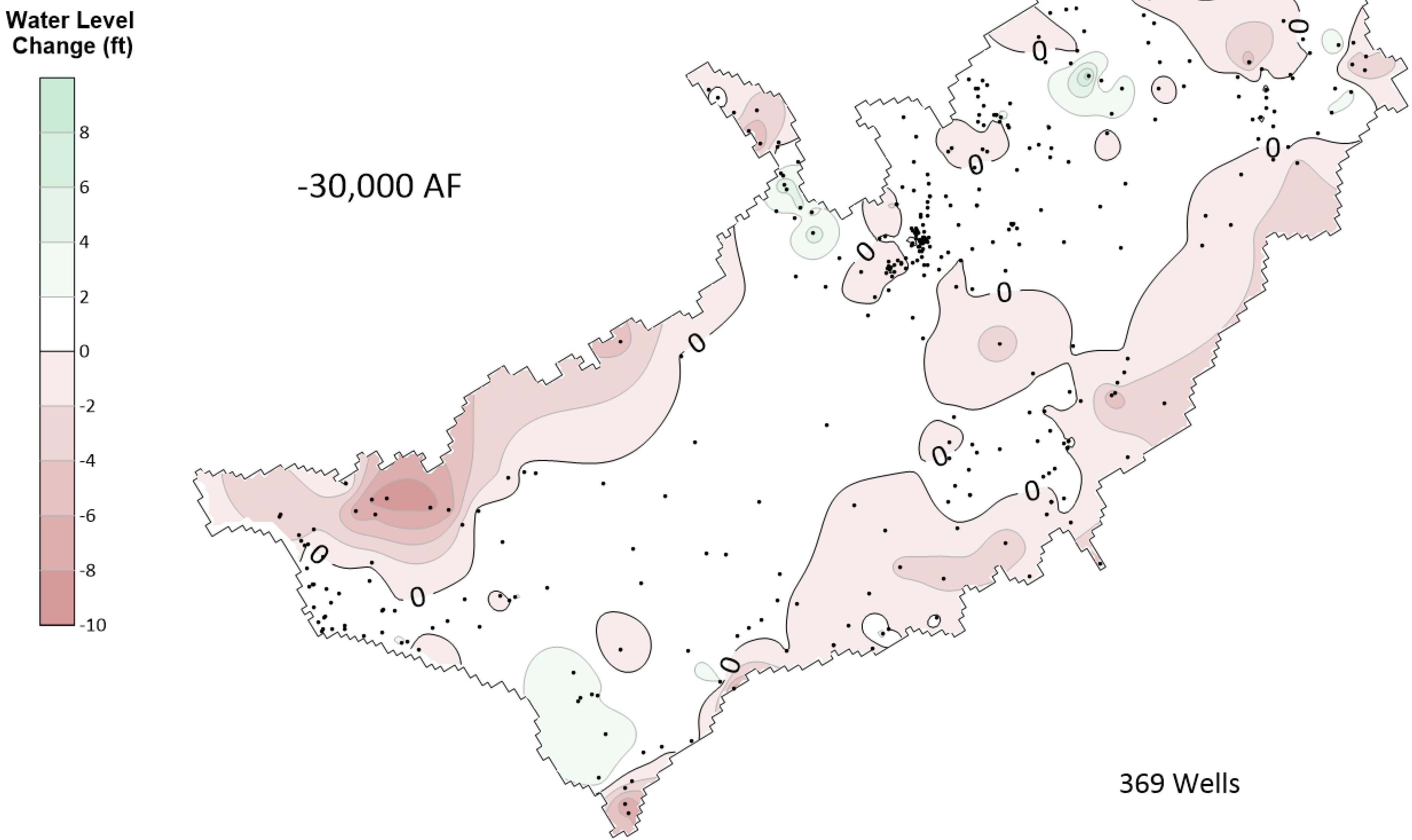
Water Level Change - Spring 2016 To Spring 2017 with Well Locations



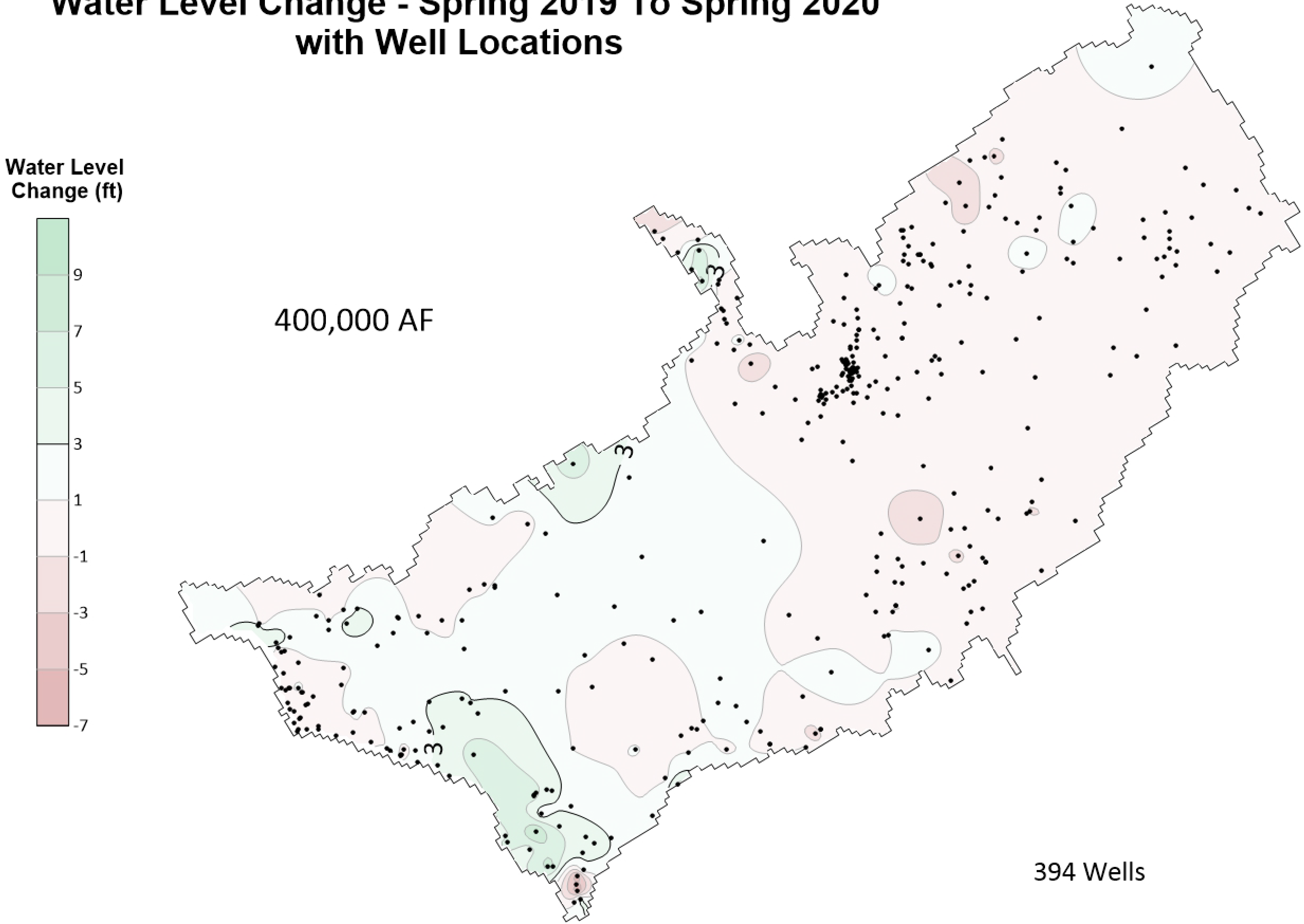
Water Level Change - Spring 2017 To Spring 2018 with Well Locations



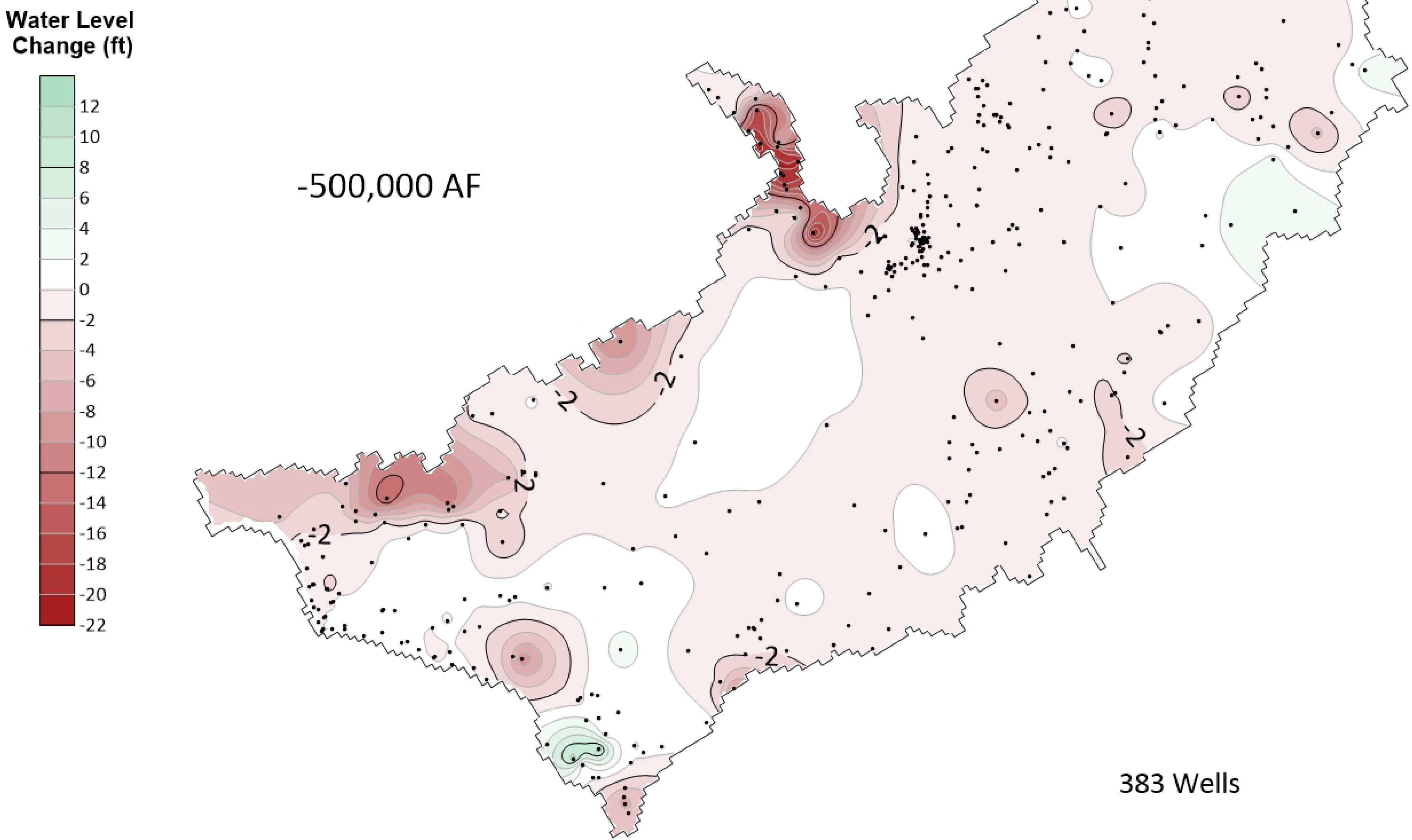
Water Level Change - Spring 2018 To Spring 2019 with Well Locations



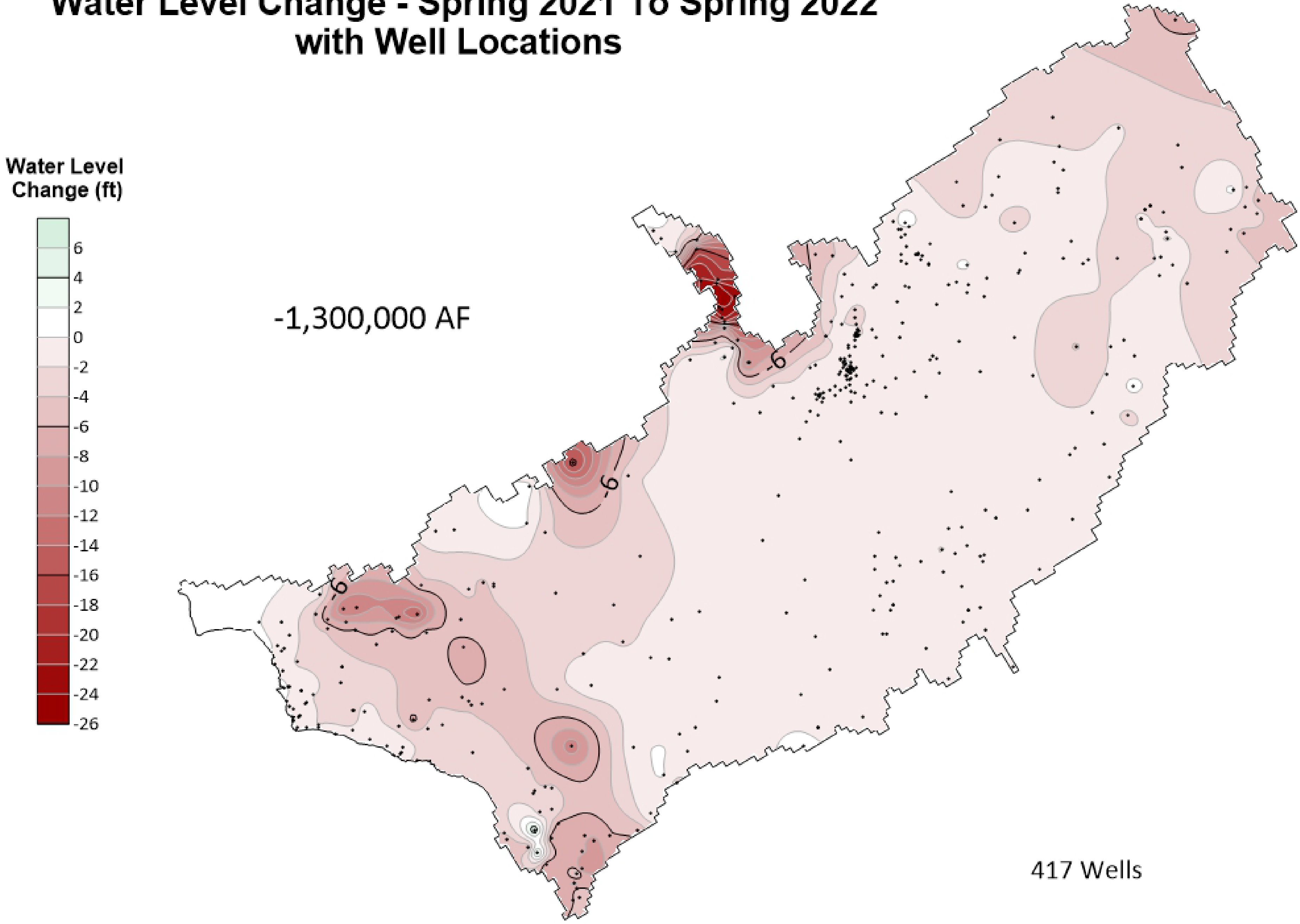
Water Level Change - Spring 2019 To Spring 2020 with Well Locations



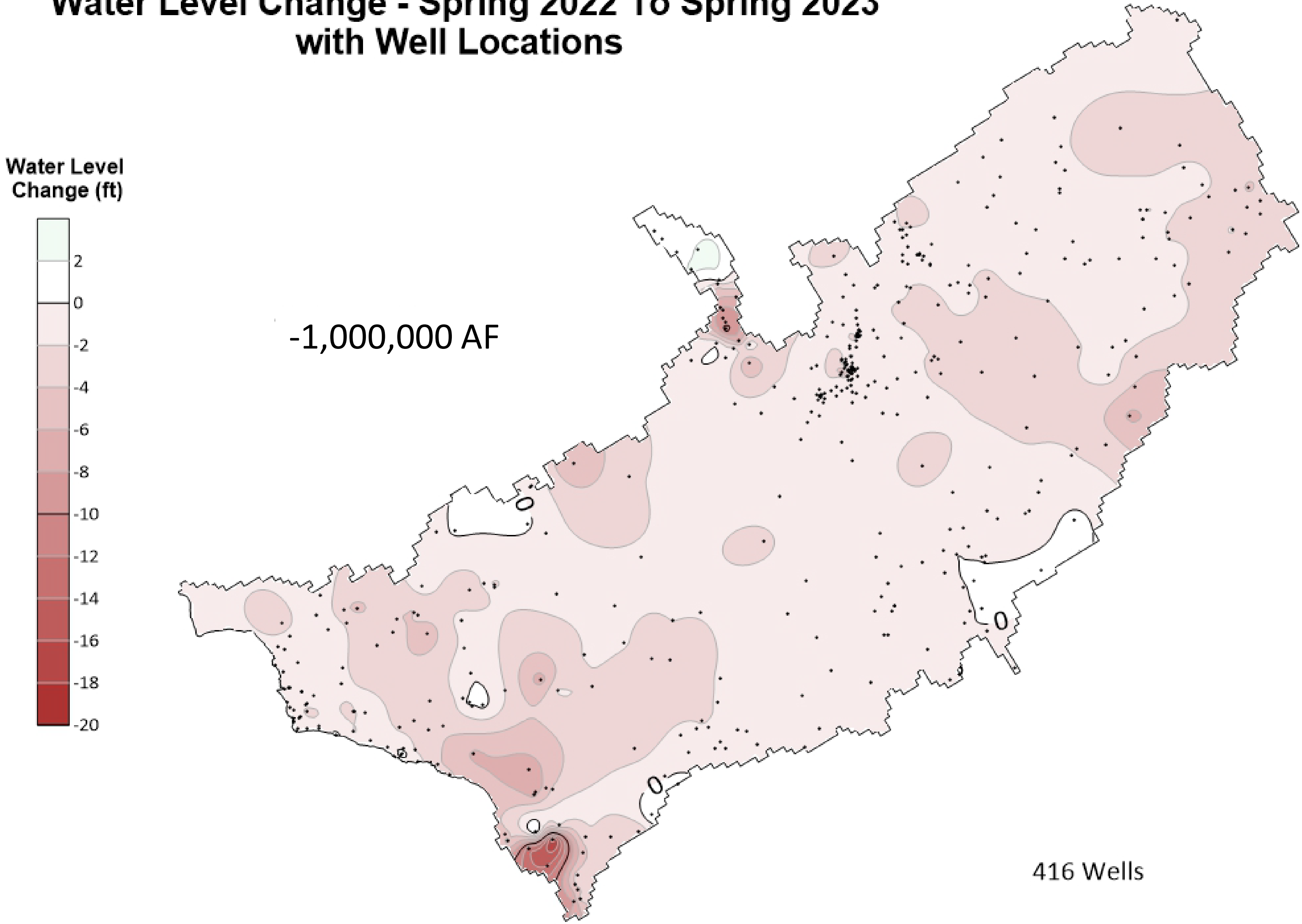
Water Level Change - Spring 2020 To Spring 2021 with Well Locations



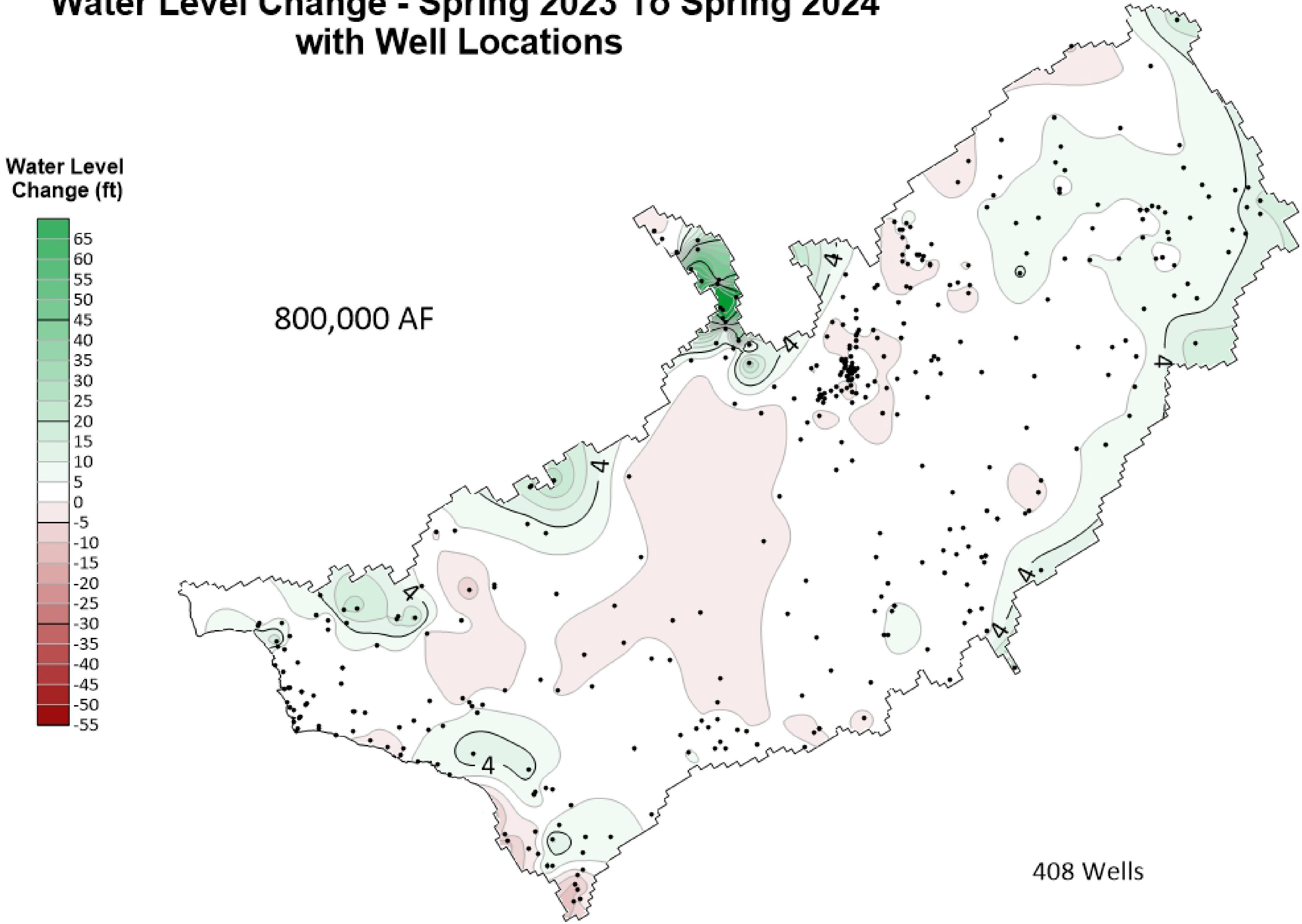
Water Level Change - Spring 2021 To Spring 2022 with Well Locations



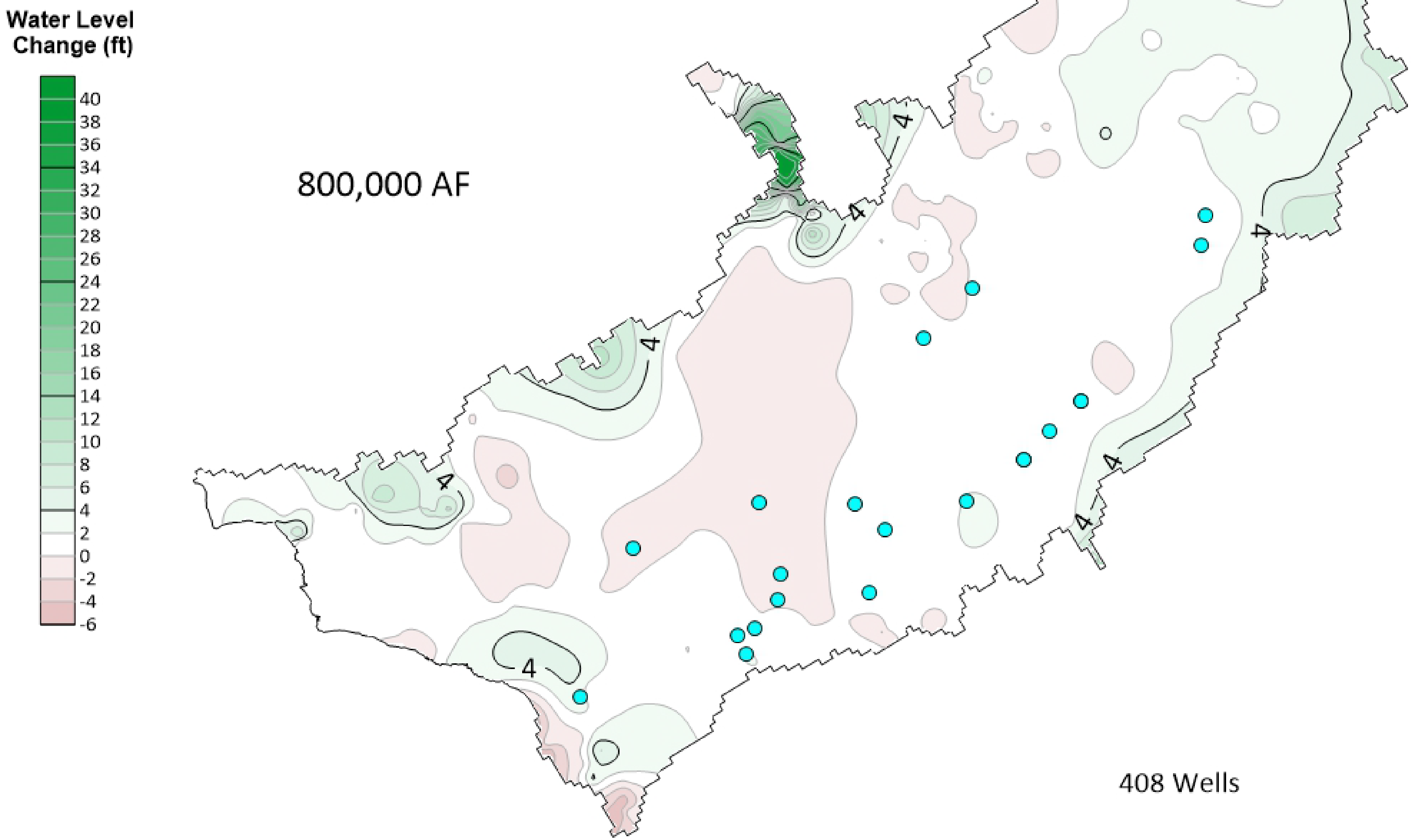
Water Level Change - Spring 2022 To Spring 2023 with Well Locations

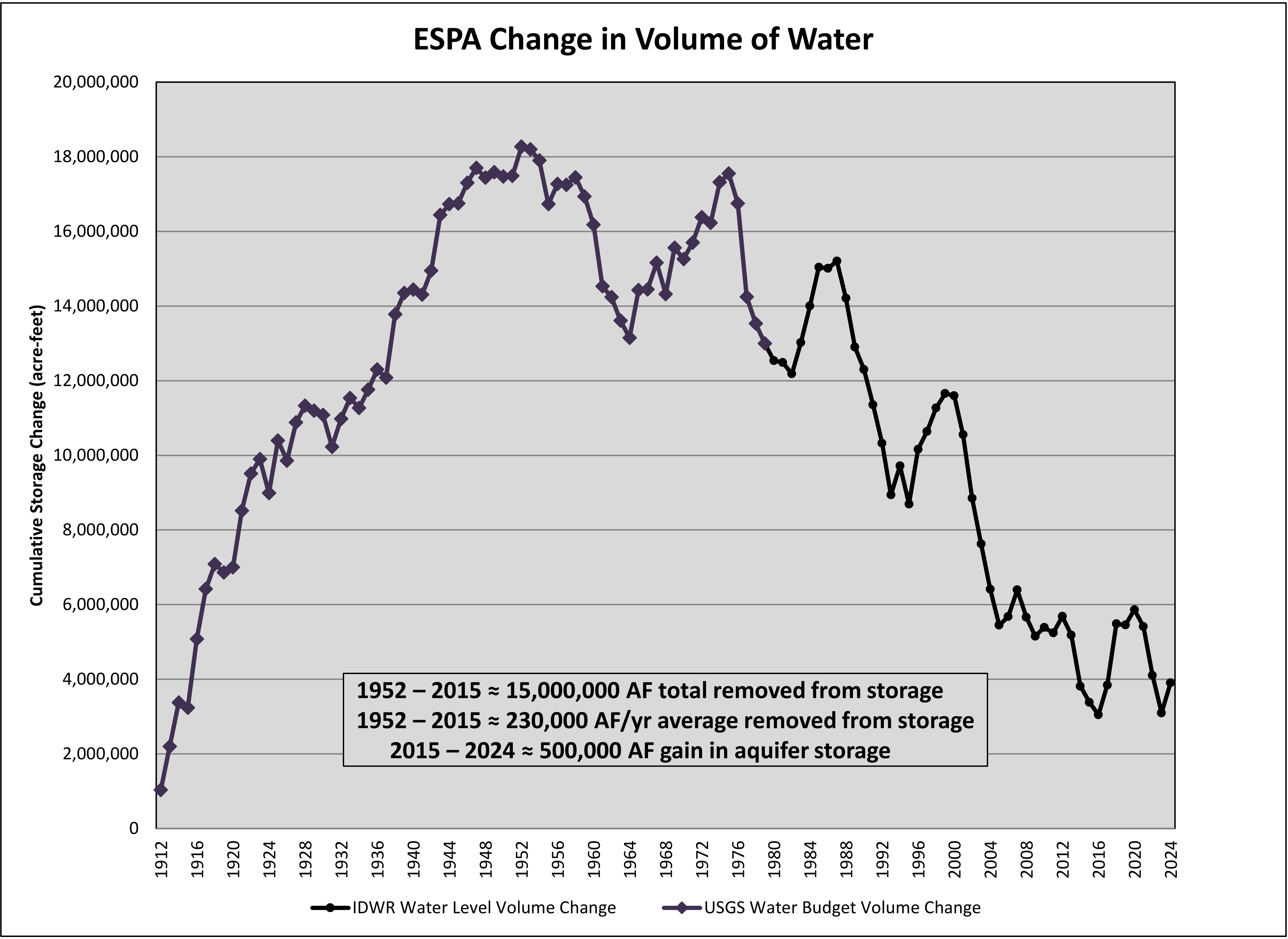


Water Level Change - Spring 2023 To Spring 2024 with Well Locations

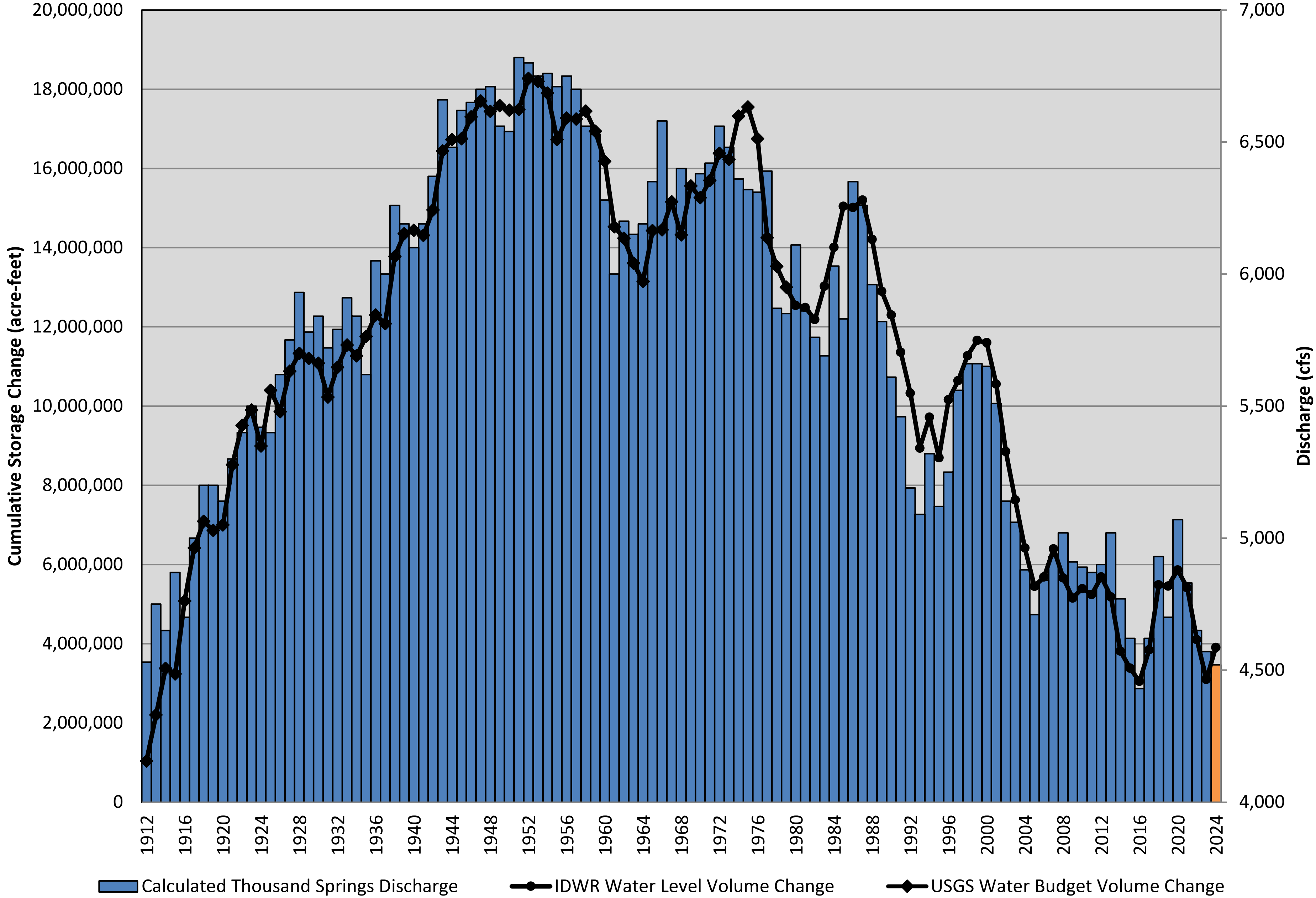


Water Level Change - Spring 2023 To Spring 2024 with Sentinel Well Locations



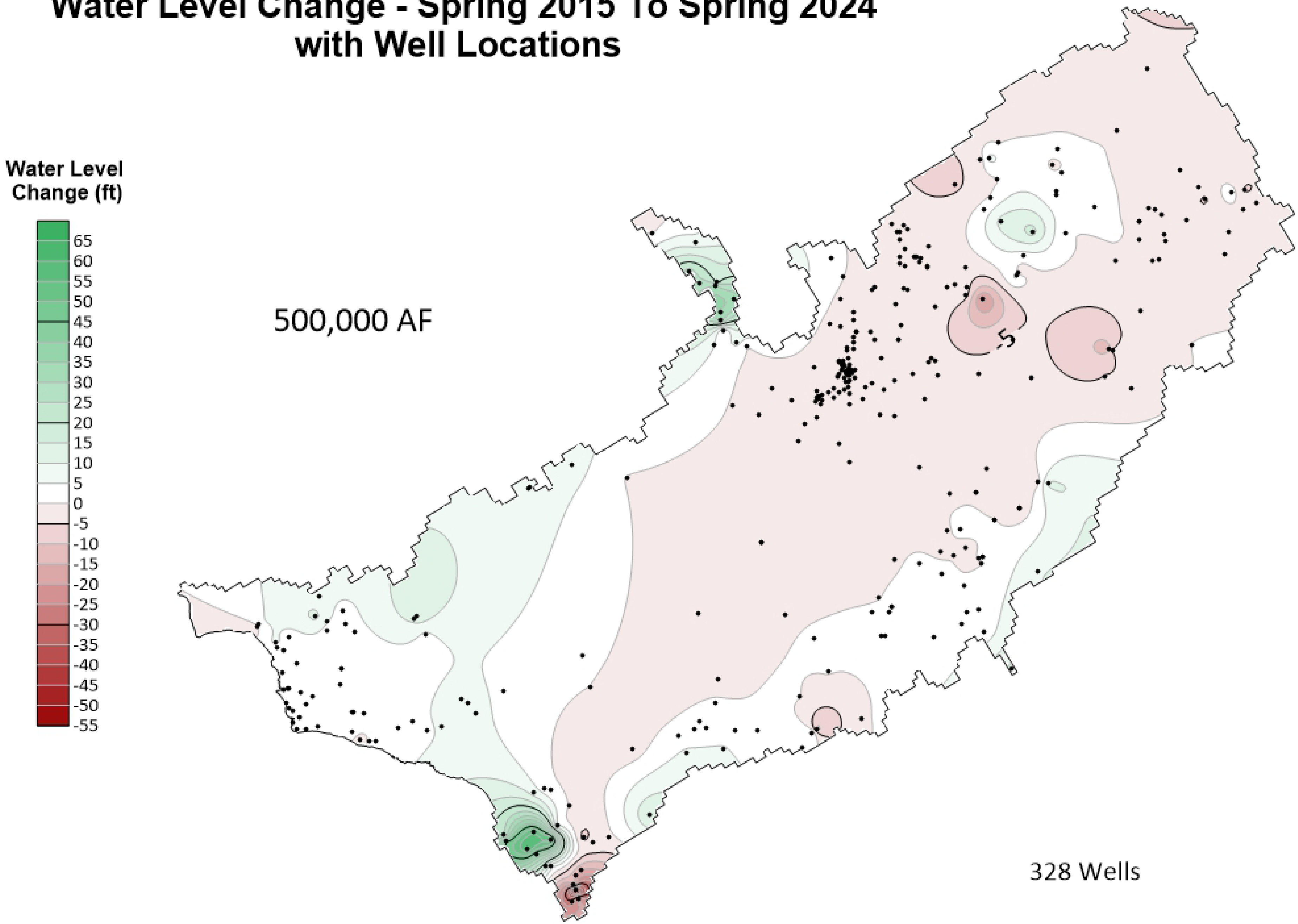

ESPA Change in Volume of Water
Cumulative Storage Change (acre-feet)
20,000,000
18,000,000
16,000,000
14,000,000
12,000,000
10,000,000
8,000,000
6,000,000
4,000,000
2,000,000
0
1912
1916
1920
1924
1928
1932
1936
1940
1944
1948
1952
1956
1960
1964
1968
1972
1976
1980
1984
1988
1992
1996
2000
2004
2008
2012
2016
2020
2024
1952 – 2015 ≈ 15,000,000 AF total removed from storage
1952 – 2015 ≈ 230,000 AF/yr average removed from storage
2015 – 2024 ≈ 500,000 AF gain in aquifer storage
IDWR Water Level Volume Change
USGS Water Budget Volume Change

ESPA Change in Volume of Water and Thousand Springs Discharge

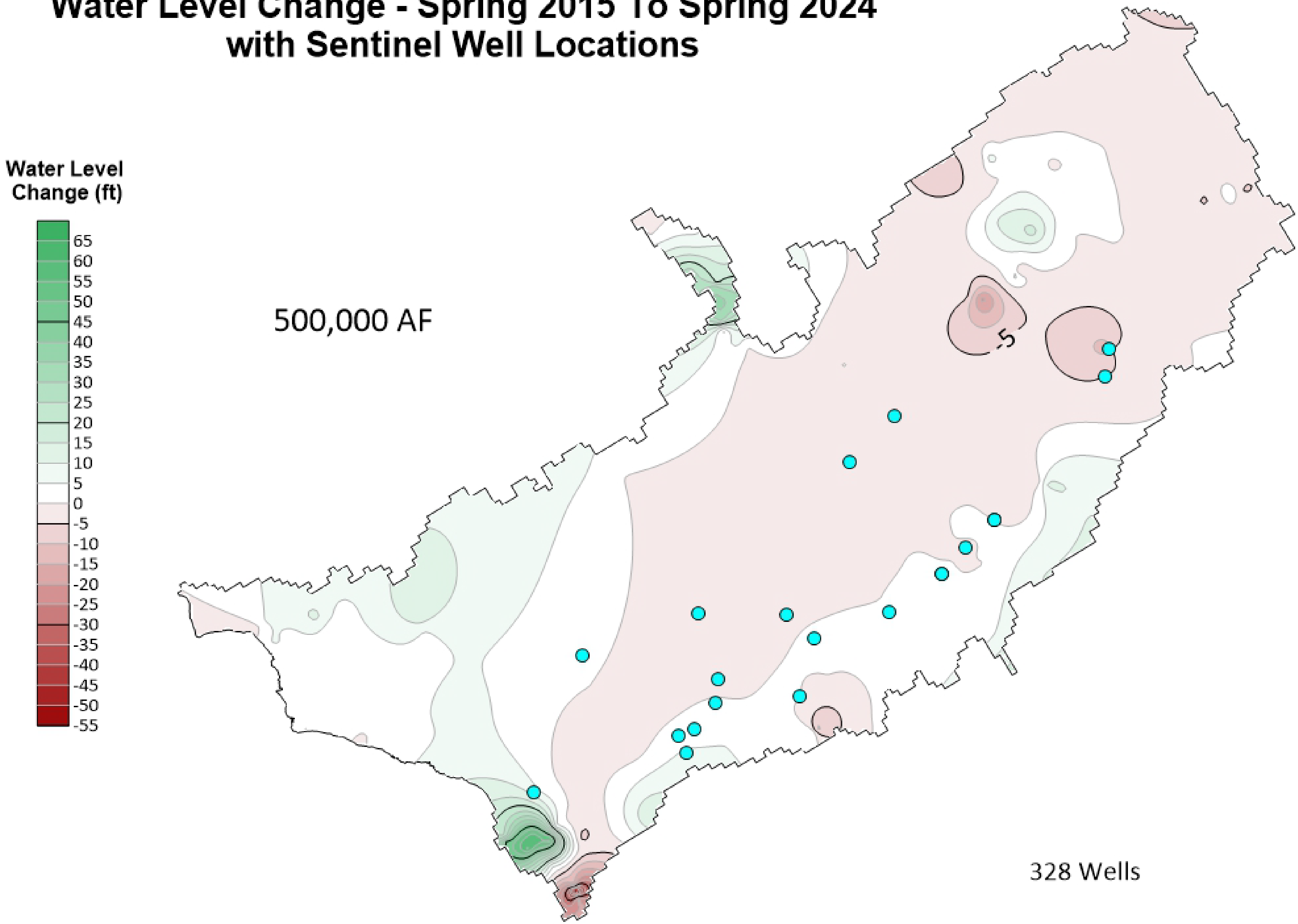


Intermediate Change Map:
2015 – 2024

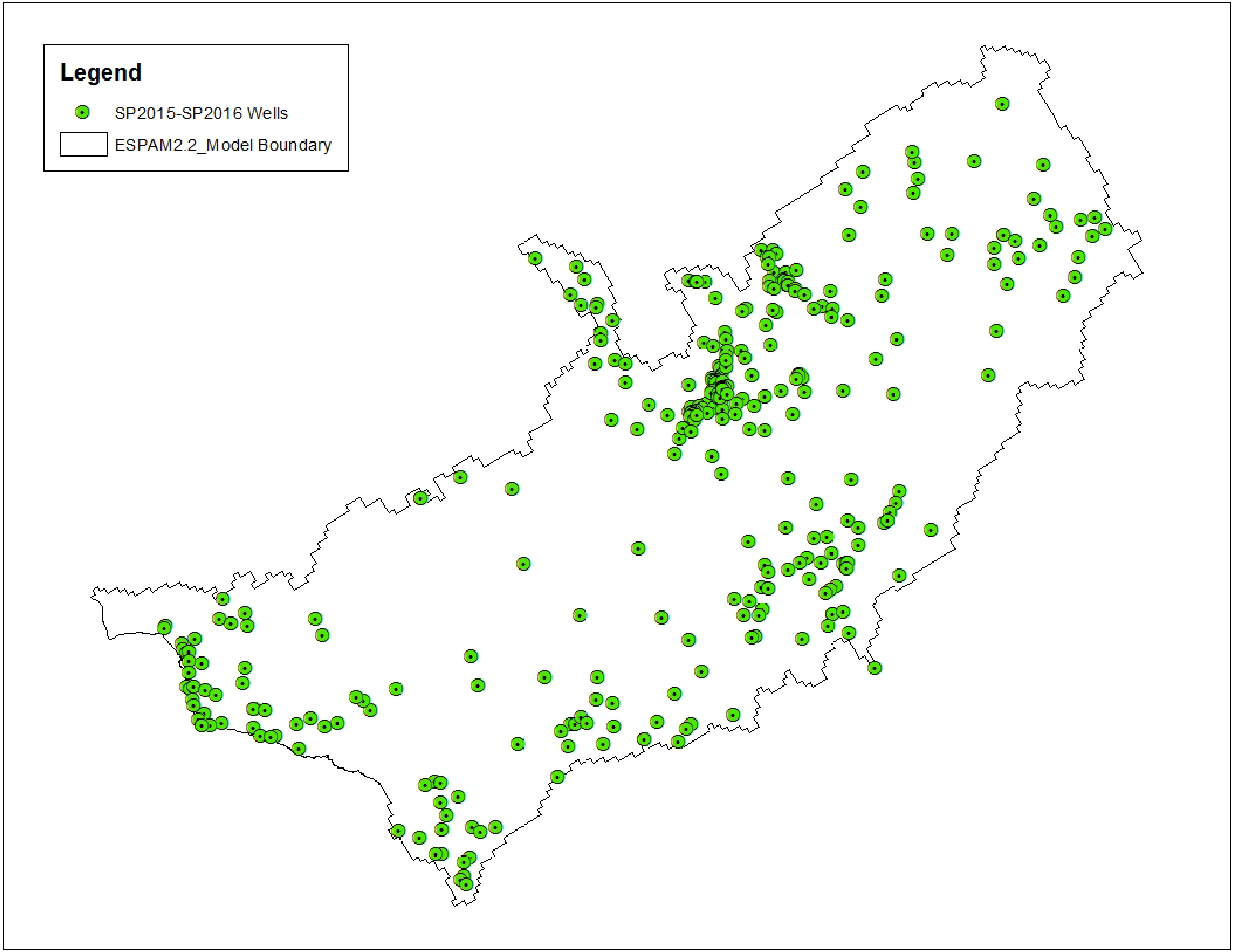
Water Level Change - Spring 2015 To Spring 2024 with Well Locations

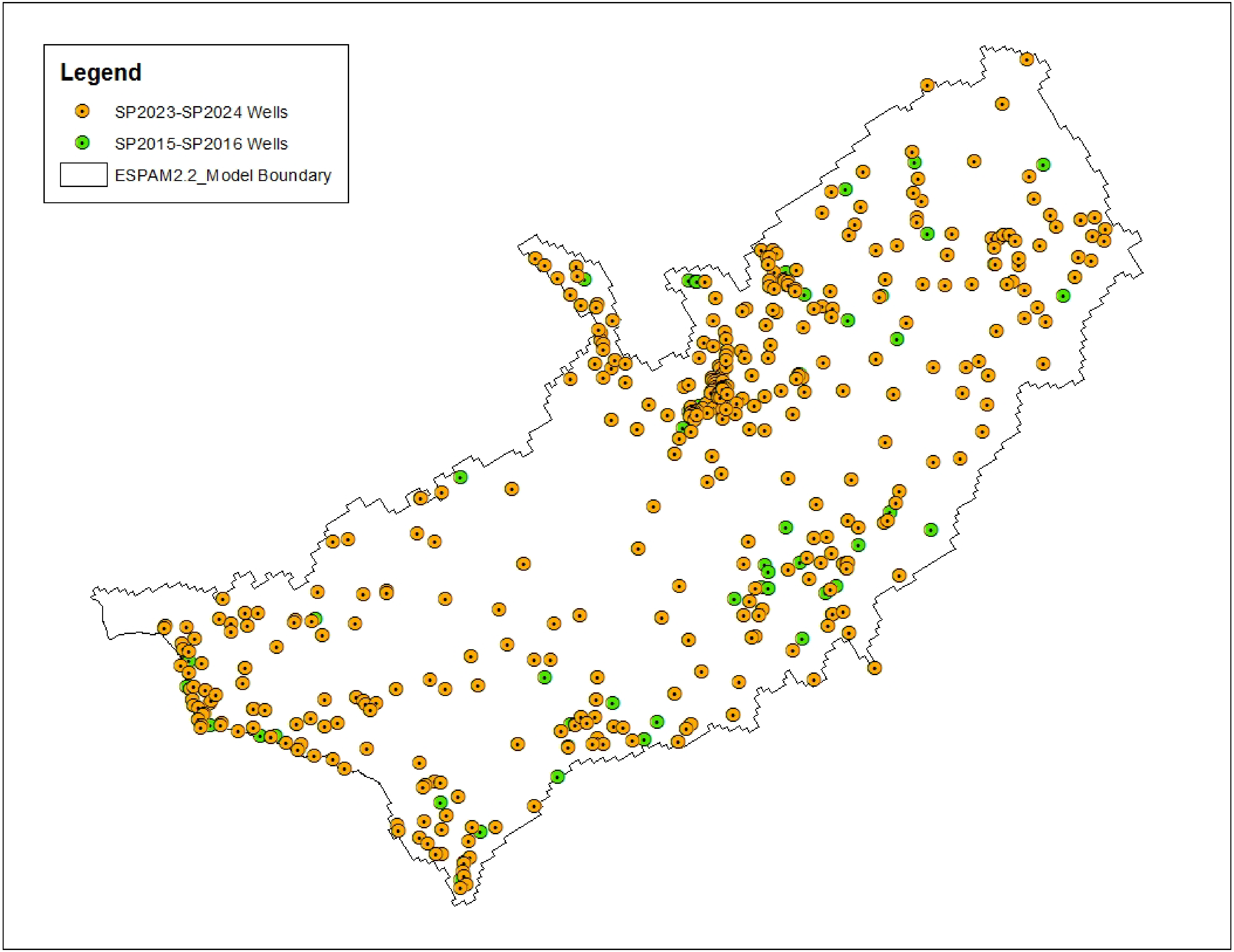


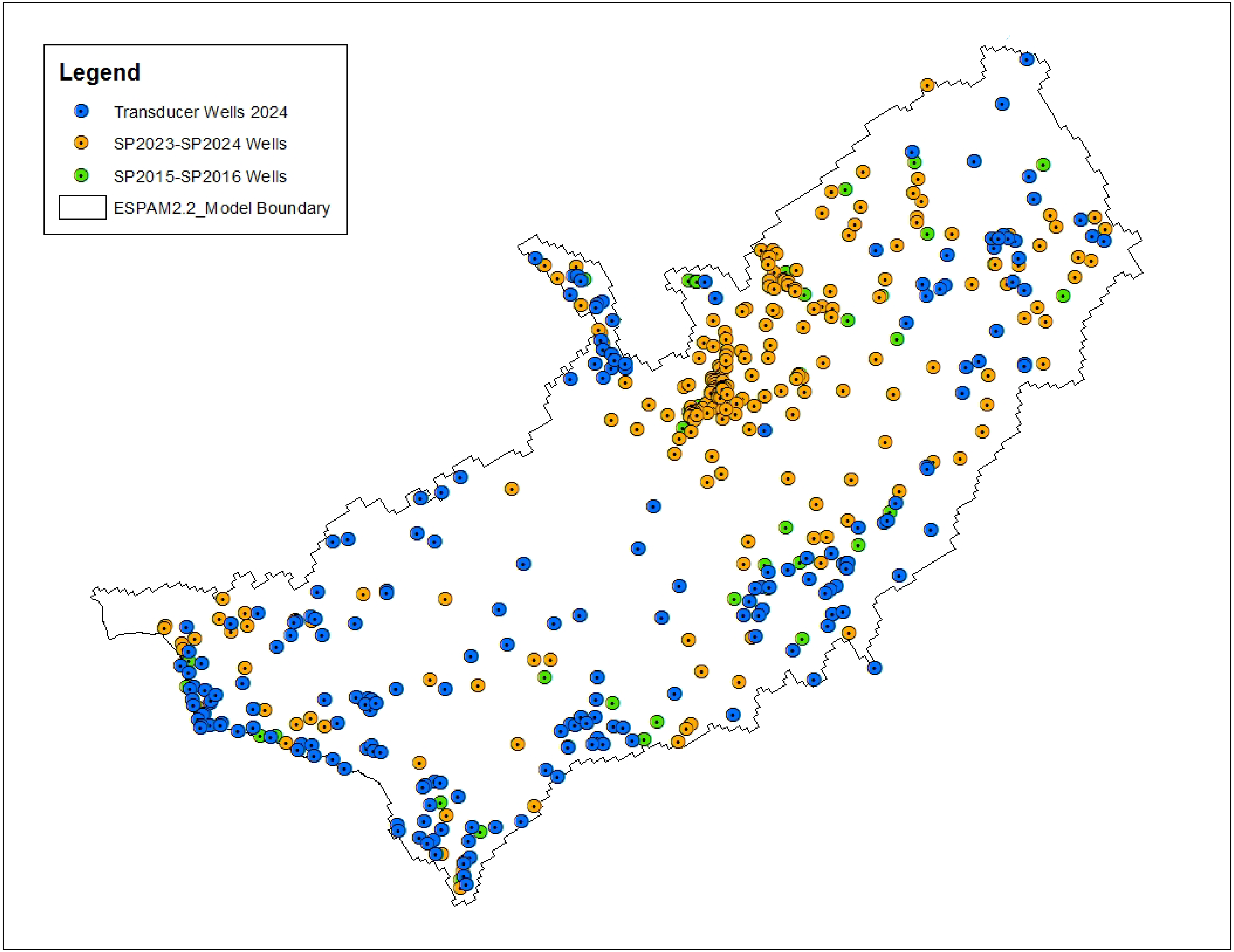
Water Level Change - Spring 2015 To Spring 2024 with Sentinel Well Locations



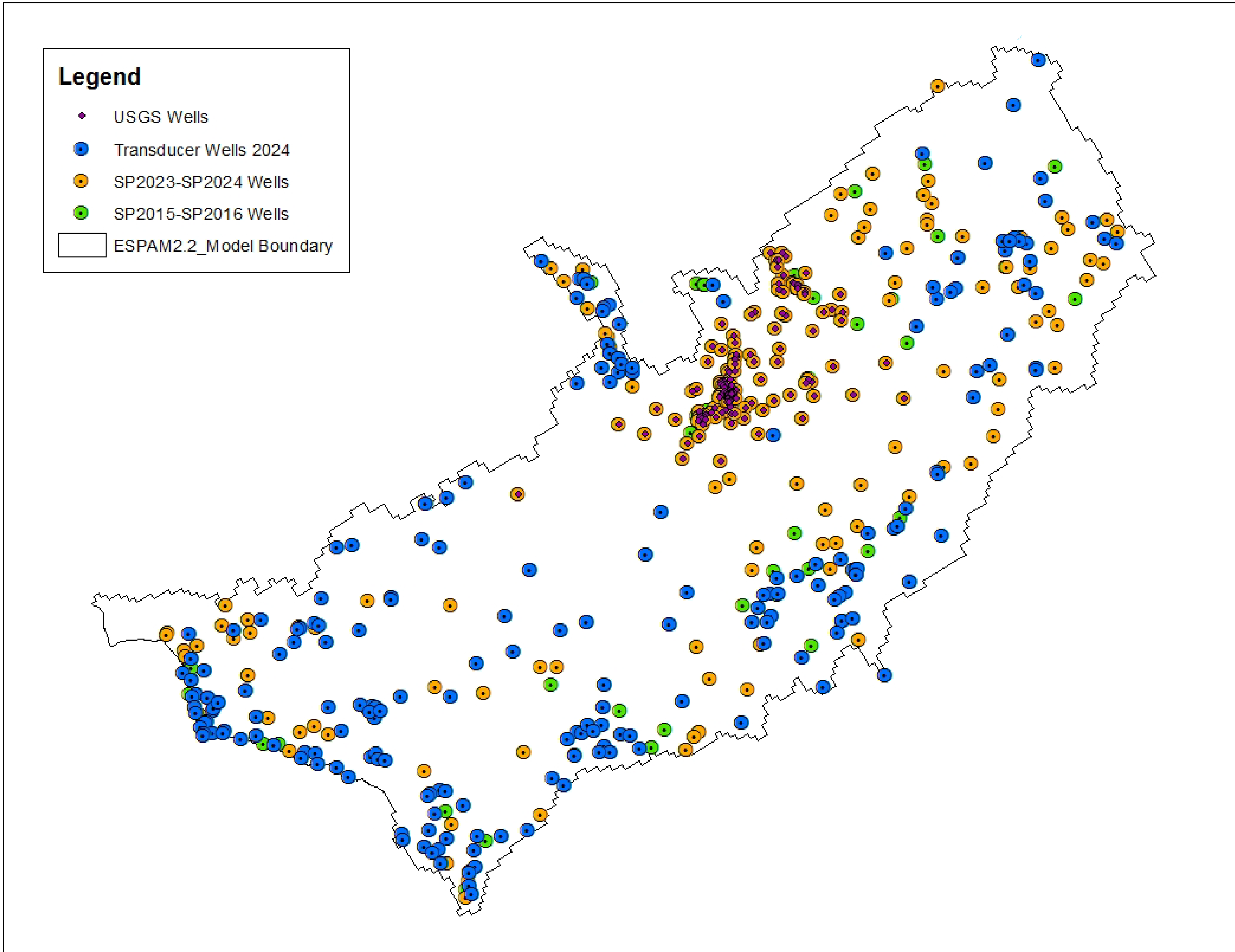
Water-Level Monitoring Network Continues to Expand


Legend
SP2015-SP2016 Wells
ESPAM2.2_Model Boundary


Legend
SP2023-SP2024 Wells
SP2015-SP2016 Wells
ESPAM2.2_Model Boundary



Legend
Transducer Wells 2024
SP2023-SP2024 Wells
SP2015-SP2016 Wells
ESPAM2.2_Model Boundary



Legend
USGS Wells
Transducer Wells 2024
SP2023-SP2024 Wells
SP2015-SP2016 Wells
ESPAM2.2_Model Boundary

Storage Change Summary

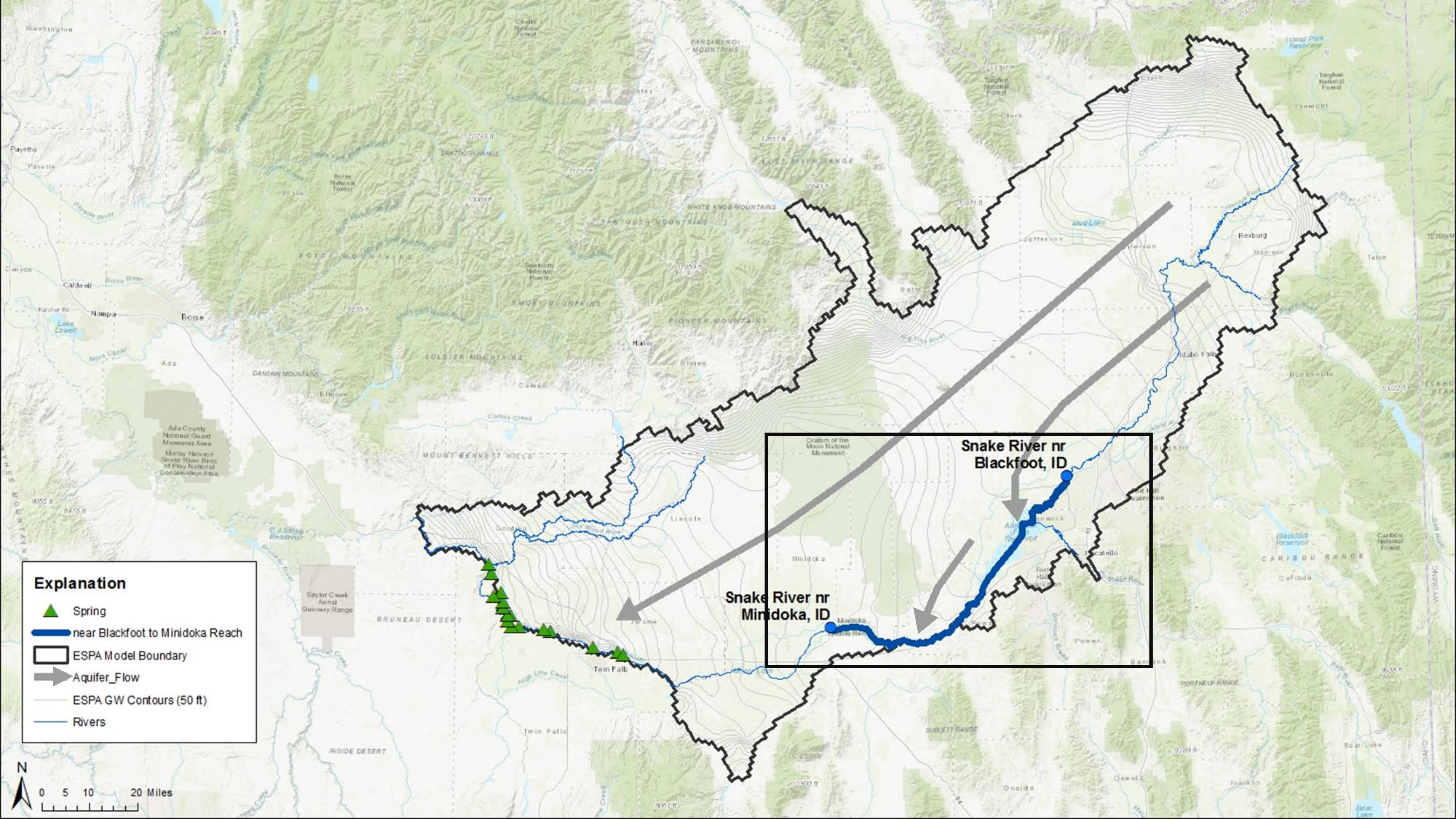
- The aquifer gained approximately 800,000 acre-feet from 2023 to 2024.
- The aquifer has gained approximately 500,000 acre-feet of storage since 2015.
- Undulations due to weather are to be expected.
- The ESPA leaks, and aquifer-storage gains are fleeting.
- Perseverance through the dry times is vital to success.

Discussion

Eastern Snake Plain Aquifer Discharge

Presented by: Ethan Geisler

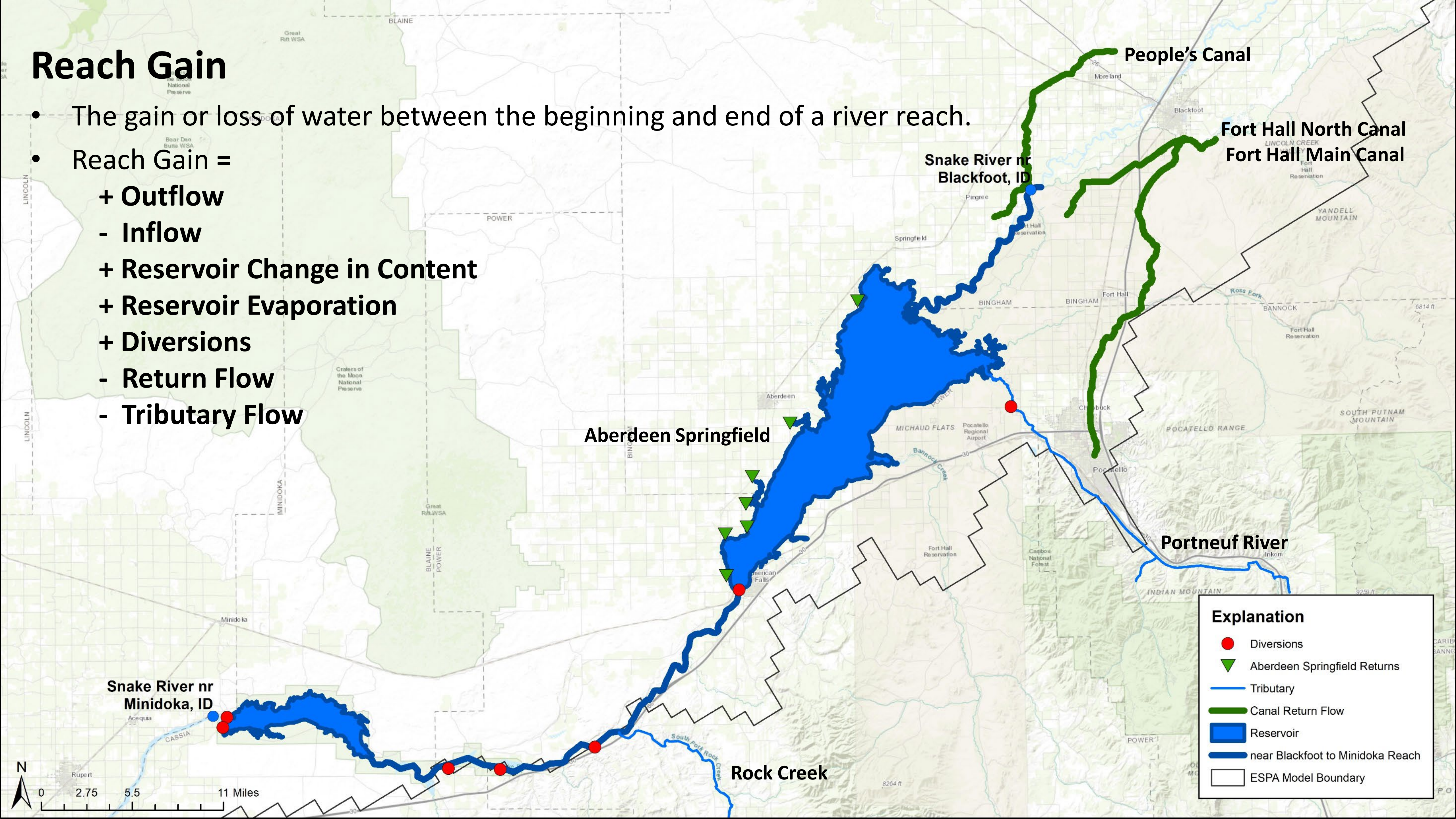
August 8, 2024

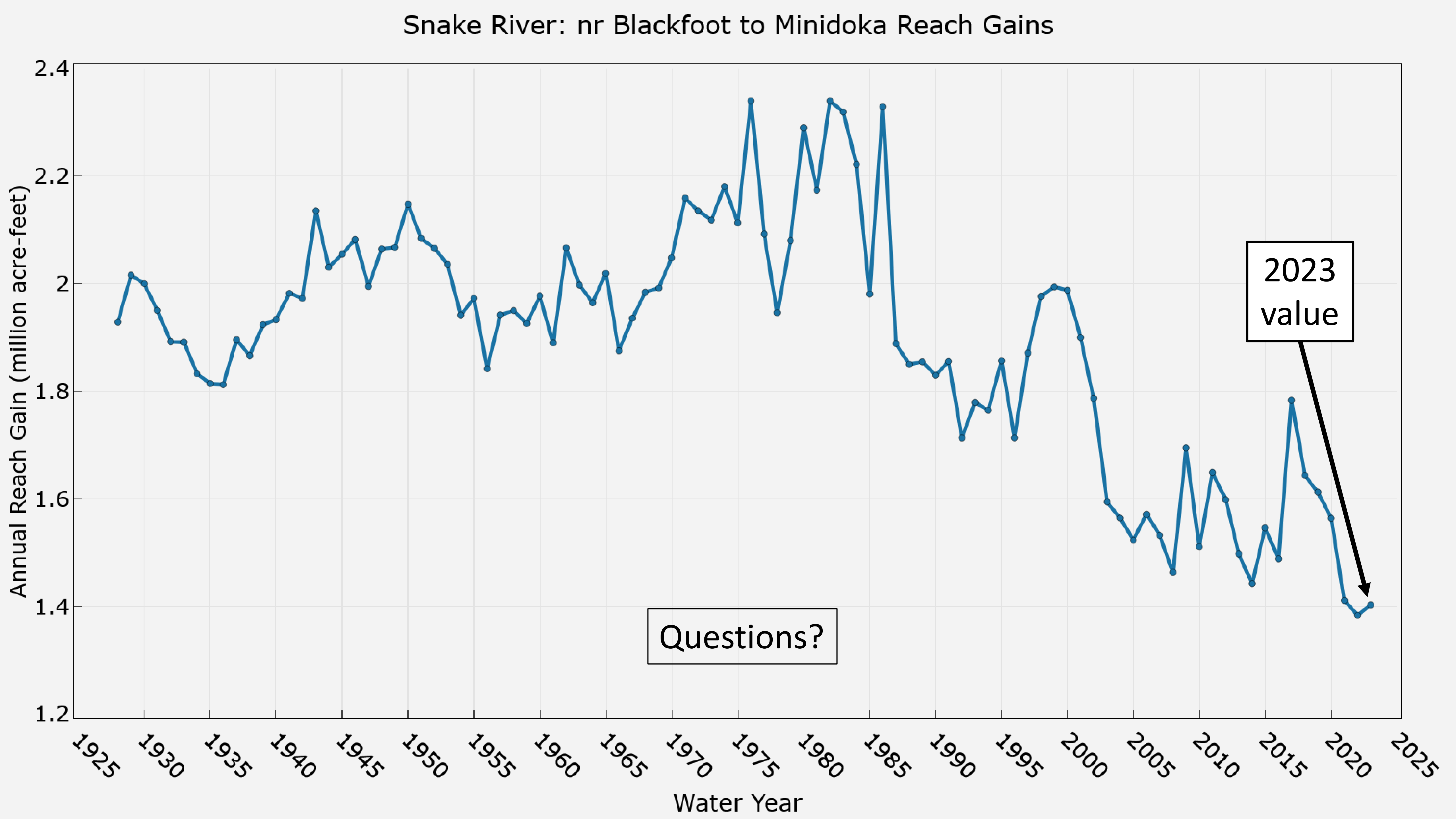


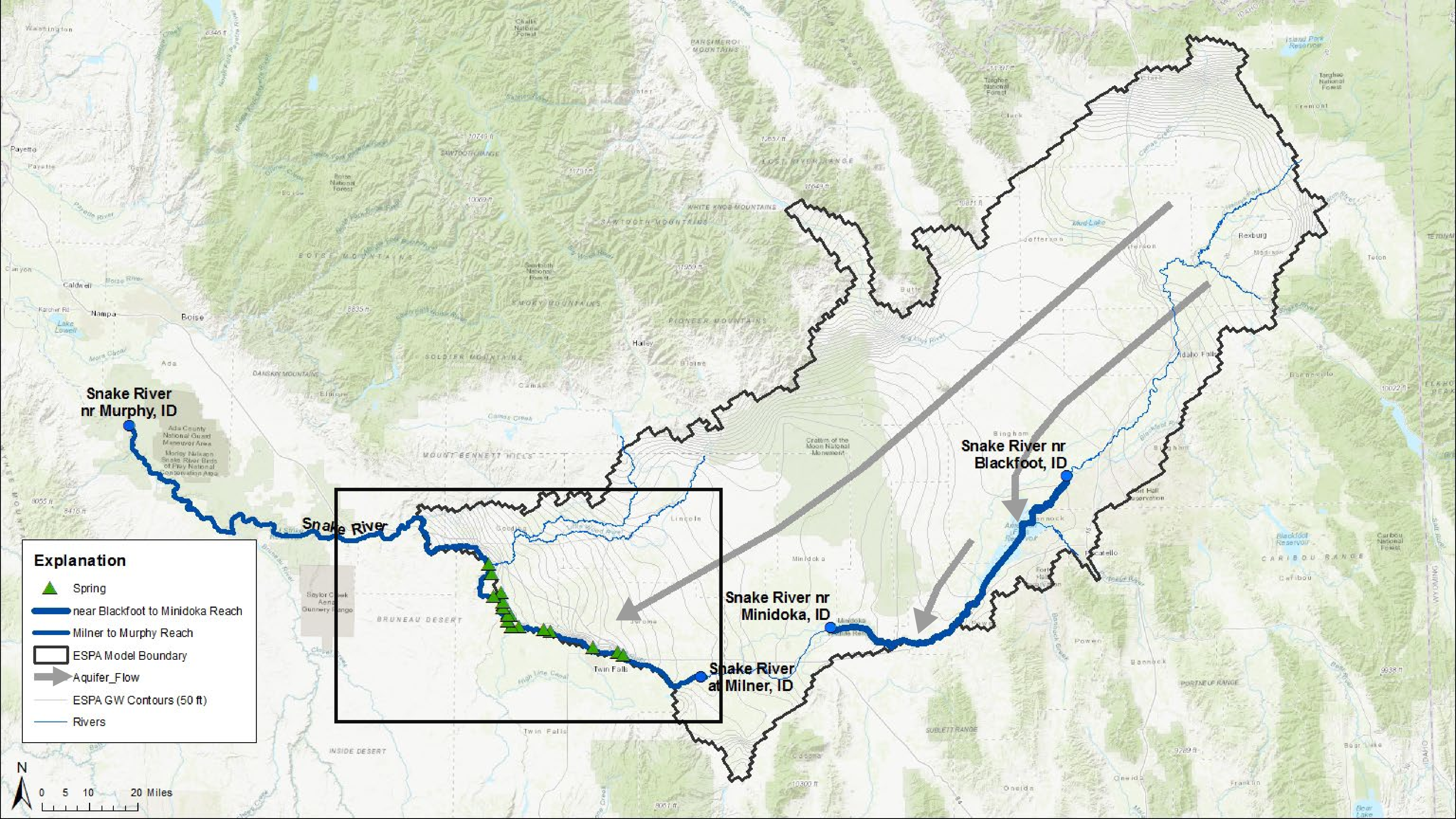
Explanation
Spring
near Blackfoot to Minidoka Reach
ESPA Model Boundary
Aquifer_Flow
ESPA GW Contours (50 ft)
Rivers
Snake River nr Blackfoot, ID
Snake River nr Minidoka, ID
N
0 5 10 20 Miles

Reach Gain

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

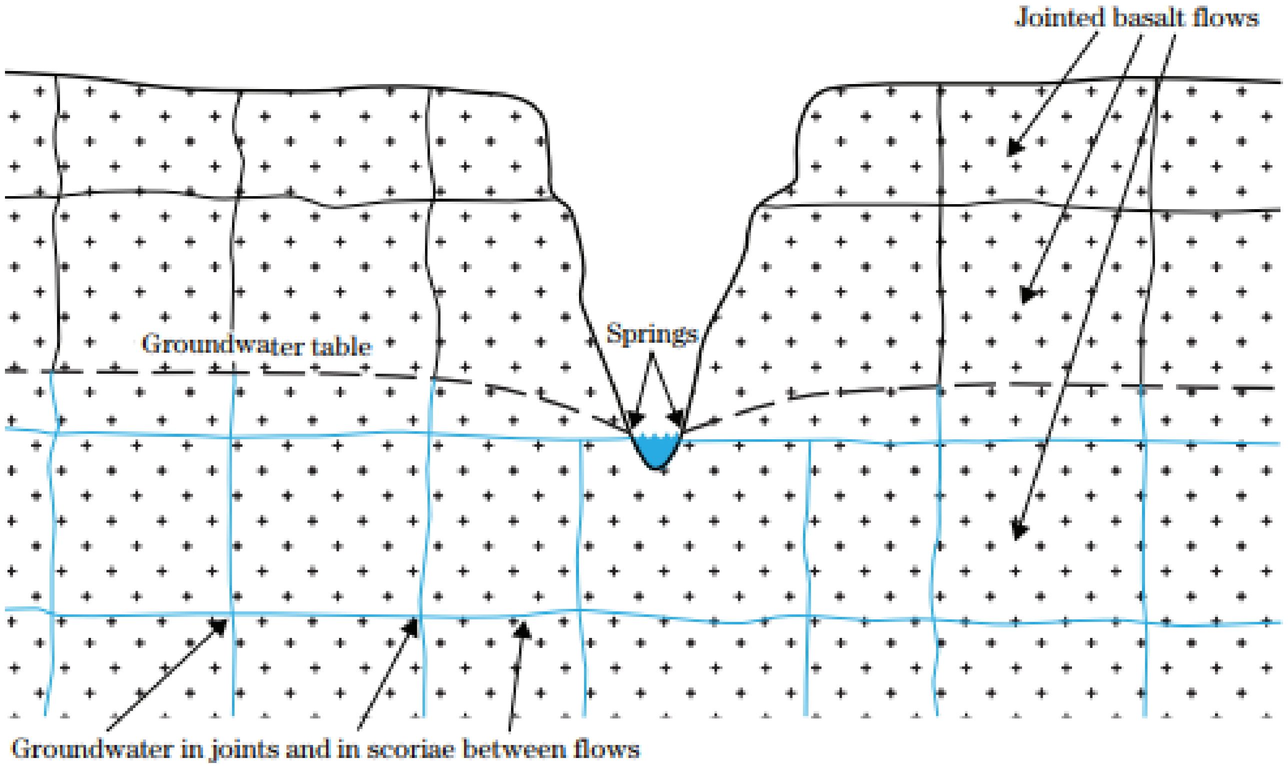



Snake River: nr Blackfoot to Minidoka Reach Gains
Annual Reach Gain (million acre-feet)
2.4
2.2
2
1.8
1.6
1.4
1.2
1925
1930
1935
1940
1945
1950
1955
1960
1965
1970
1975
1980
1985
1990
1995
2000
2005
2010
2015
2020
2025
Water Year
2023 value
Questions?



Snake River nr Murphy, ID
Snake River
Snake River nr Blackfoot, ID
Snake River nr Minidoka, ID
Snake River at Milner, ID
Explanation
Spring
near Blackfoot to Minidoka Reach
Milner to Murphy Reach
ESPA Model Boundary
Aquifer_Flow
ESPA GW Contours (50 ft)
Rivers
N
0 5 10 20 Miles

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.

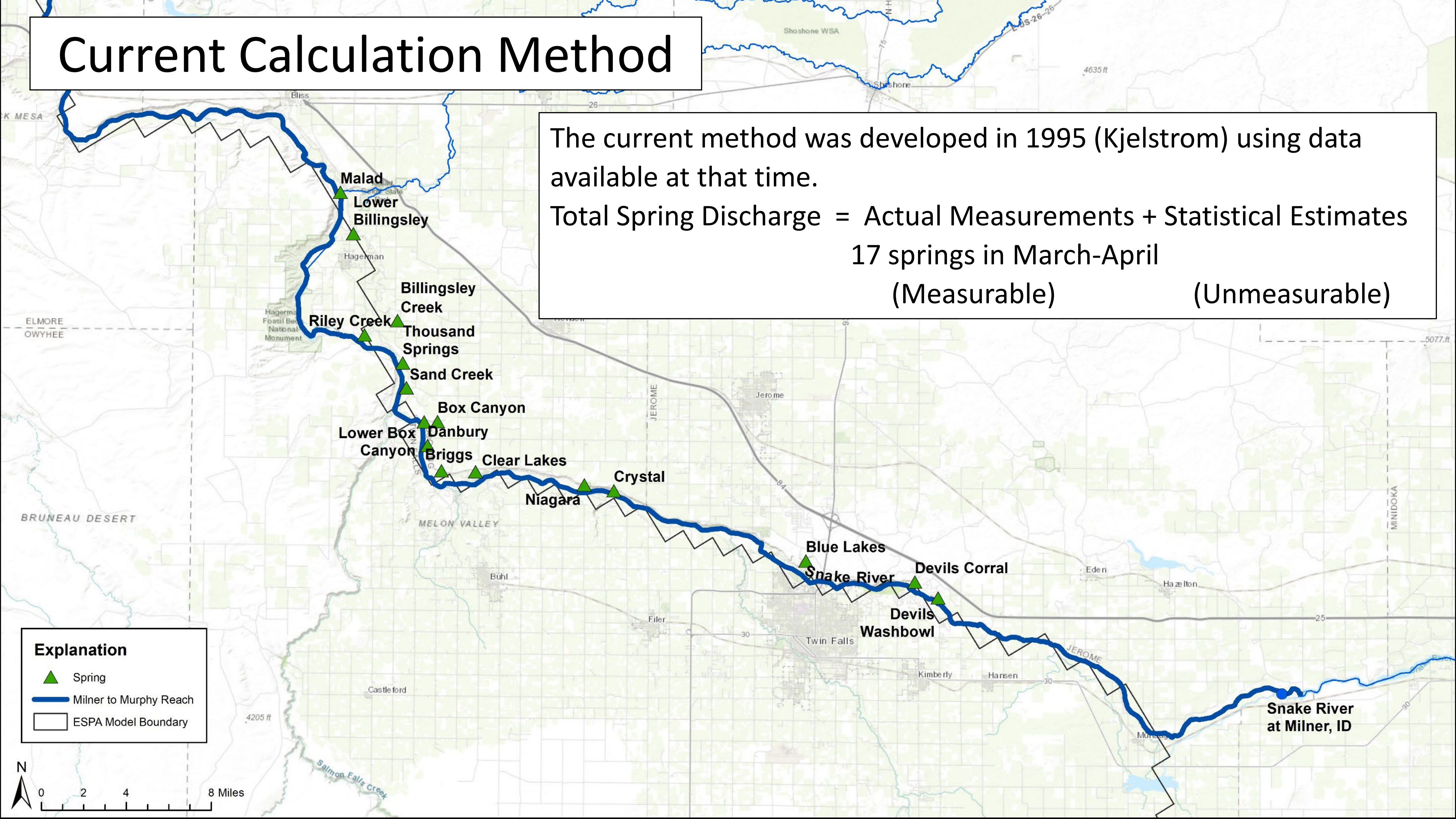
Current Calculation Method

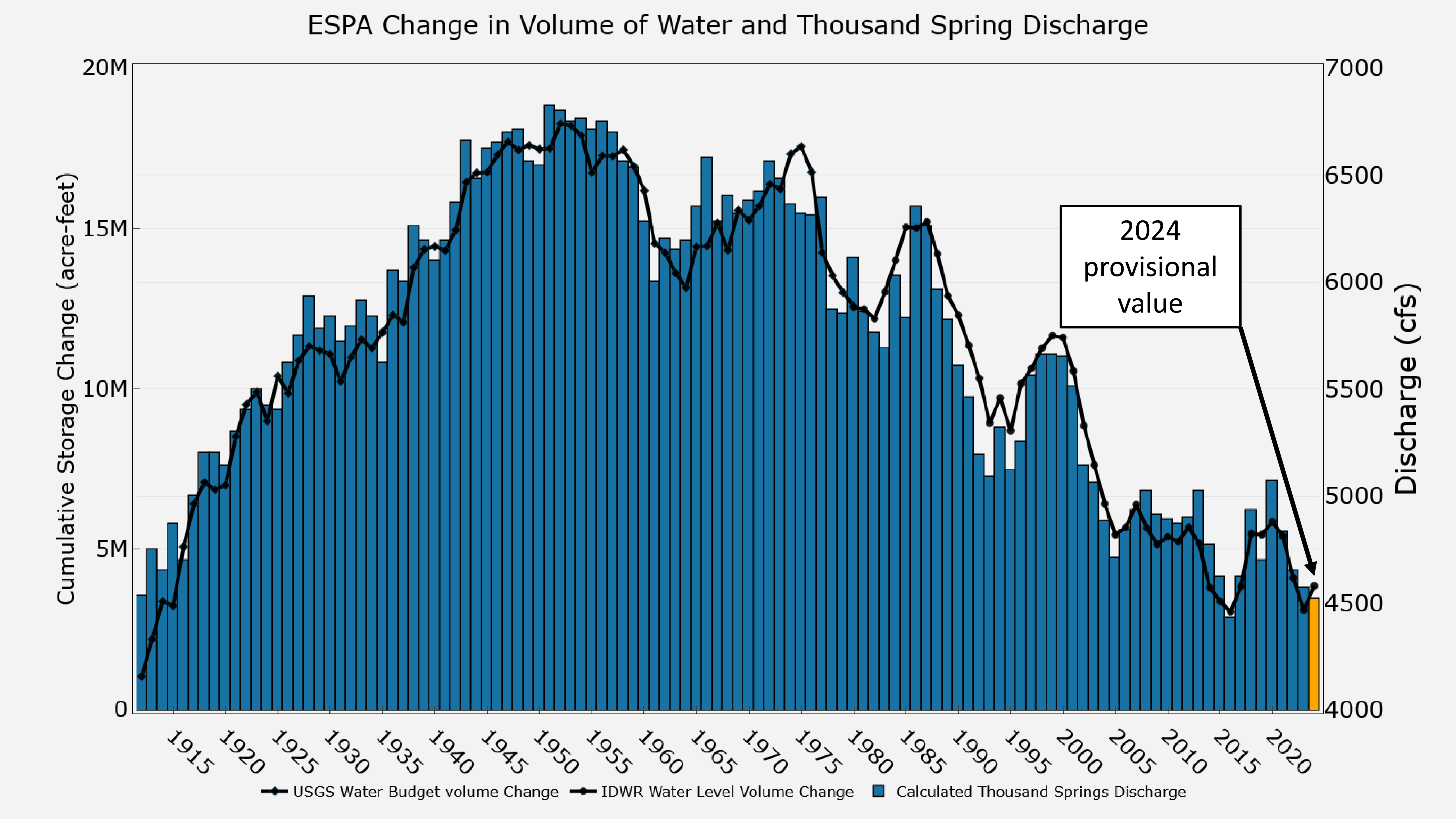
The current method was developed in 1995 (Kjelstrom) using data available at that time.

Total Spring Discharge = Actual Measurements + Statistical Estimates

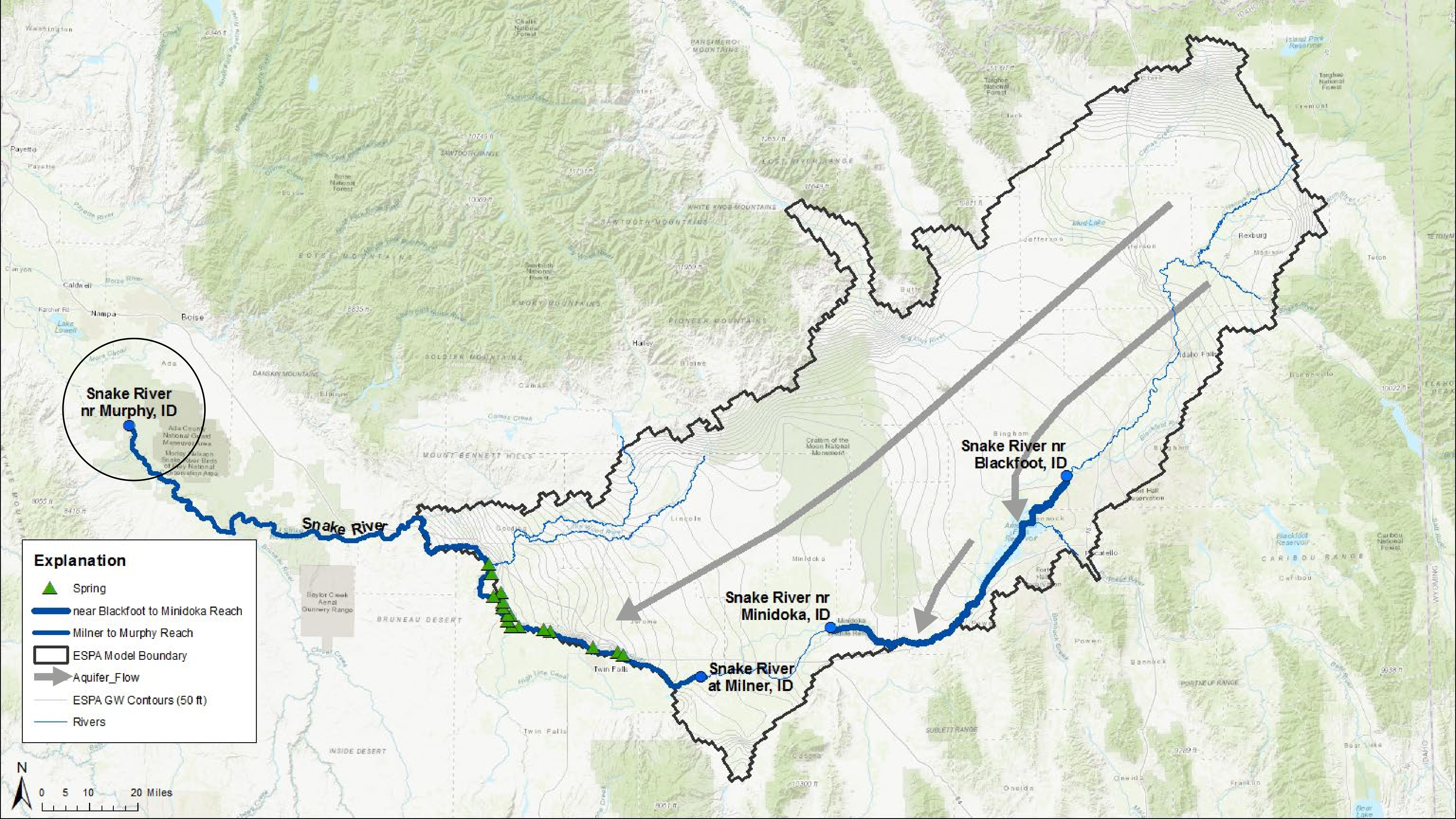
17 springs in March-April

(Measurable) (Unmeasurable)





ESPA Change in Volume of Water and Thousand Spring Discharge
Cumulative Storage Change (acre-feet)
Discharge (cfs)
20M
15M
10M
5M
0
7000
6500
6000
5500
5000
4500
4000
1915
1920
1925
1930
1935
1940
1945
1950
1955
1960
1965
1970
1975
1980
1985
1990
1995
2000
2005
2010
2015
2020
2024 provisional value
USGS Water Budget volume Change
IDWR Water Level Volume Change
Calculated Thousand Springs Discharge



Snake River nr Murphy, ID
Snake River
Snake River nr Blackfoot, ID
Snake River nr Minidoka, ID
Snake River at Milner, ID
Explanation
Spring
near Blackfoot to Minidoka Reach
Milner to Murphy Reach
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Aquifer_Flow
ESPA GW Contours (50 ft)
Rivers
N
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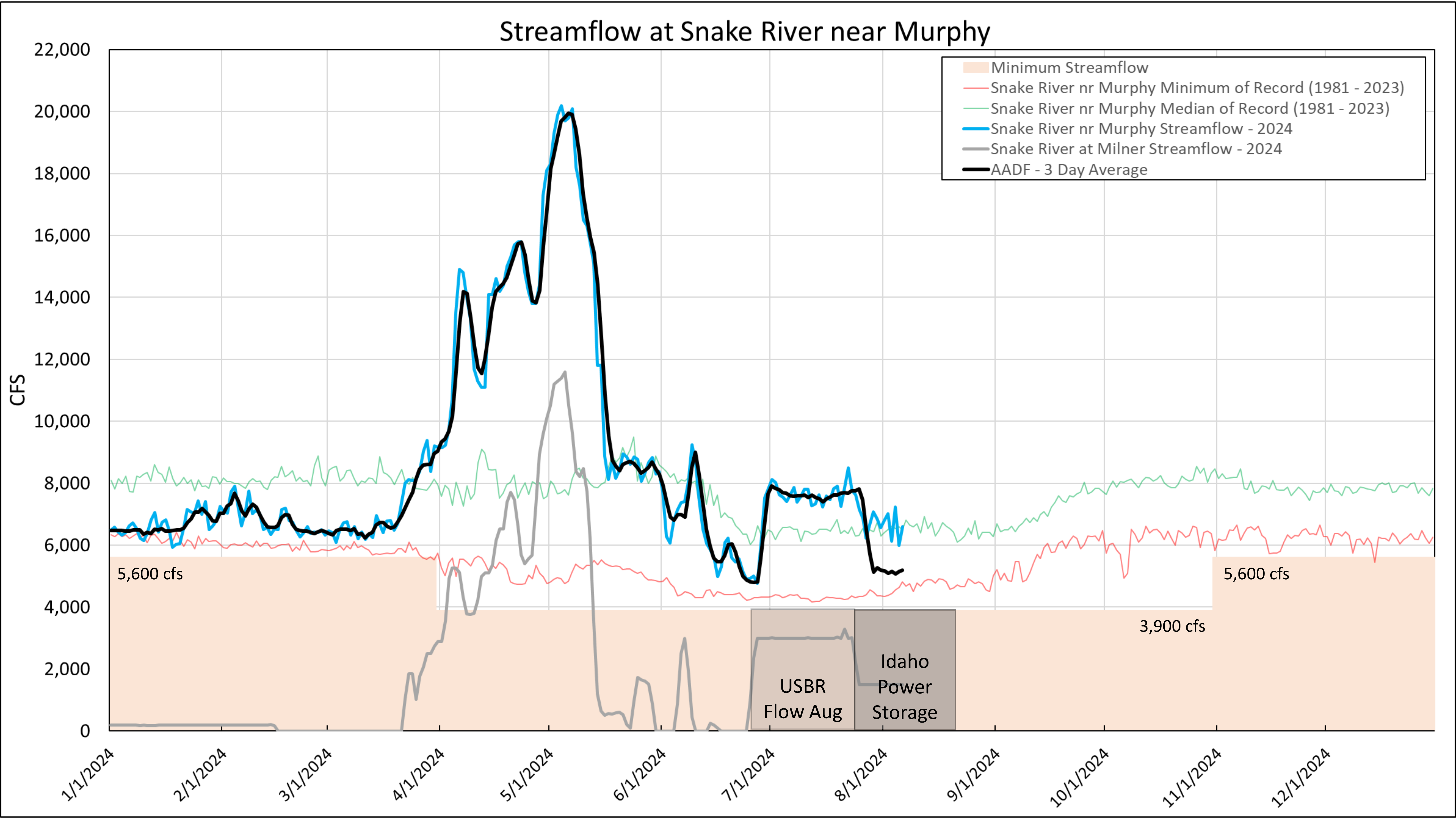
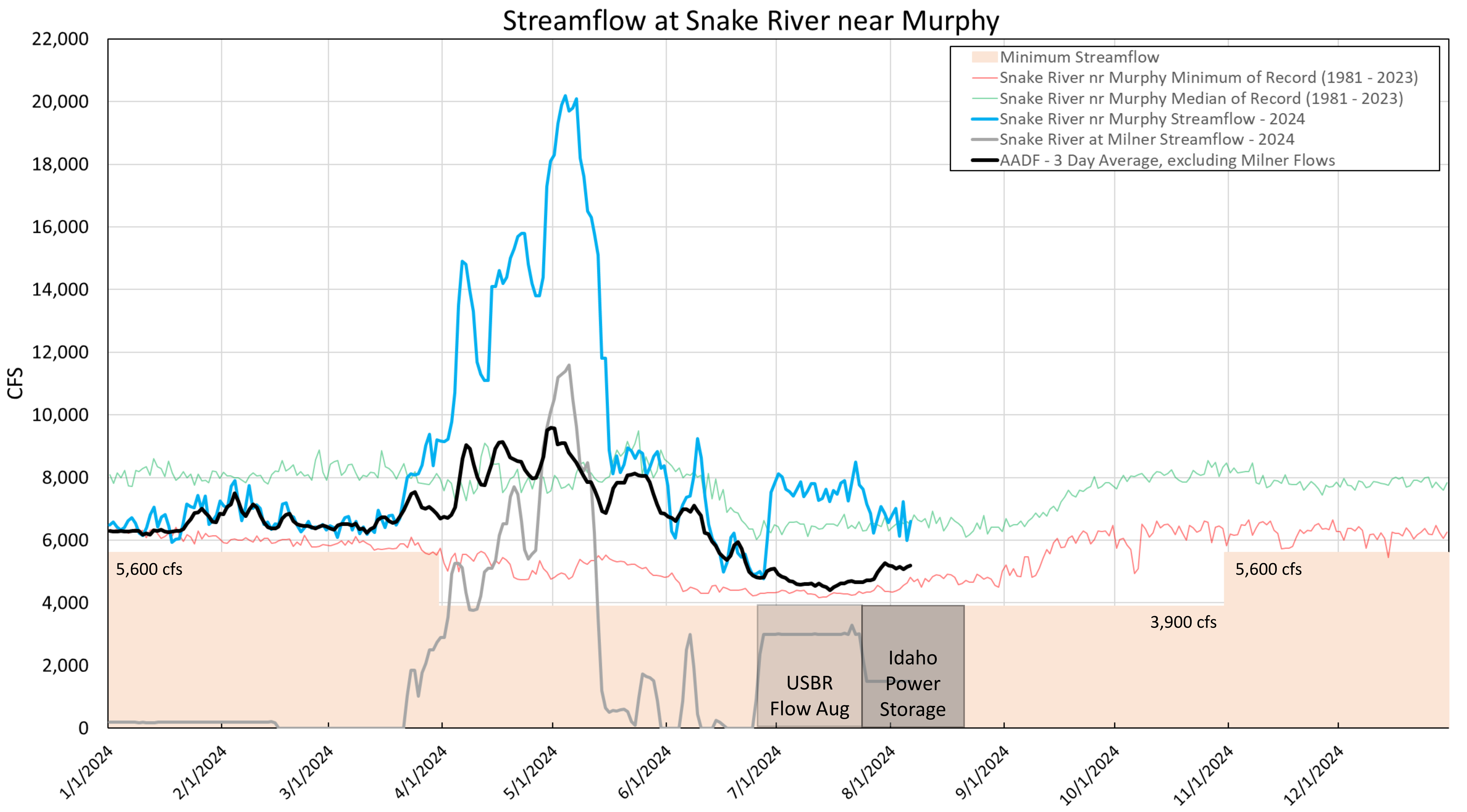
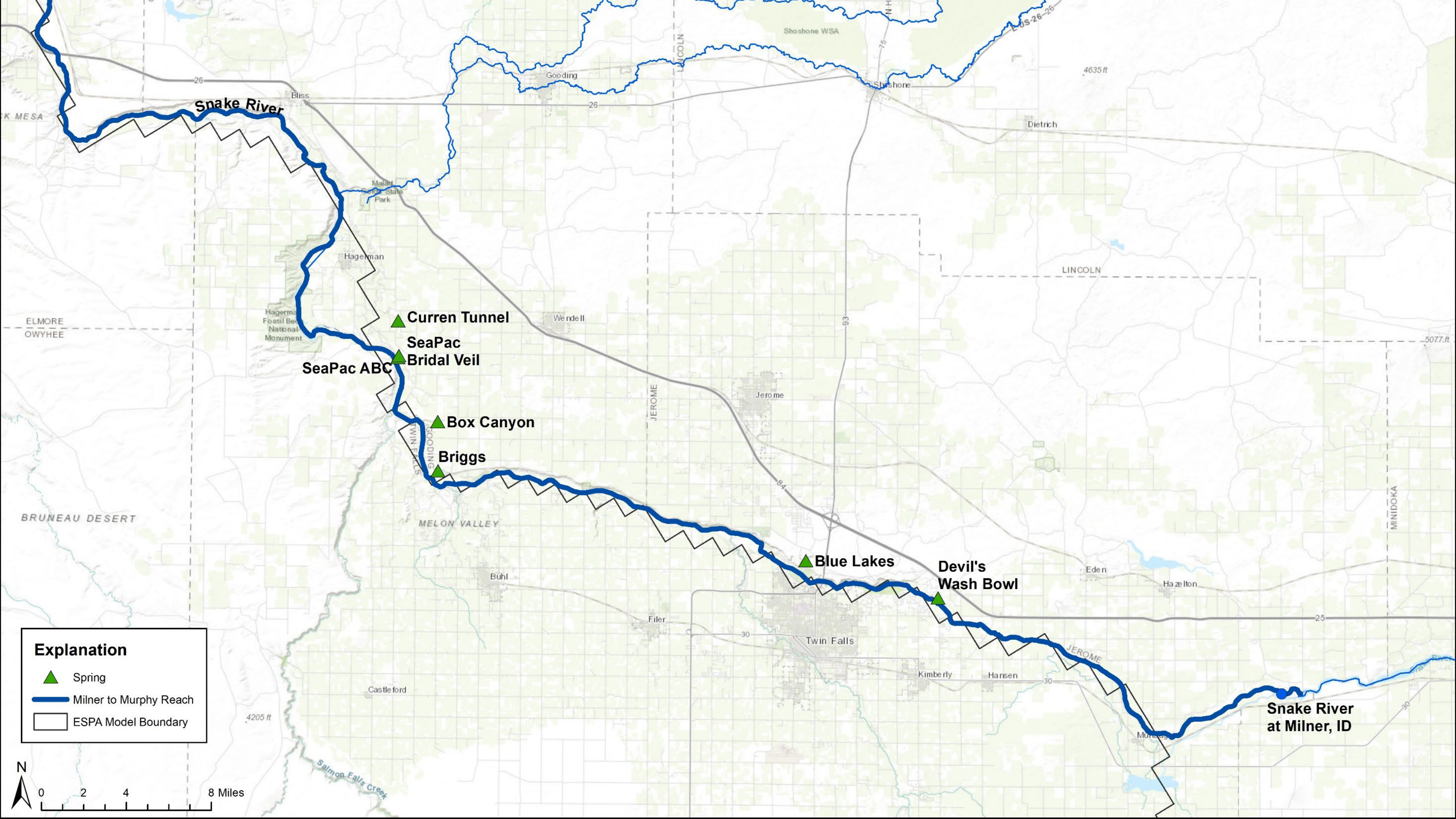
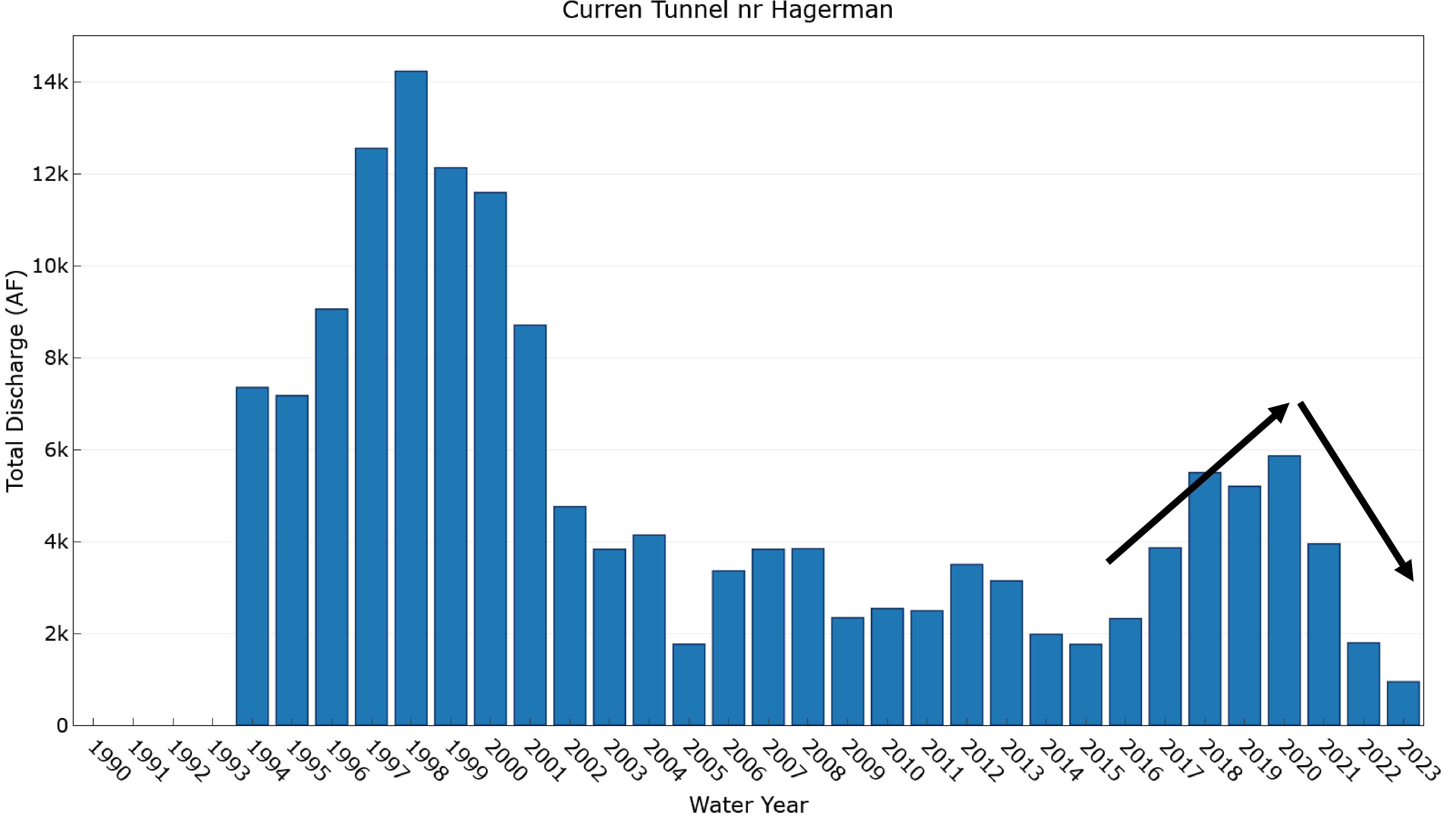
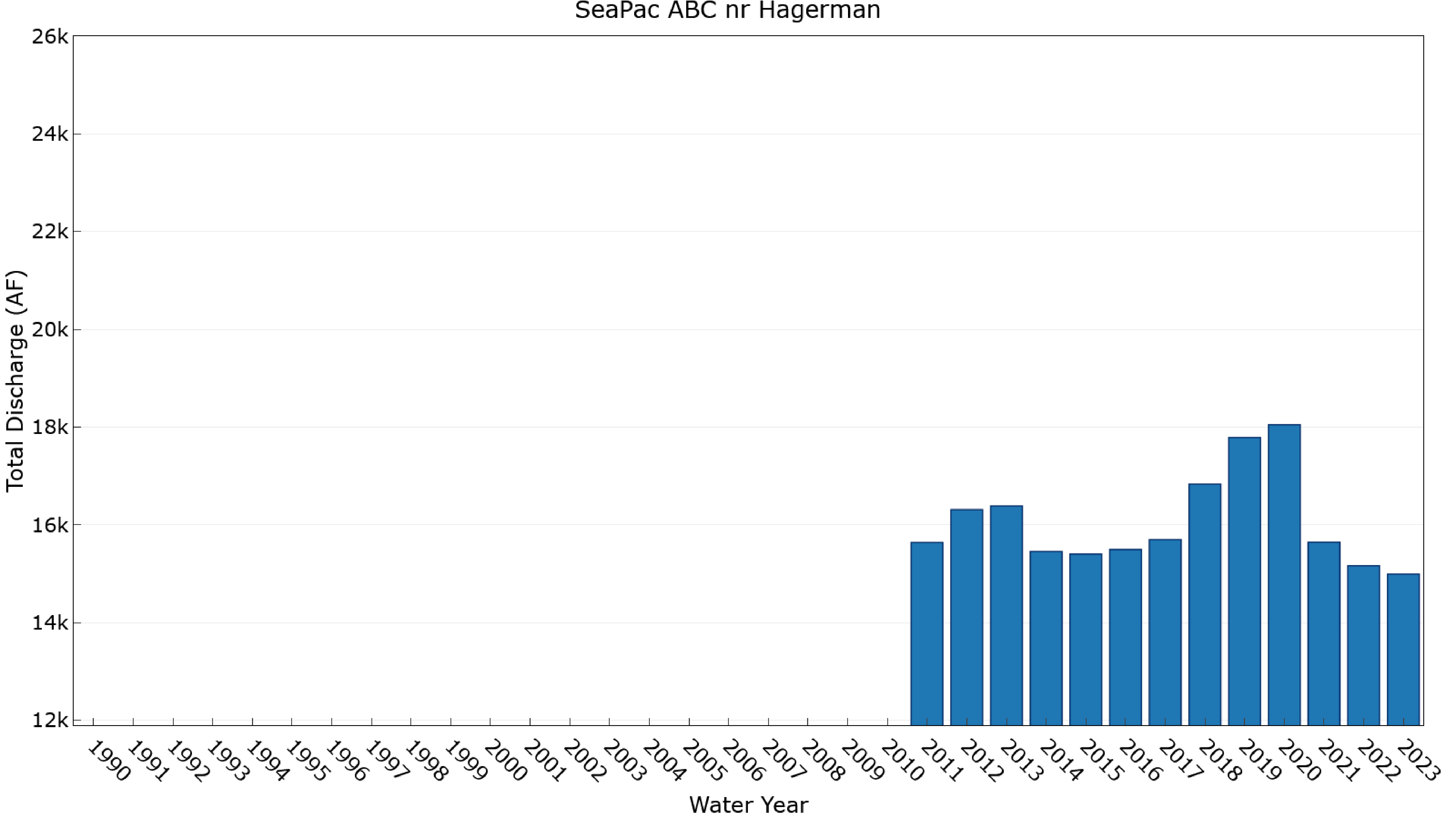


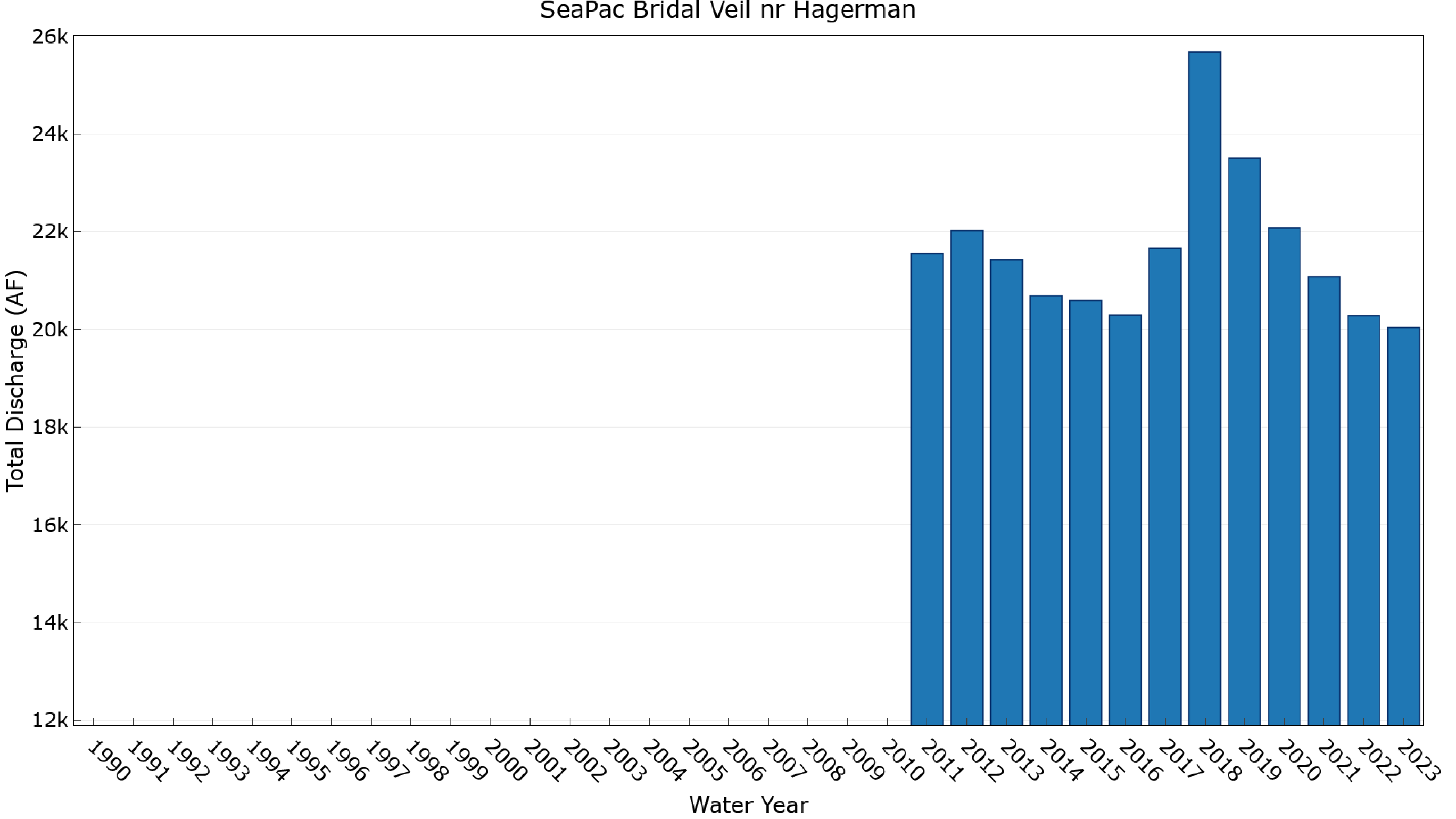
Streamflow at Snake River near Murphy
CFS
22,000
20,000
18,000
16,000
14,000
12,000
10,000
8,000
6,000
4,000
2,000
0
1/1/2024
2/1/2024
3/1/2024
4/1/2024
5/1/2024
6/1/2024
7/1/2024
8/1/2024
9/1/2024
10/1/2024
11/1/2024
12/1/2024
Minimum Streamflow
Snake River nr Murphy Minimum of Record (1981 - 2023)
Snake River nr Murphy Median of Record (1981 - 2023)
Snake River nr Murphy Streamflow - 2024
Snake River at Milner Streamflow - 2024
AADF - 3 Day Average
5,600 cfs
5,600 cfs
3,900 cfs
USBR Flow Aug
Idaho Power Storage


Streamflow at Snake River near Murphy
CFS
22,000
20,000
18,000
16,000
14,000
12,000
10,000
8,000
6,000
4,000
2,000
0
1/1/2024
2/1/2024
3/1/2024
4/1/2024
5/1/2024
6/1/2024
7/1/2024
8/1/2024
9/1/2024
10/1/2024
11/1/2024
12/1/2024
Minimum Streamflow
Snake River nr Murphy Minimum of Record (1981 - 2023)
Snake River nr Murphy Median of Record (1981 - 2023)
Snake River nr Murphy Streamflow - 2024
Snake River at Milner Streamflow - 2024
AADF - 3 Day Average, excluding Milner Flows
5,600 cfs
5,600 cfs
3,900 cfs
USBR Flow Aug
Idaho Power Storage

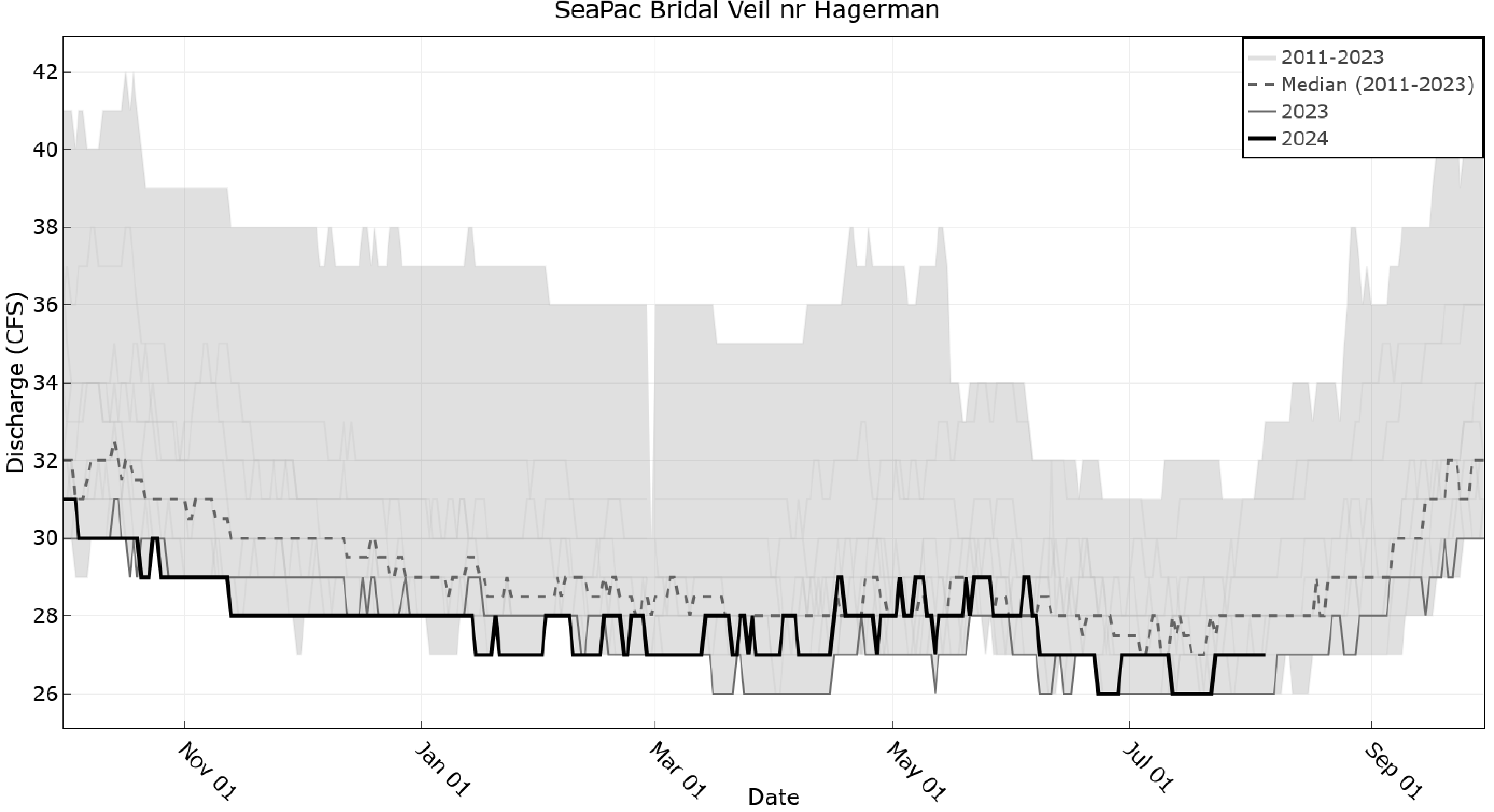

Snake River
Curren Tunnel
SeaPac
Bridal Veil
SeaPac ABC
Box Canyon
Briggs
Blue Lakes
Devil's
Wash Bowl
Snake River
at Milner, ID
Explanation
Spring
Milner to Murphy Reach
ESPA Model Boundary
N
0
2
4
8 Miles
Bliss
Gooding
Shoshone
Shoshone WSA
Dietrich
Hagerman
Hagerman
Fossil Beds
National
Monument
Wendell
Jerome
Twin Falls
Kimberly
Hansen
Buhl
Filer
Castleford
Eden
Hazelton
ELMORE
OWYHEE
LINCOLN
JEROME
MINIDOKA
BRUNEAU DESERT
MELON VALLEY
Salmon Falls Creek
4635 ft
5077 ft
4205 ft

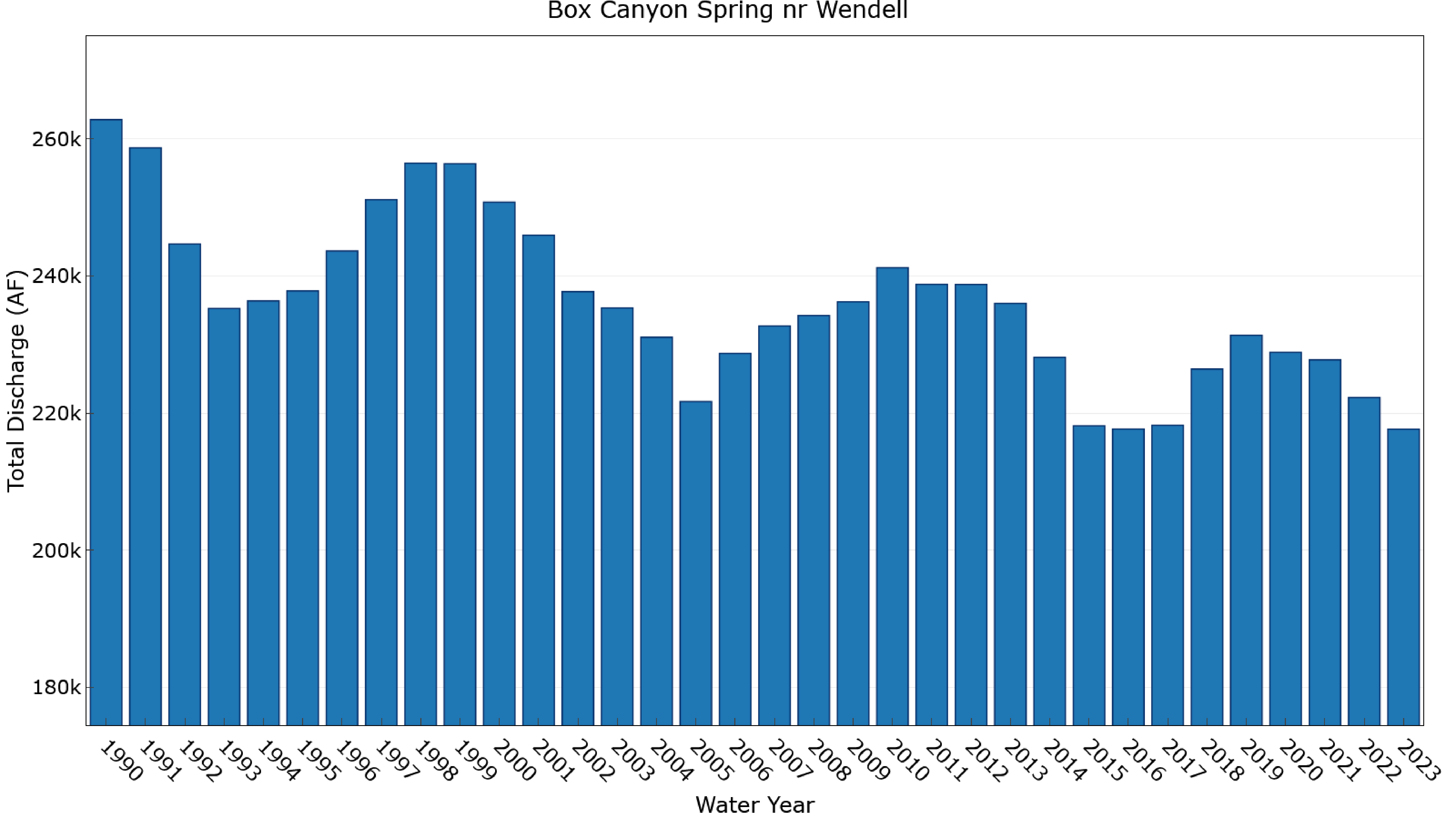

Curren Tunnel nr Hagerman
Total Discharge (AF)
0
2k
4k
6k
8k
10k
12k
14k
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022
2023
Water Year

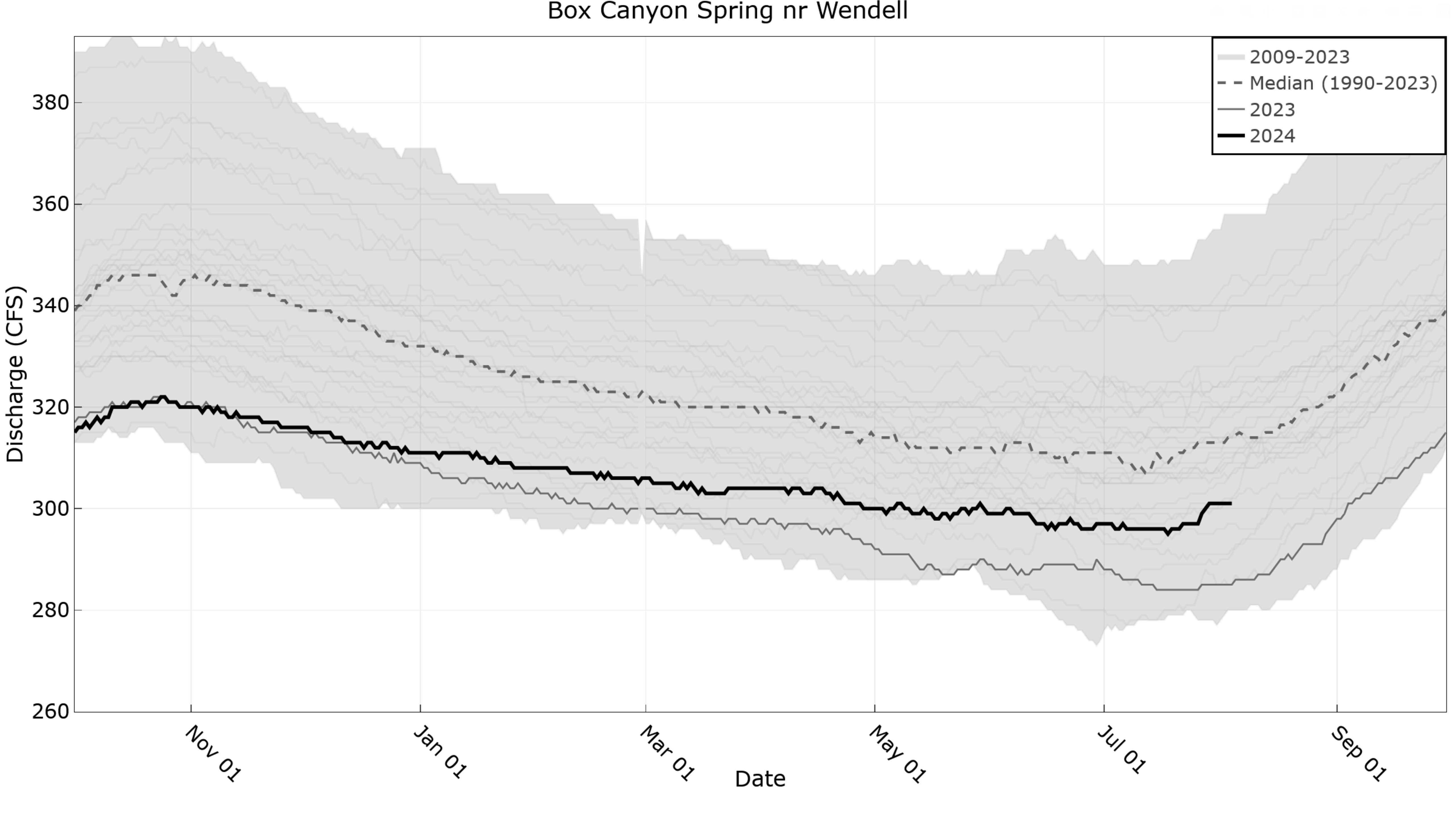

SeaPac ABC nr Hagerman
Total Discharge (AF)
26k
24k
22k
20k
18k
16k
14k
12k
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022
2023
Water Year

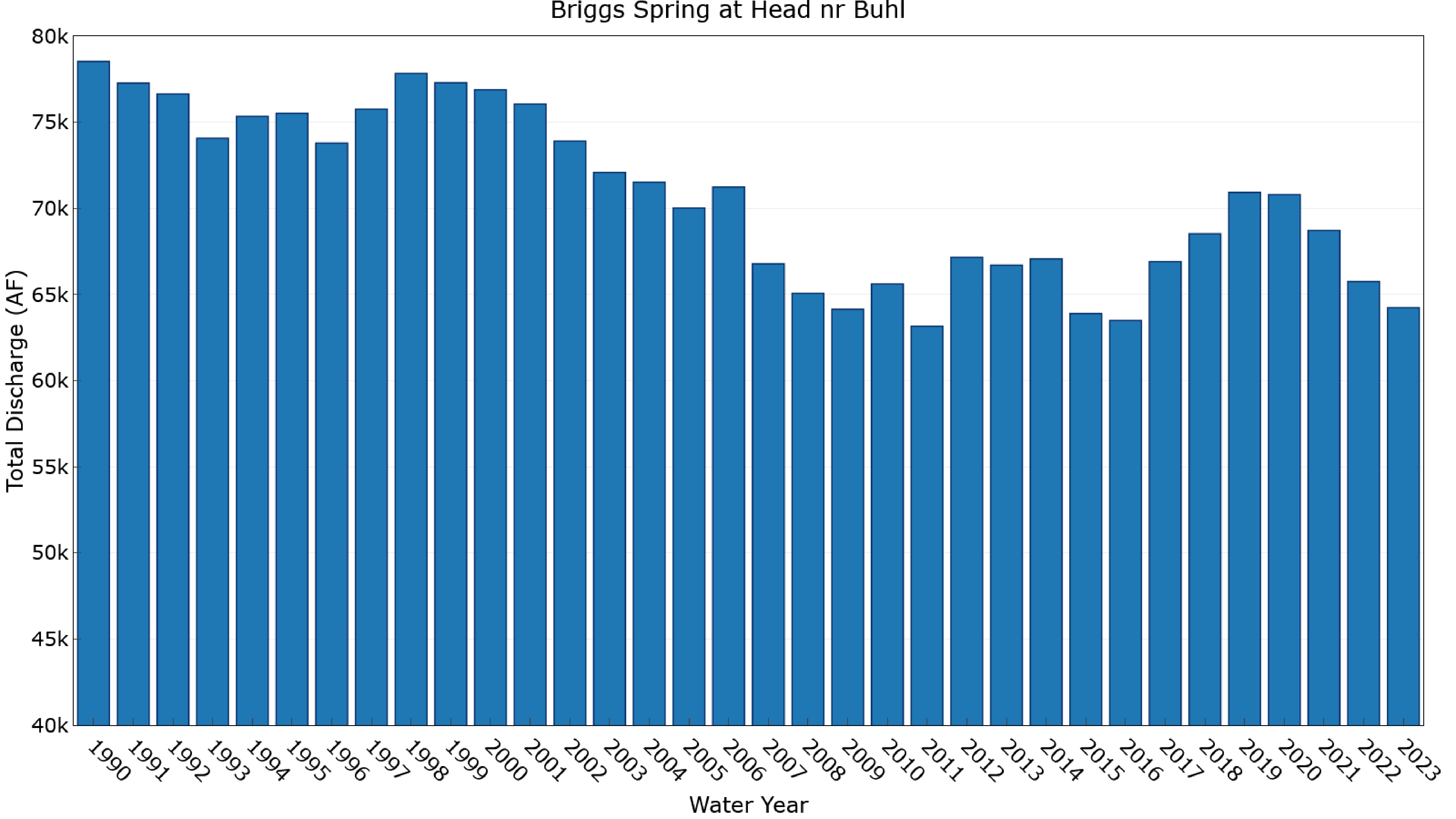


SeaPac Bridal Veil nr Hagerman
Total Discharge (AF)
Water Year
26k
24k
22k
20k
18k
16k
14k
12k
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022
2023

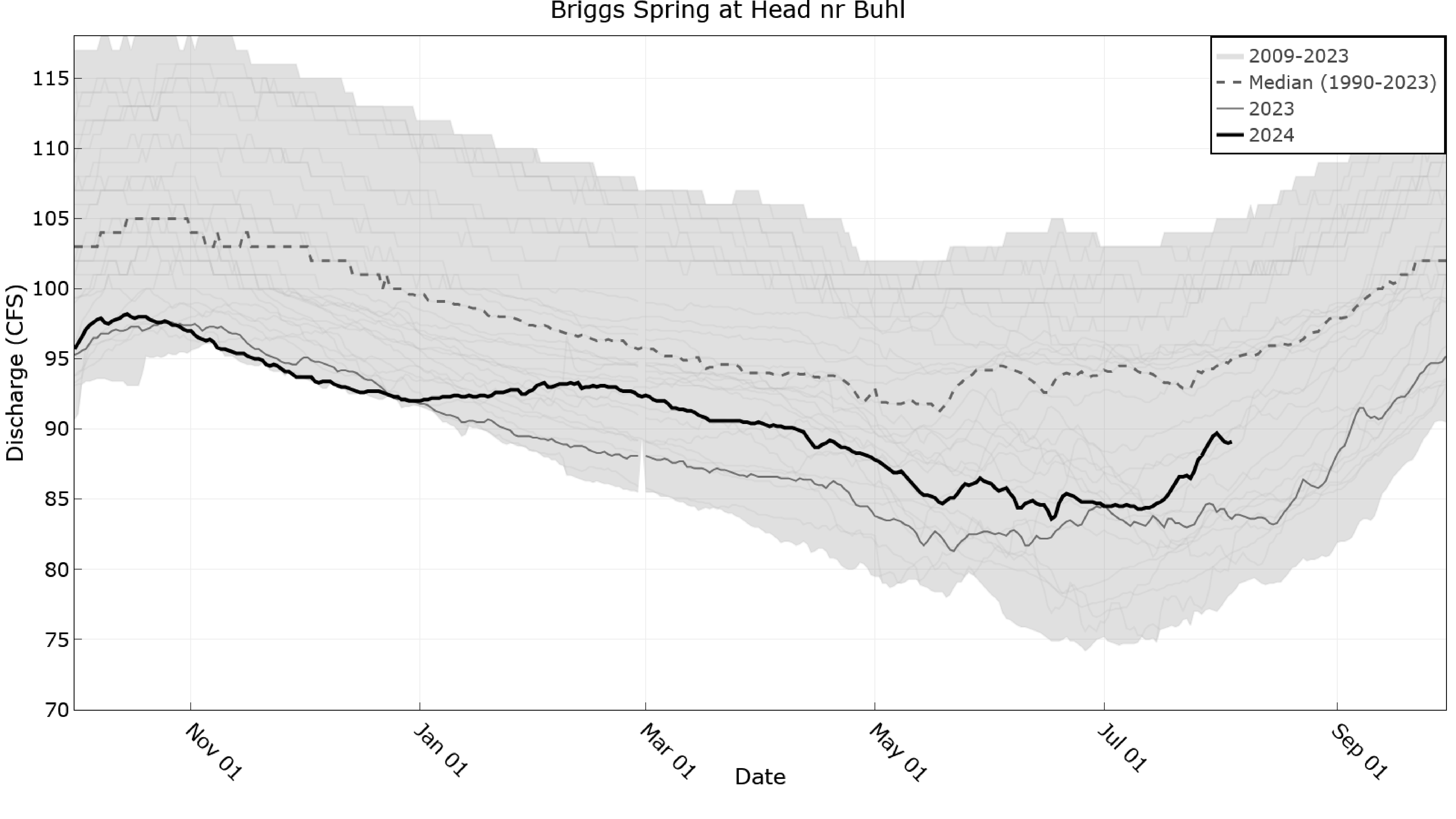

SeaPac Bridal Veil nr Hagerman
2011-2023
Median (2011-2023)
2023
2024
Discharge (CFS)
42
40
38
36
34
32
30
28
26
Nov 01
Jan 01
Mar 01
May 01
Jul 01
Sep 01
Date

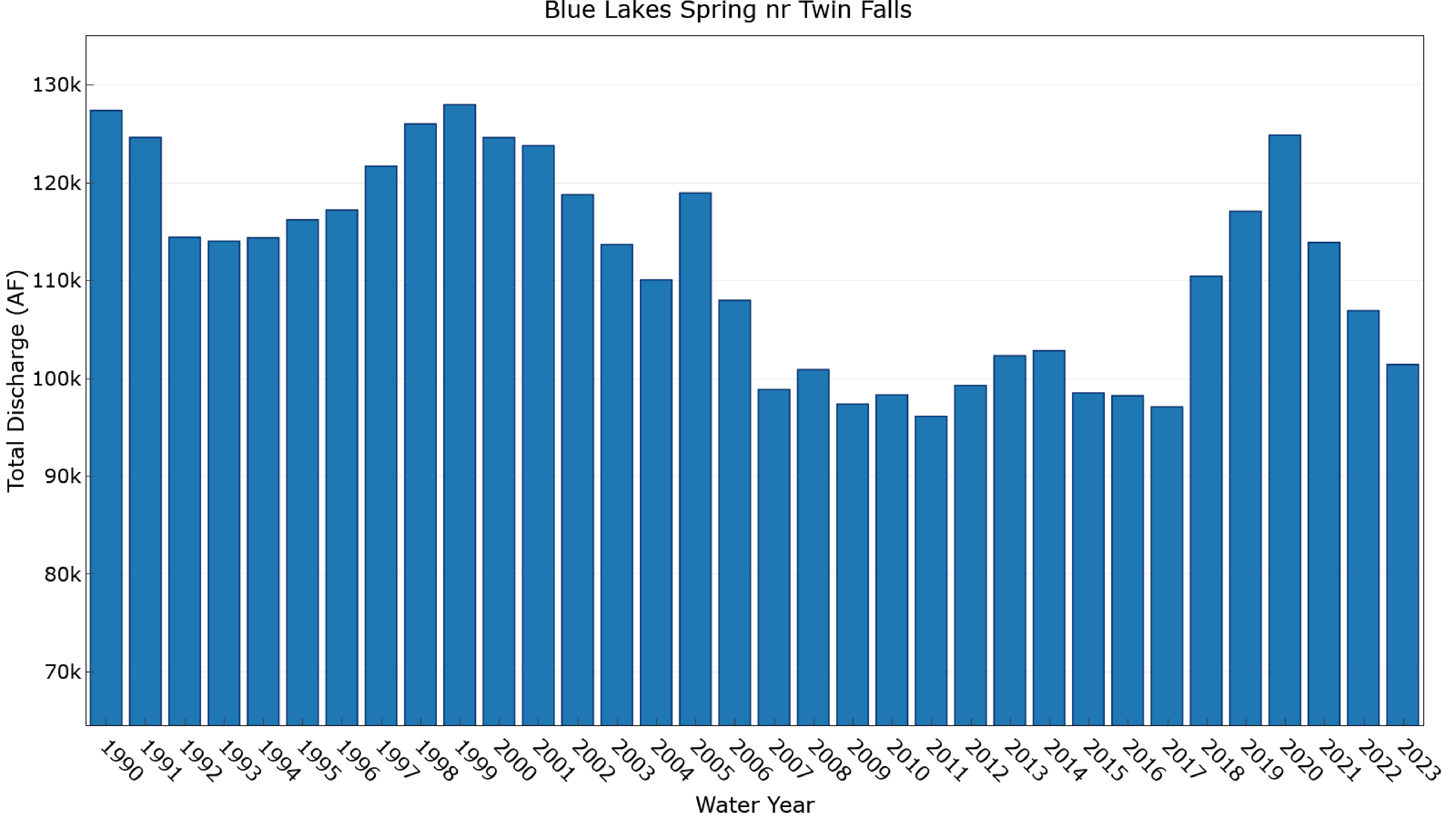

Box Canyon Spring nr Wendell
Total Discharge (AF)
260k
240k
220k
200k
180k
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022
2023
Water Year

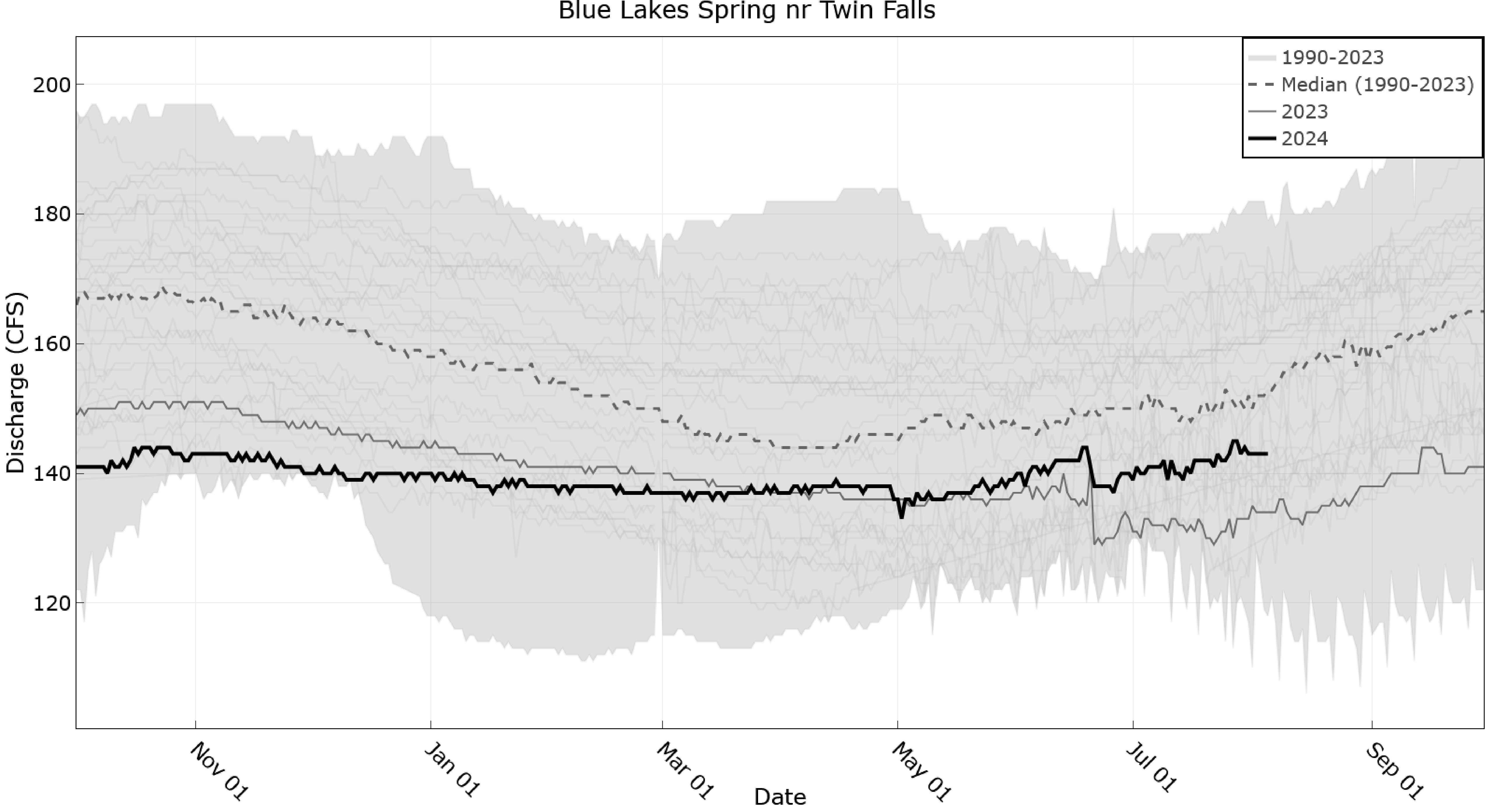

Box Canyon Spring nr Wendell
Discharge (CFS)
Date
260
280
300
320
340
360
380
Nov 01
Jan 01
Mar 01
May 01
Jul 01
Sep 01
2009-2023
Median (1990-2023)
2023
2024



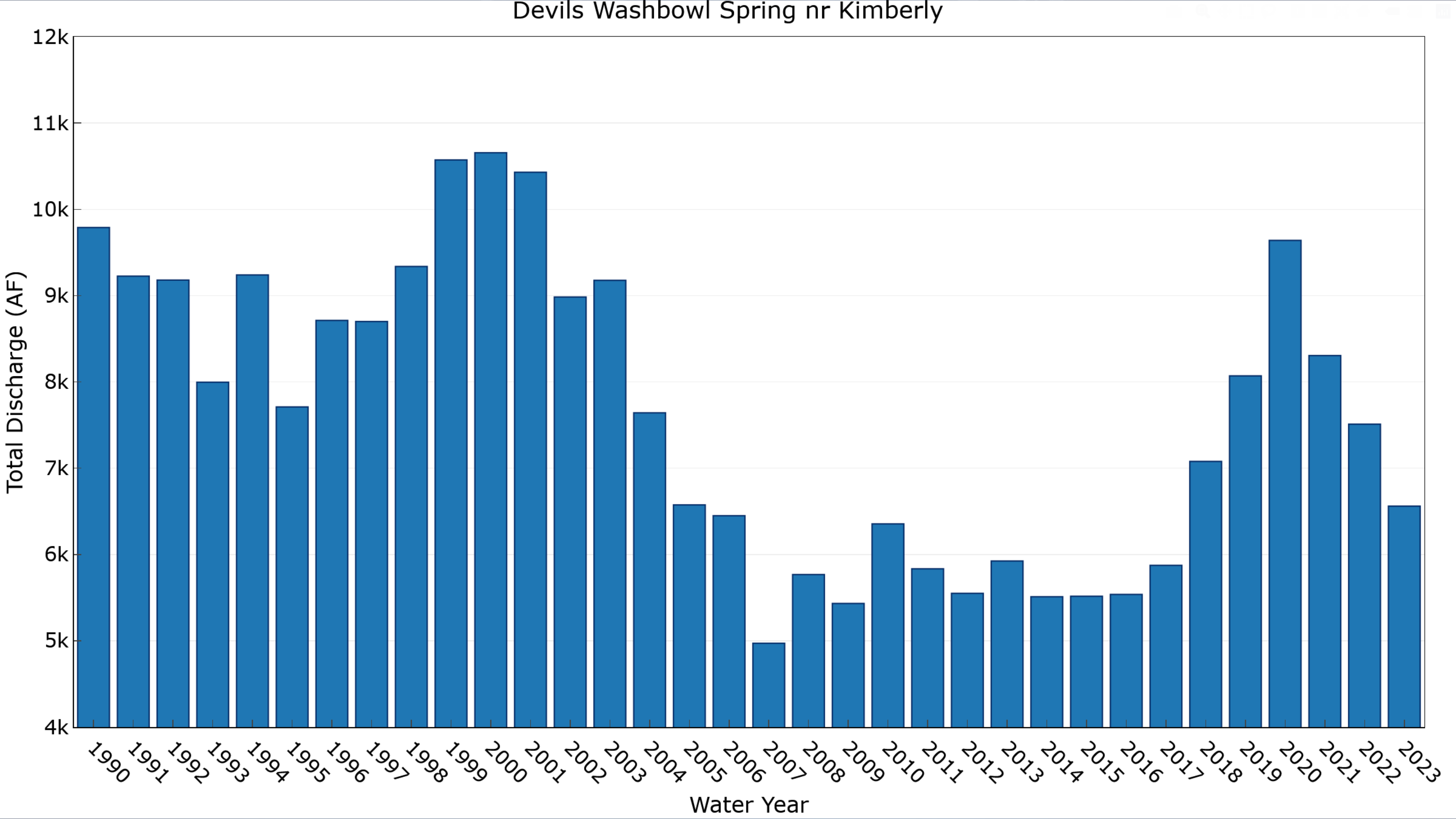
Briggs Spring at Head nr Buhl
Total Discharge (AF)
80k
75k
70k
65k
60k
55k
50k
45k
40k
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022
2023
Water Year


Briggs Spring at Head nr Buhl
2009-2023
Median (1990-2023)
2023
2024
Discharge (CFS)
Date
115
110
105
100
95
90
85
80
75
70
Nov 01
Jan 01
Mar 01
May 01
Jul 01
Sep 01


Blue Lakes Spring nr Twin Falls
Total Discharge (AF)
130k
120k
110k
100k
90k
80k
70k
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
2023
Water Year



Blue Lakes Spring nr Twin Falls
1990-2023
Median (1990-2023)
2023
2024
Discharge (CFS)
200
180
160
140
120
Nov 01
Jan 01
Mar 01
May 01
Jul 01
Sep 01
Date



Devils Washbowl Spring nr Kimberly
Total Discharge (AF)
12k
11k
10k
9k
8k
7k
6k
5k
4k
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
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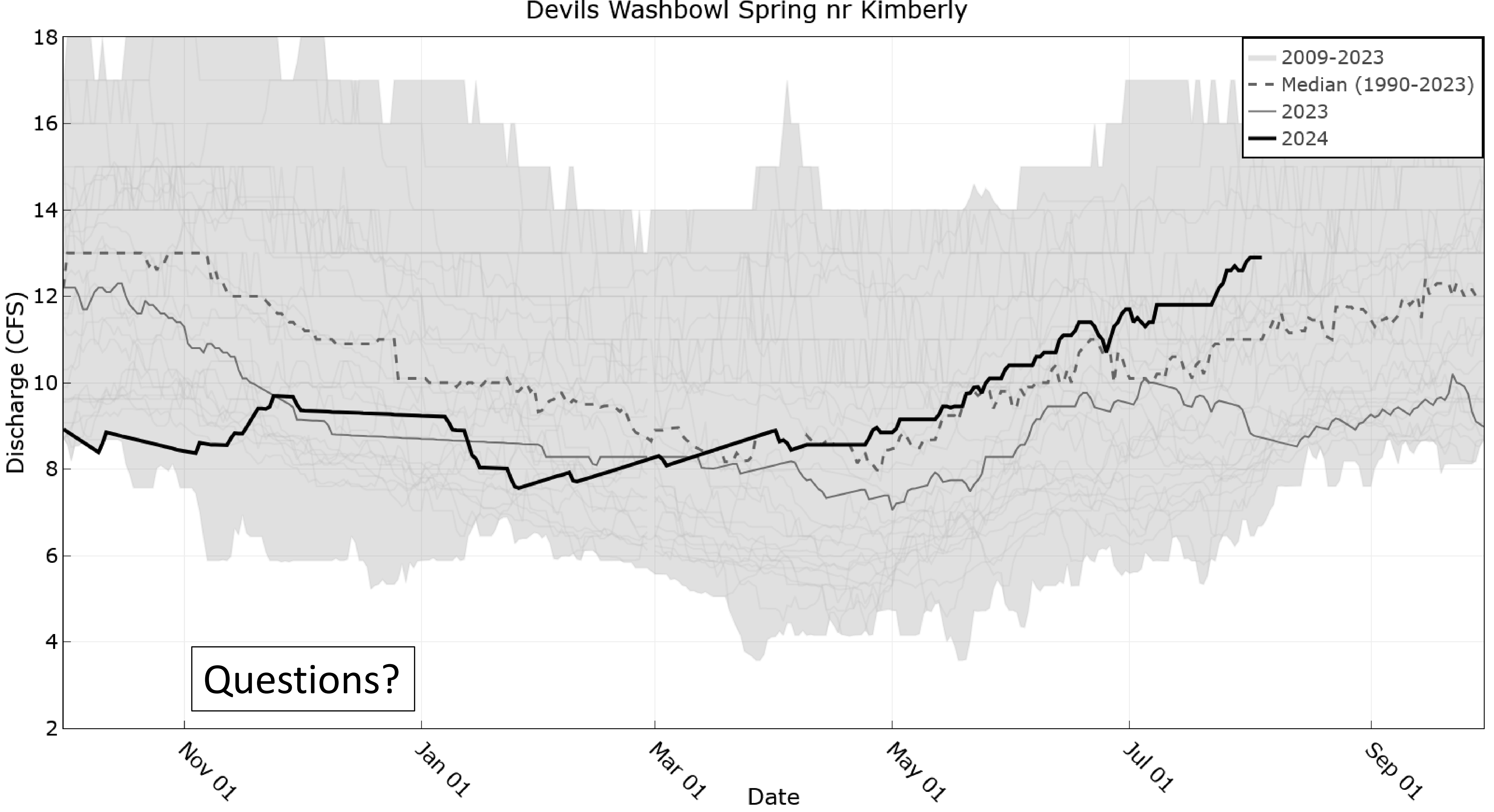
2014
2015
2016
2017
2018
2019
2020
2021
2022
2023
Water Year


Devils Washbowl Spring nr Kimberly
Discharge (CFS)
Date
2009-2023
Median (1990-2023)
2023
2024
18
16
14
12
10
8
6
4
2
Nov 01
Jan 01
Mar 01
May 01
Jul 01
Sep 01

Questions?

Modeled Aquifer Management Impacts, Update 2024

ALEX MOODY, IDWR

AUGUST 8, 2024

IDAHO DEPARTMENT OF
WATER RESOURCES

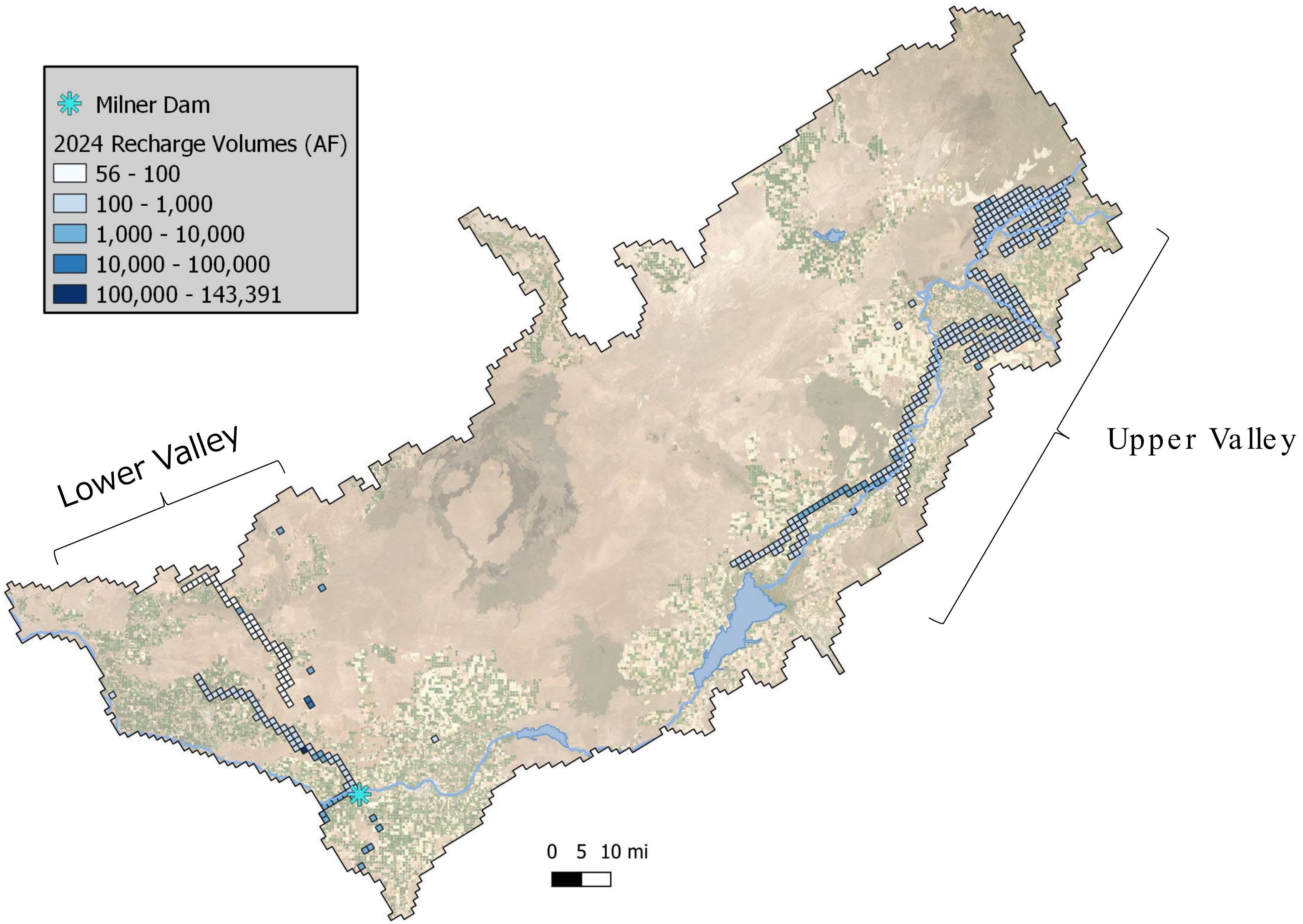
Modeled recharge and pumping reduction volumes

- IGWA Recharge
  - Scenario includes donated SWC storage and Cities' recharge
  - Knowledge of timing and location varies in detail
- Pumping reductions
  - Distributed evenly through the irrigation season
  - Some WMIS wells have unknown locations
- IWRB recharge
  - Timing and location well known

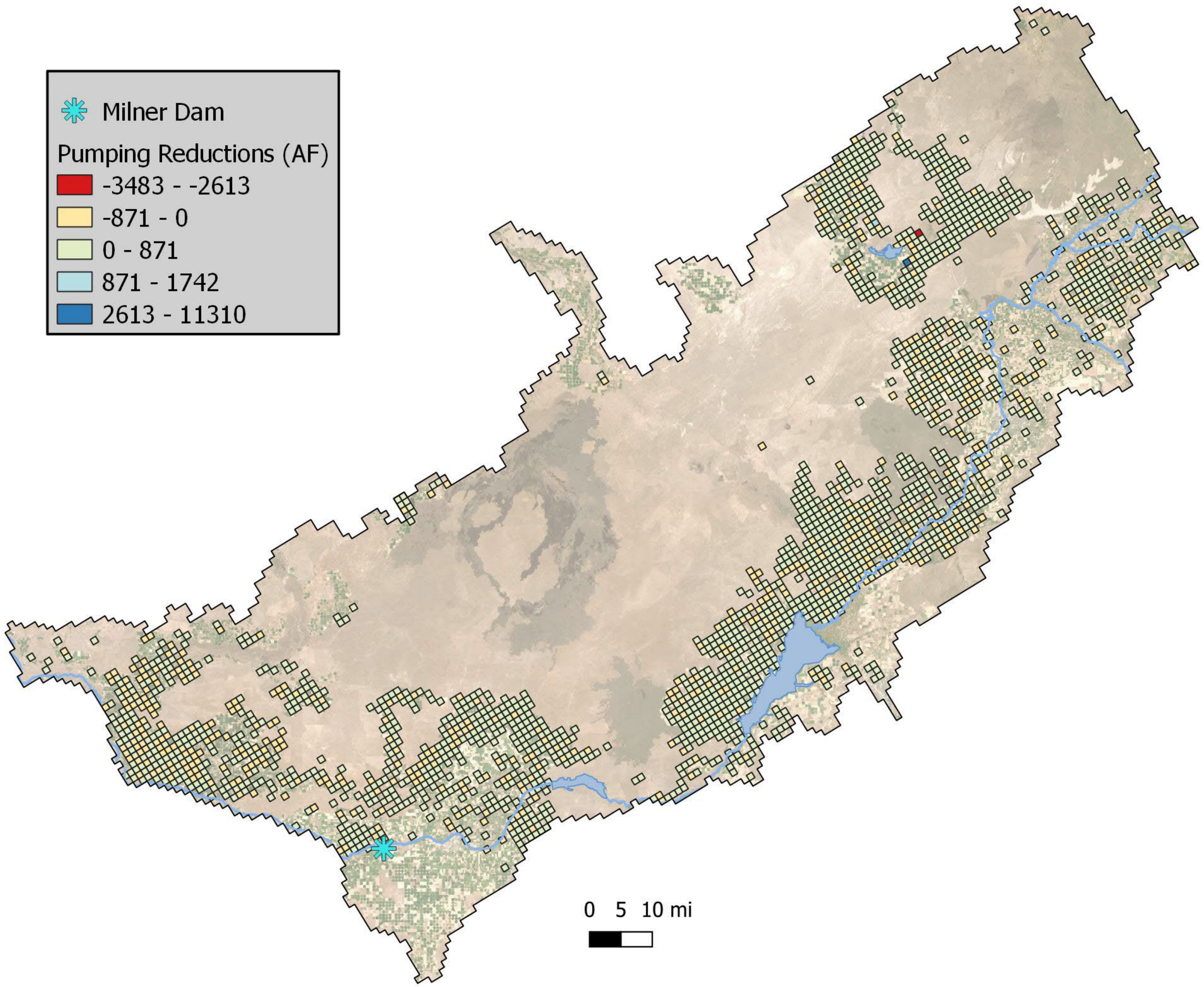
Calendar Year	Board Recharge (AF)*	IGWA Recharge (AF)*	Pumping Reduction (AF)*
2014	36,087	-	-
2015	67,542	16,847	-
2016	77,432	101,814	128,764
2017	420,212	243,311	266,507
2018	352,348	178,207	213,269
2019	336,301	168,195	299,988
2020	469,480	157,497	224,301
2021	134,524	67,584	72,959
2022	156,922	20,473	130,912
2023	135,000	94,728	358,712
2024	329,686	17,379	-

* These volumes are model and inputs and may differ slightly from reported Department or IGWA numbers due to aggregation period, wells being outside of the model boundary, and omission of conversions.

2024 recharge on ESPAM grid

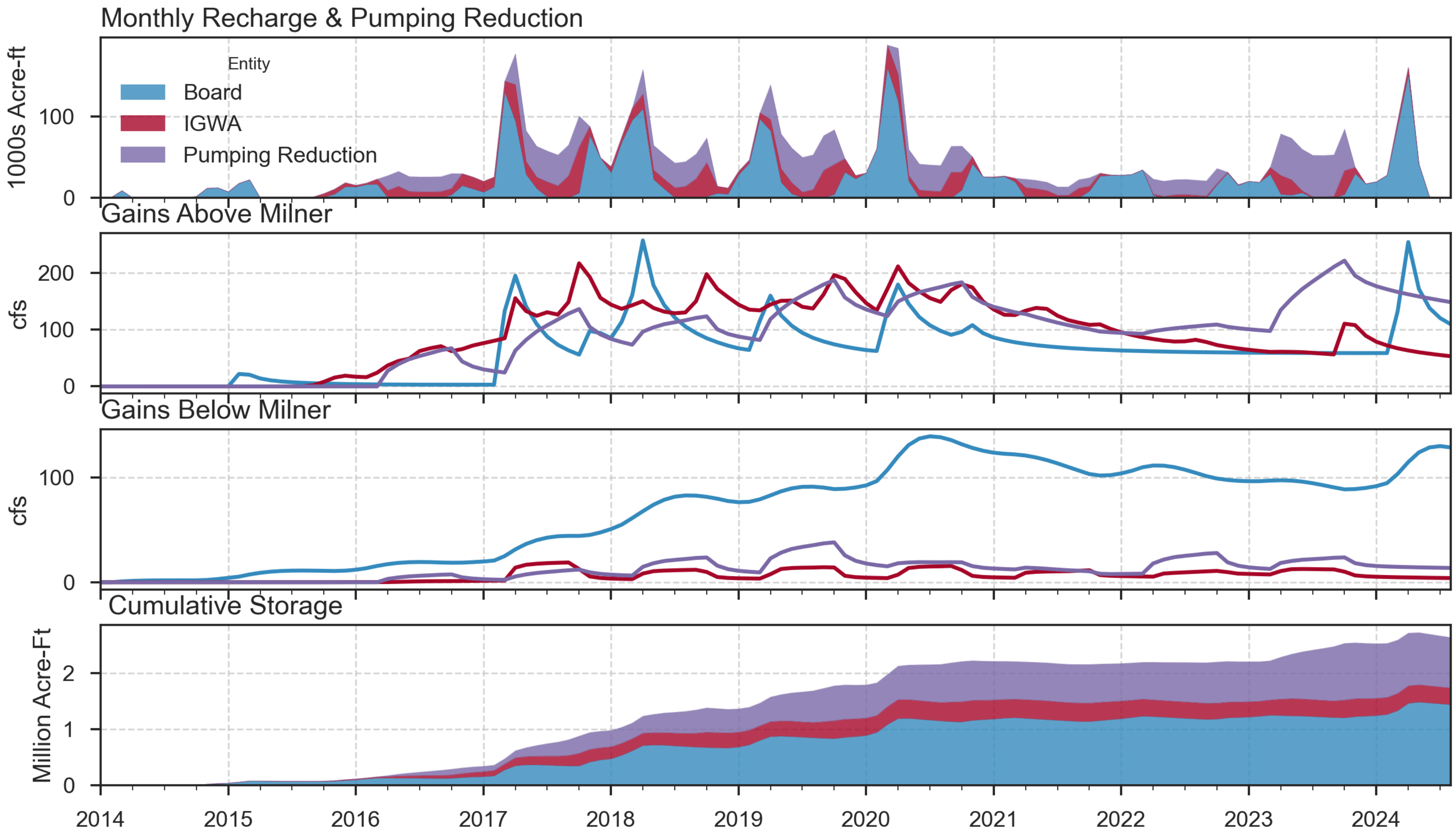


2023 pumping reductions on ESPAM grid



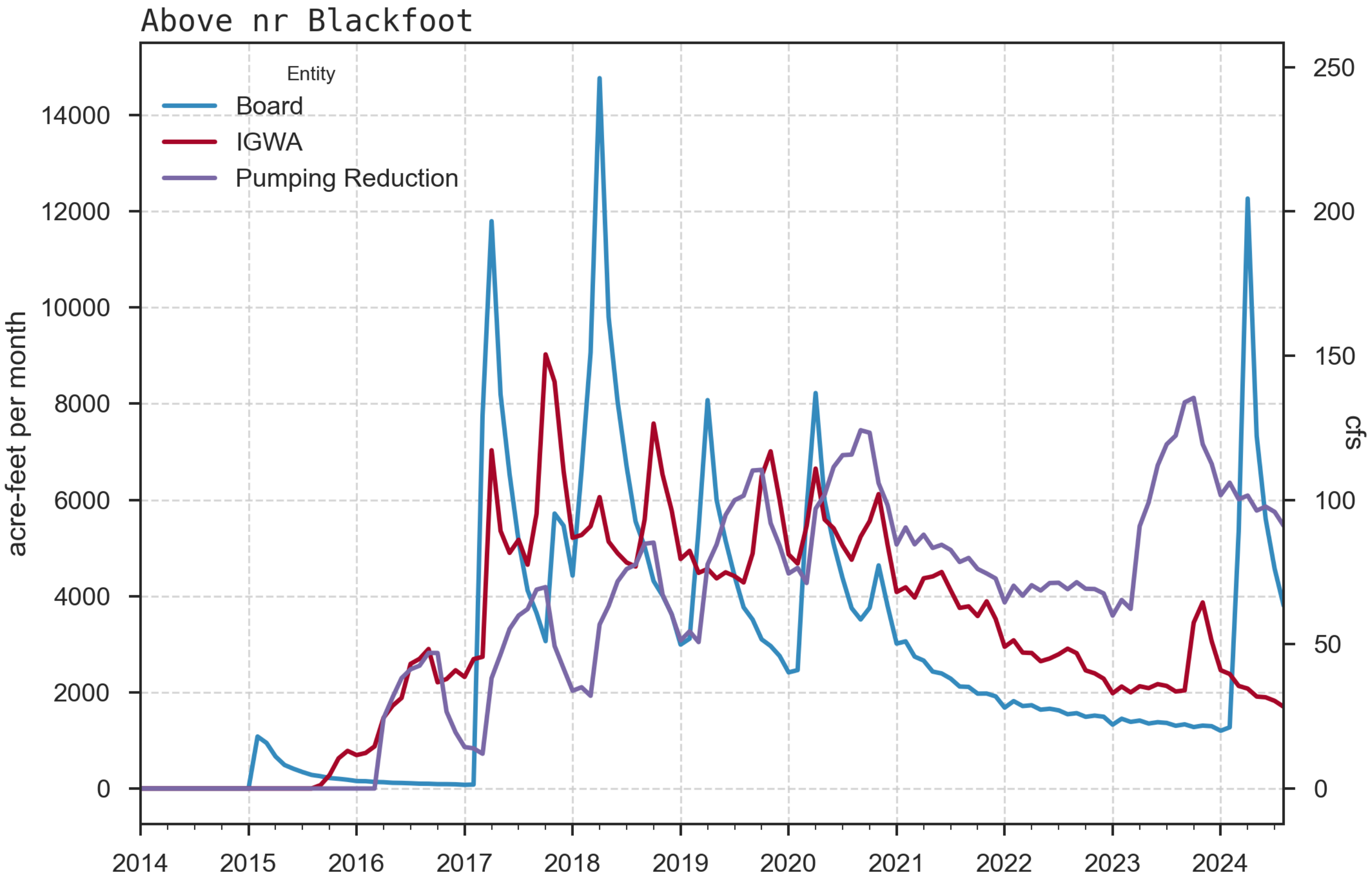
Aquifer Recharge, Discharge, and Storage

- Top plot shows timing and total volumes (inputs)
- Storage impact at end of model run (August 2024)
  - IWRB: 1.44 MAF
  - IGWA Recharge: 0.3 MAF
  - Reductions: 0.89 MAF
  - Total: 2.63 MAF



Impacts above near Blackfoot

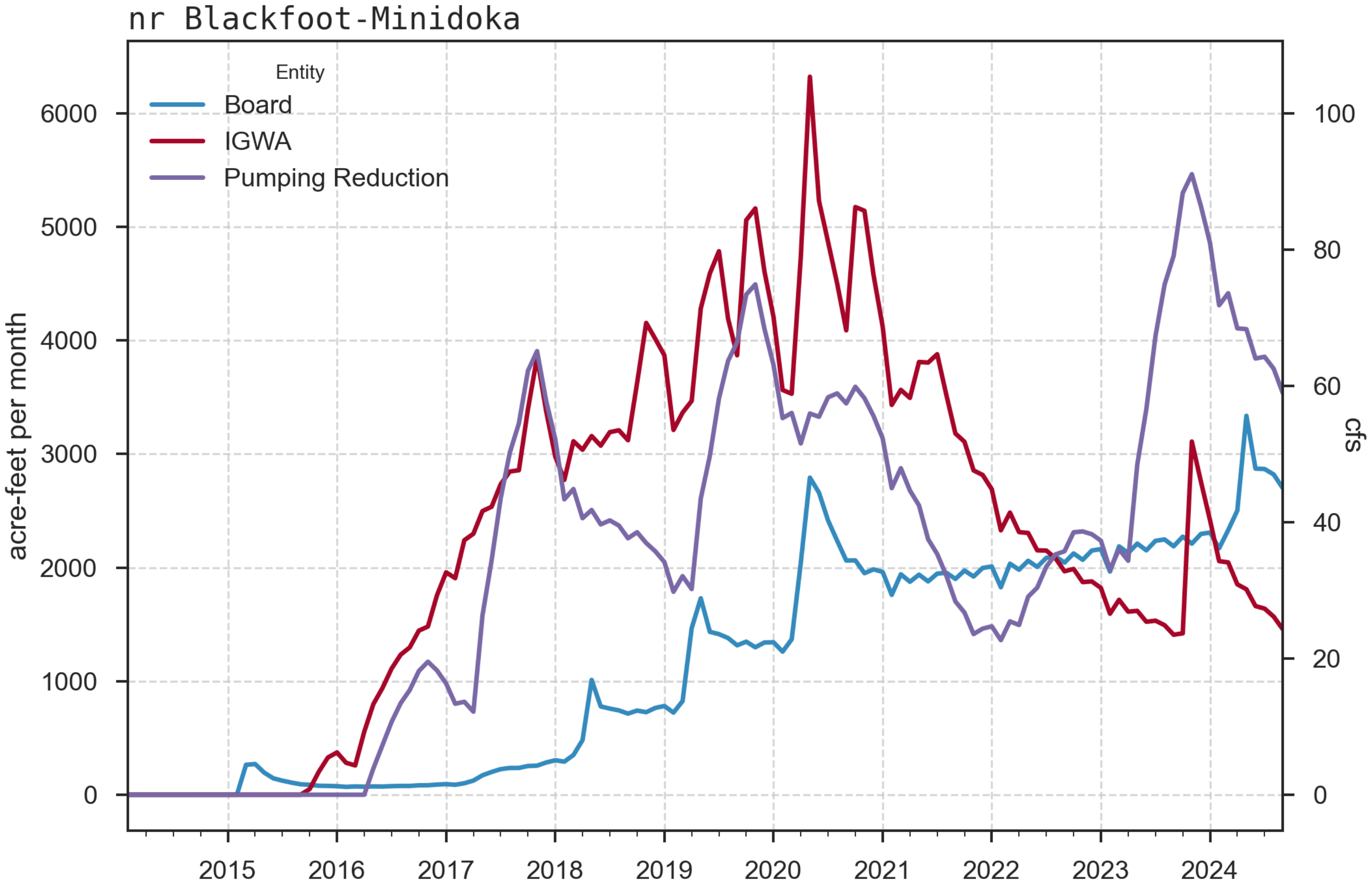
Average volume (AF) accruing to reach since 2018	Apr-Oct	Nov-Mar
Board	28,027	15,827
IGWA	27,493	21,412
Pumping Reduction	37,823	21,864
Total	94,052	59,104



Impacts from near Blackfoot to Minidoka

- IWRB impacts to reach steadily increasing.
- ~45 cfs at end of August 2024

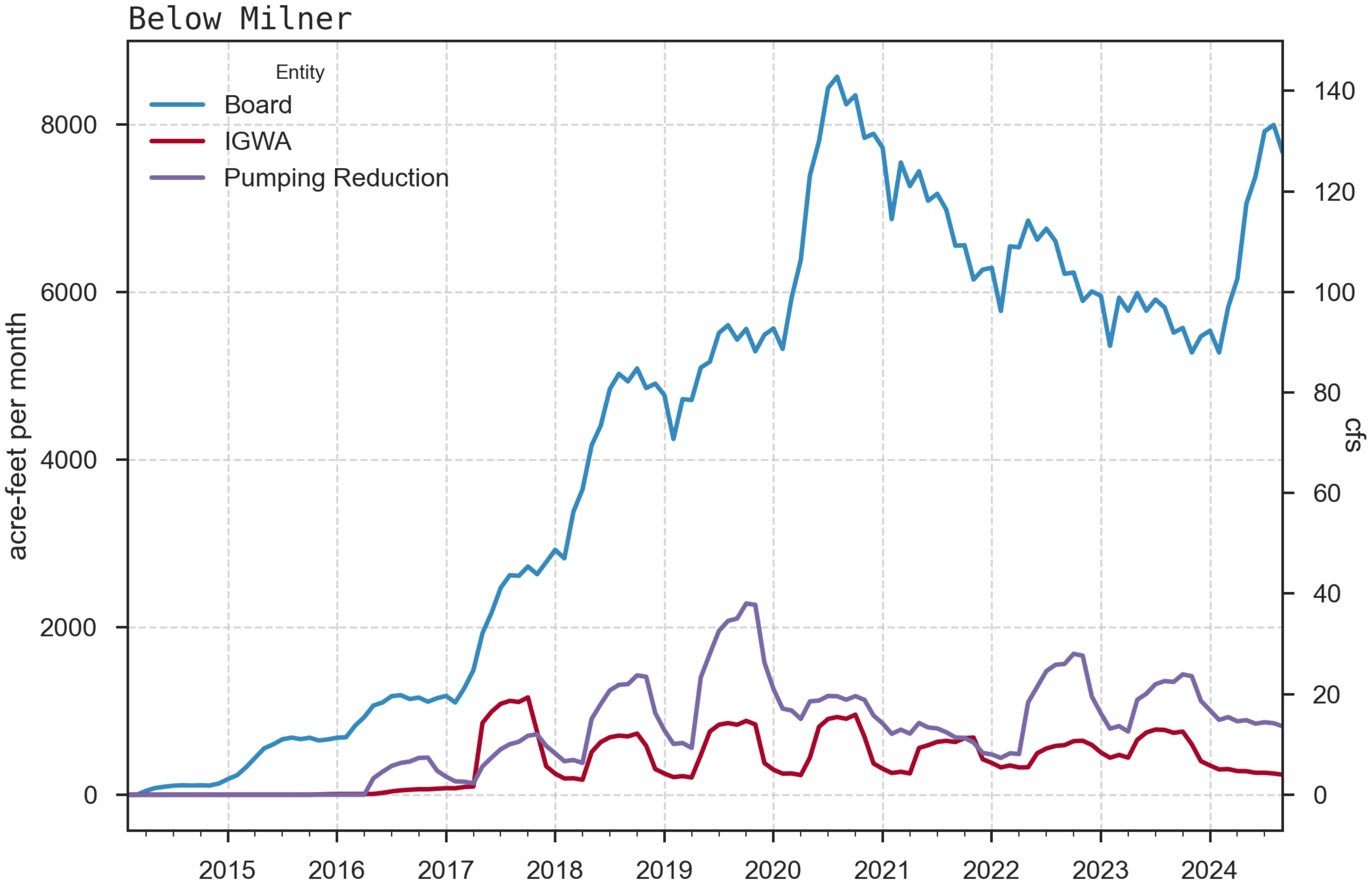
Average volume (AF) accruing to reach since 2018		
	Apr-Oct	Nov-Mar
Board	12,847	7,884
IGWA	21,937	15,059
Pumping Reduction	20,685	13,695
Total	55,469	36,638



Impacts below Milner

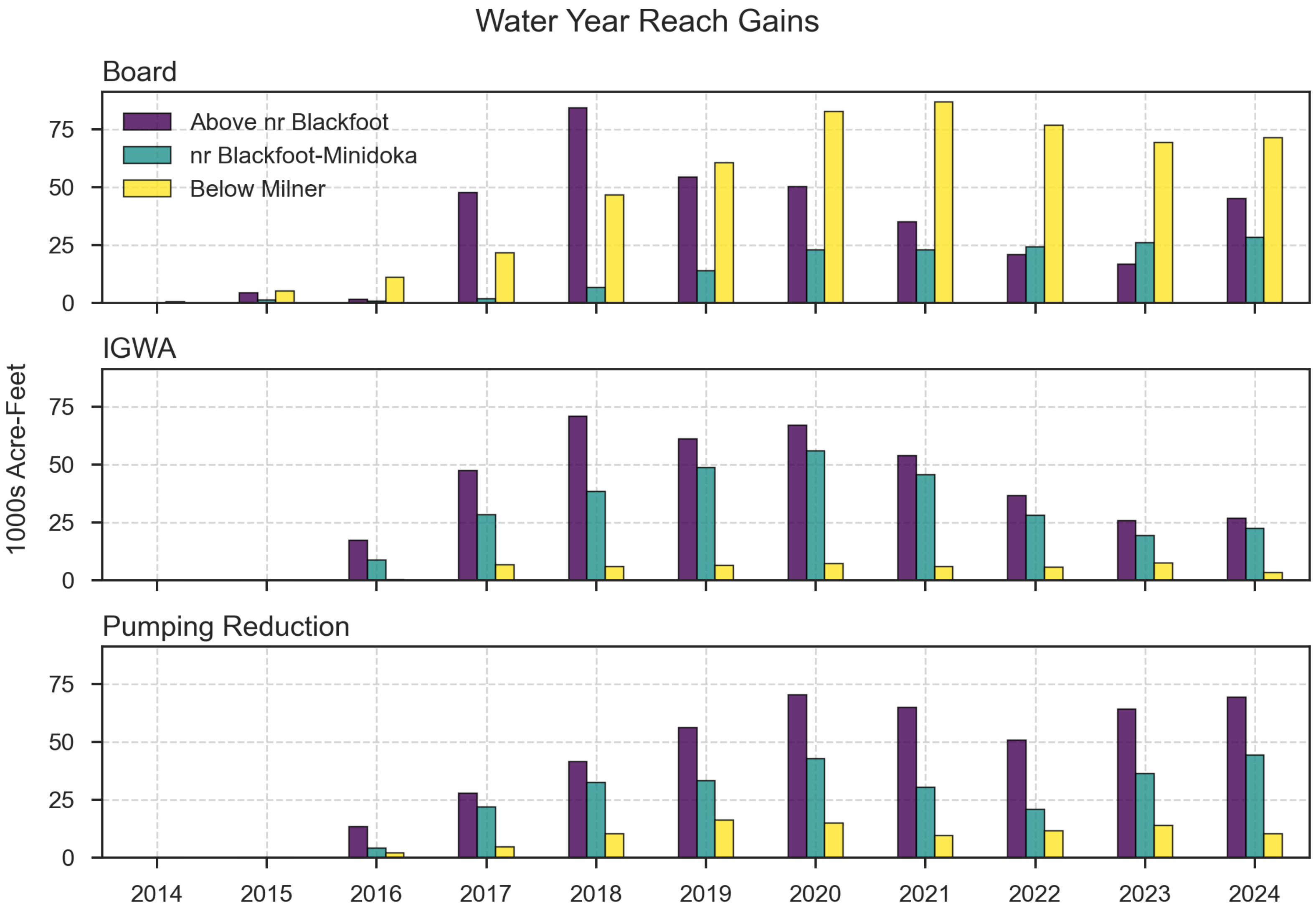
During 2024, IWRB contributions to below Milner peaked at 8 KAF in July

Average volume (AF) accruing to reach since 2018		
	Apr-Oct	Nov-Mar
Board	43,280	27,651
IGWA	4,426	1,593
Pumping Reduction	8,597	3,902
Total	56,049	33,147



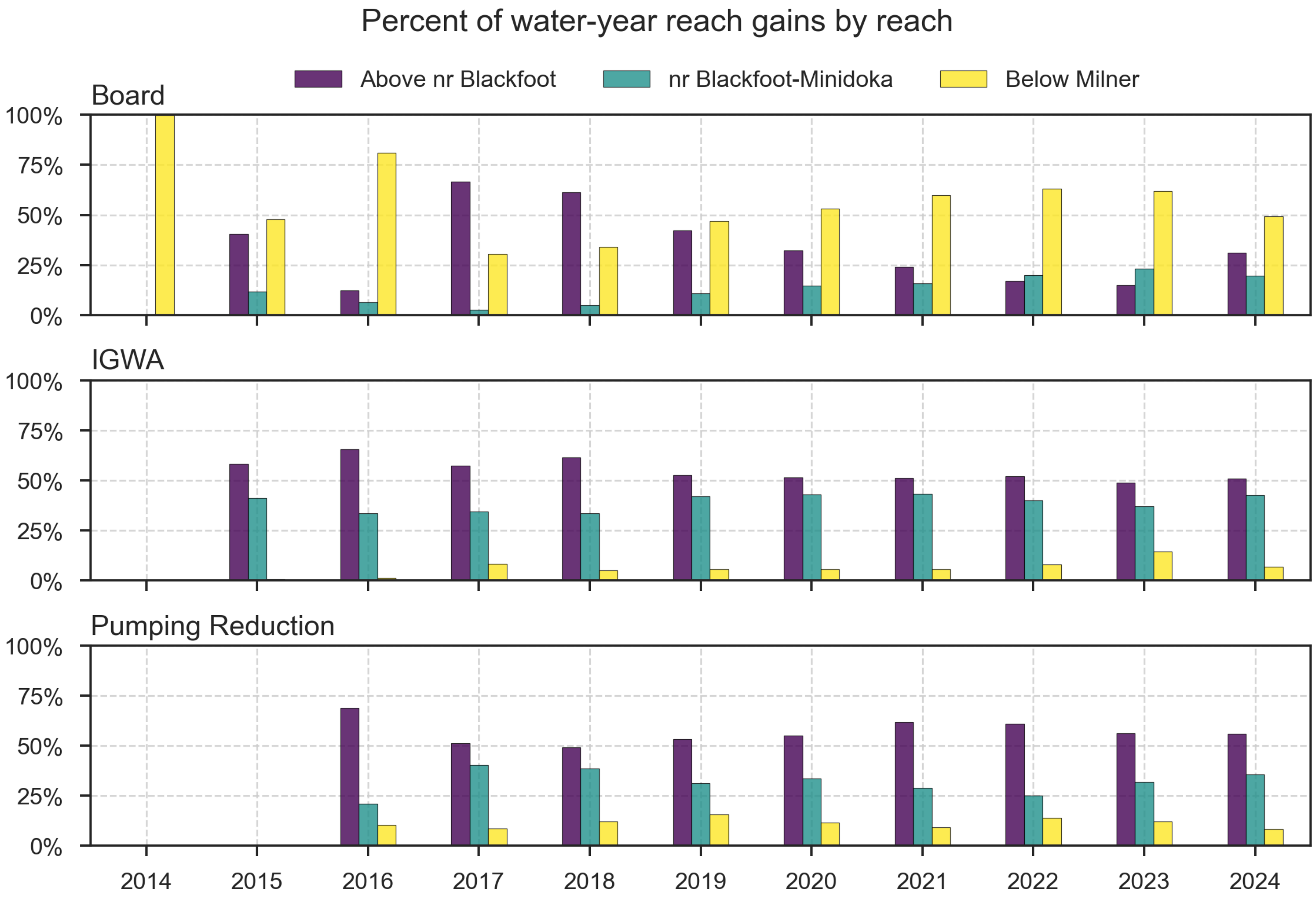
Annual gains by reach

- Where are reach gains occurring for each management activity?
- Board recharge mainly impacts below Milner, but gains above Milner are increasing
- Relative location of impacts for IGWA recharge and pumping reduction consistent



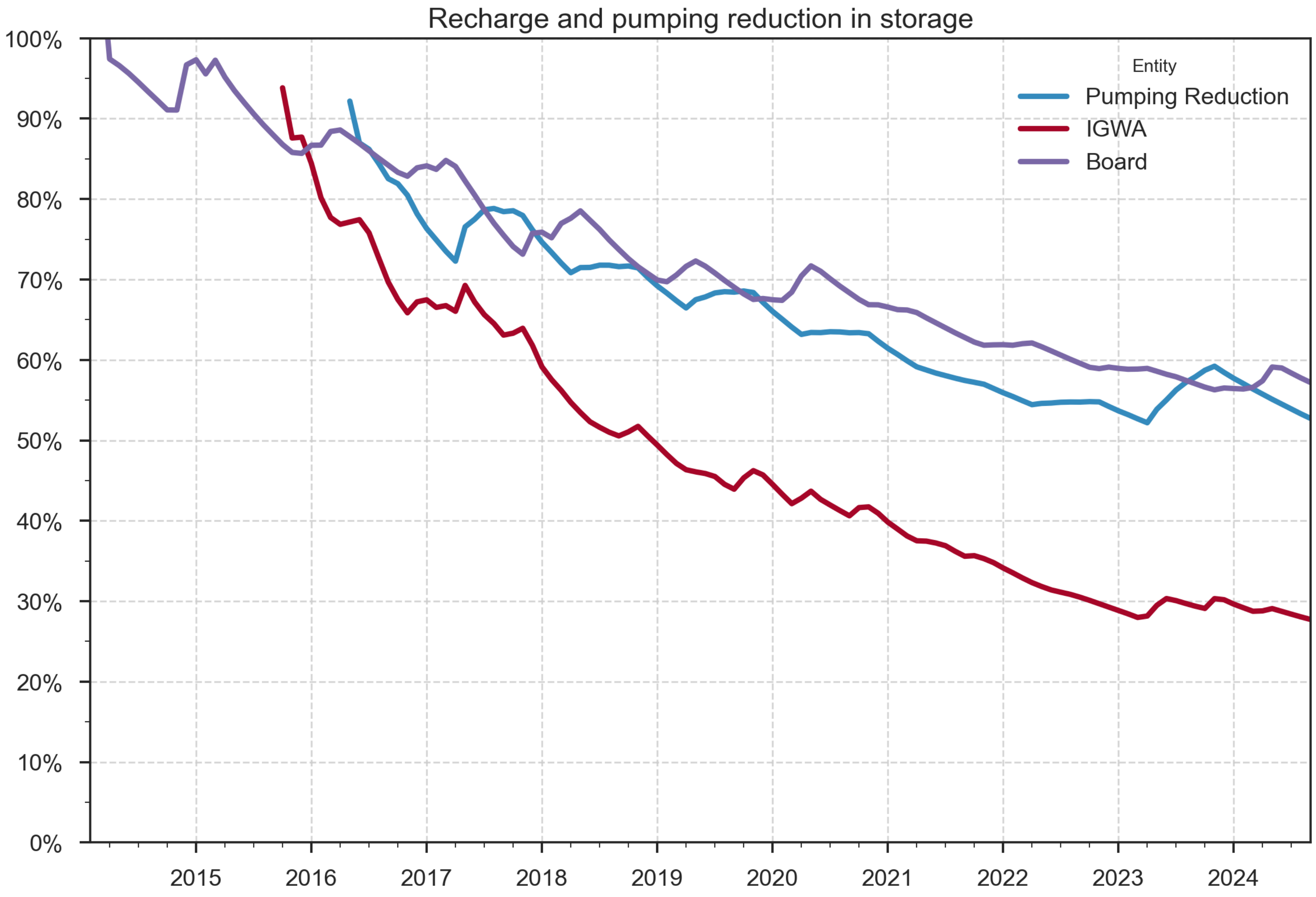
Percent of realized reach gains

- 50% of annual gains due to Board recharge accrue below Milner in 2024



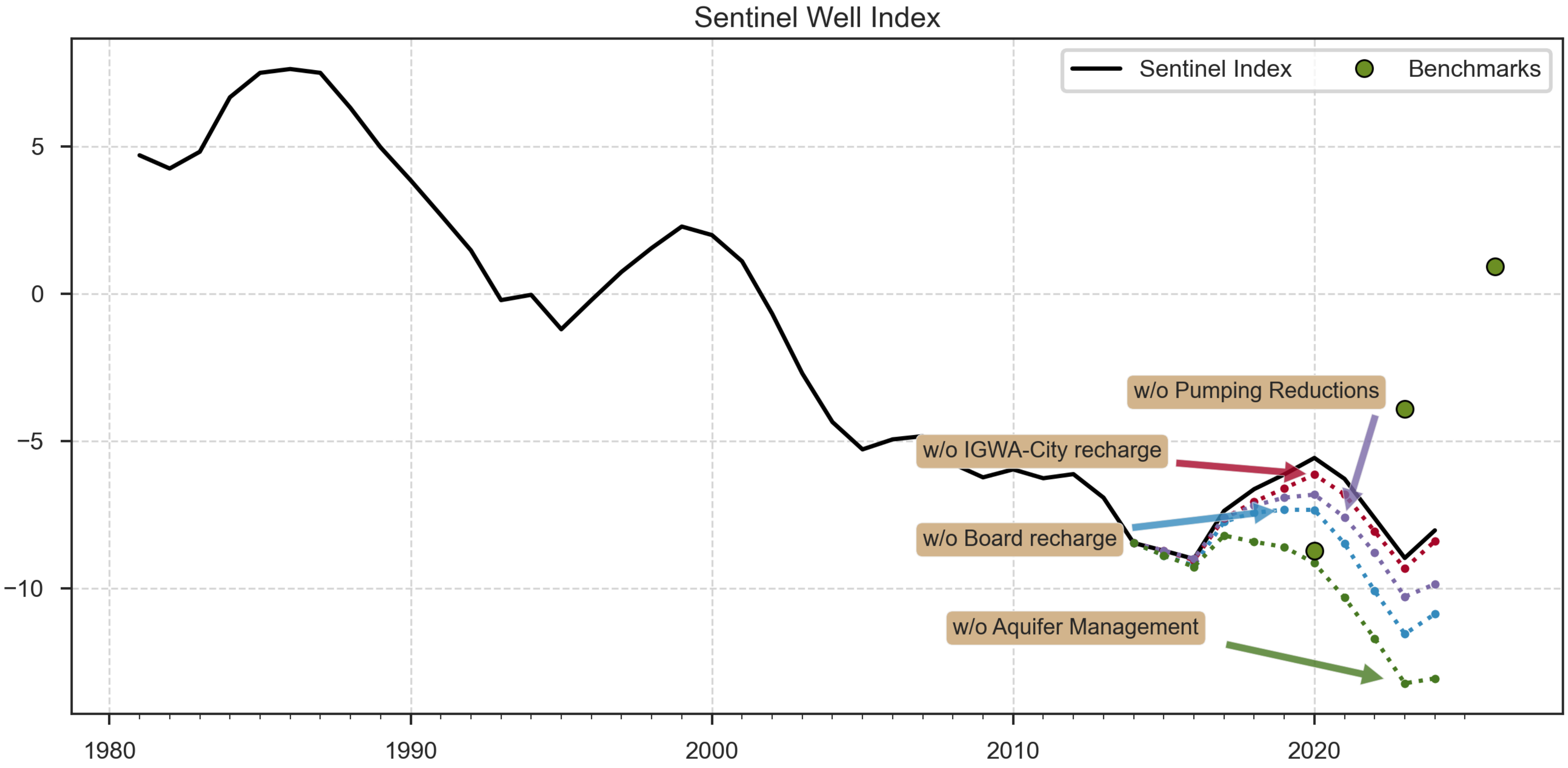
Volumes remaining in storage

- 56% of IWRB recharge occurring since 2014 remains in storage
- 29% of IGWA recharge remains in storage
- 53% of pumping reductions remain in storage



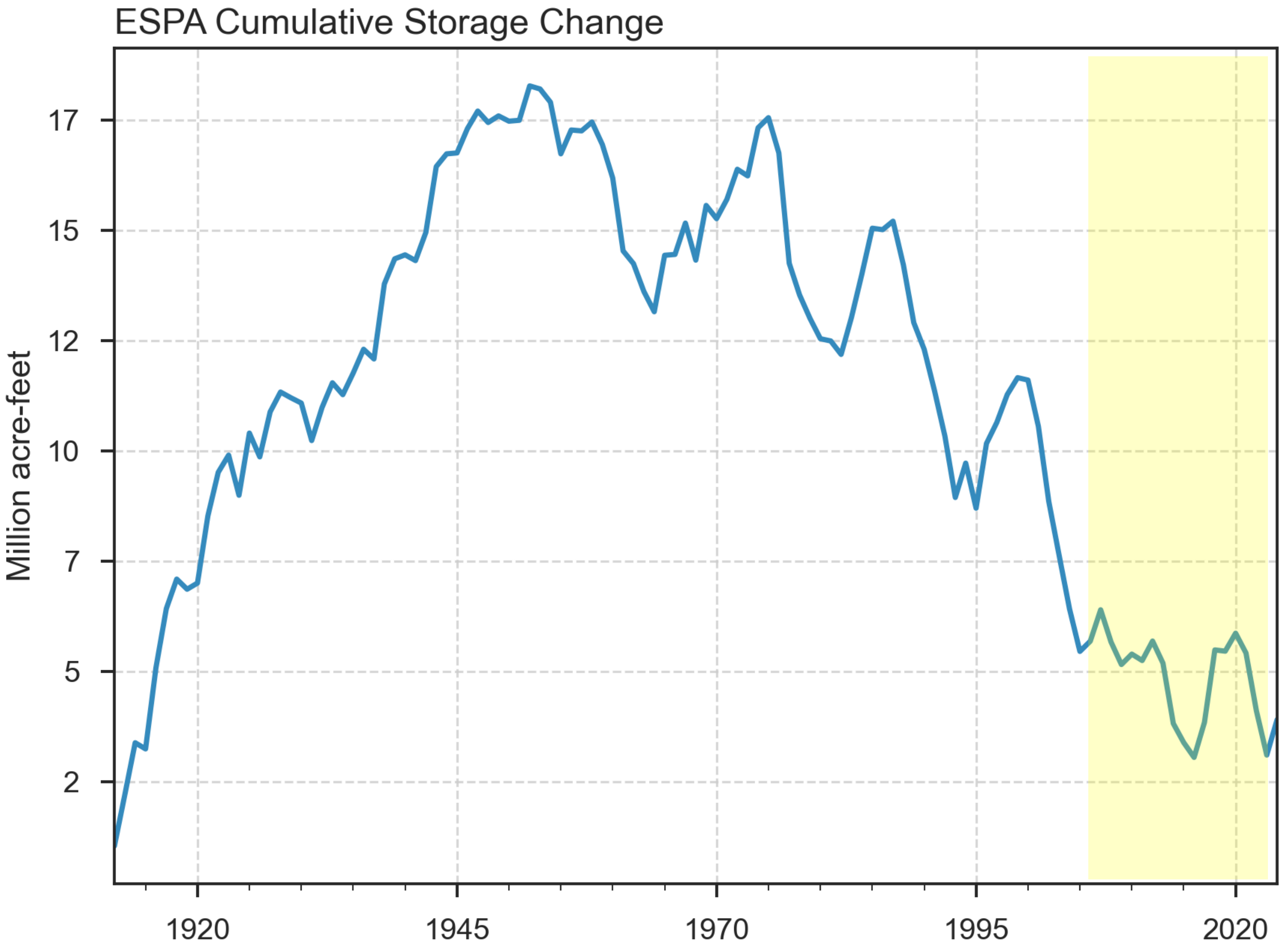
Sentinel well impacts

Index is 5 points higher with aquifer management



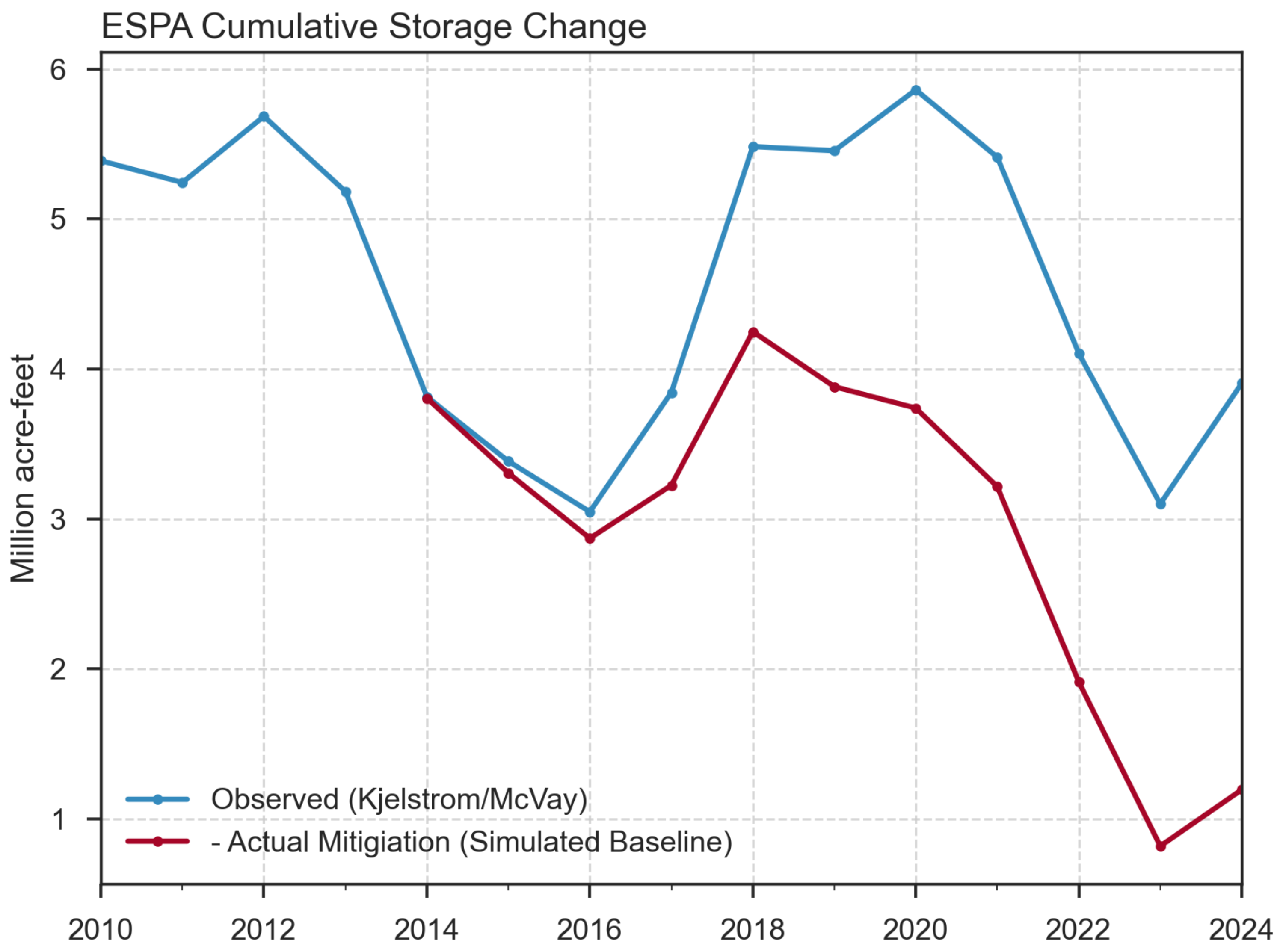
Comparison to ESPA aquifer storage change

- Estimate storage change baseline as observed change less modeled aquifer storage impacts
- Add simulated recharge scenarios to new baseline



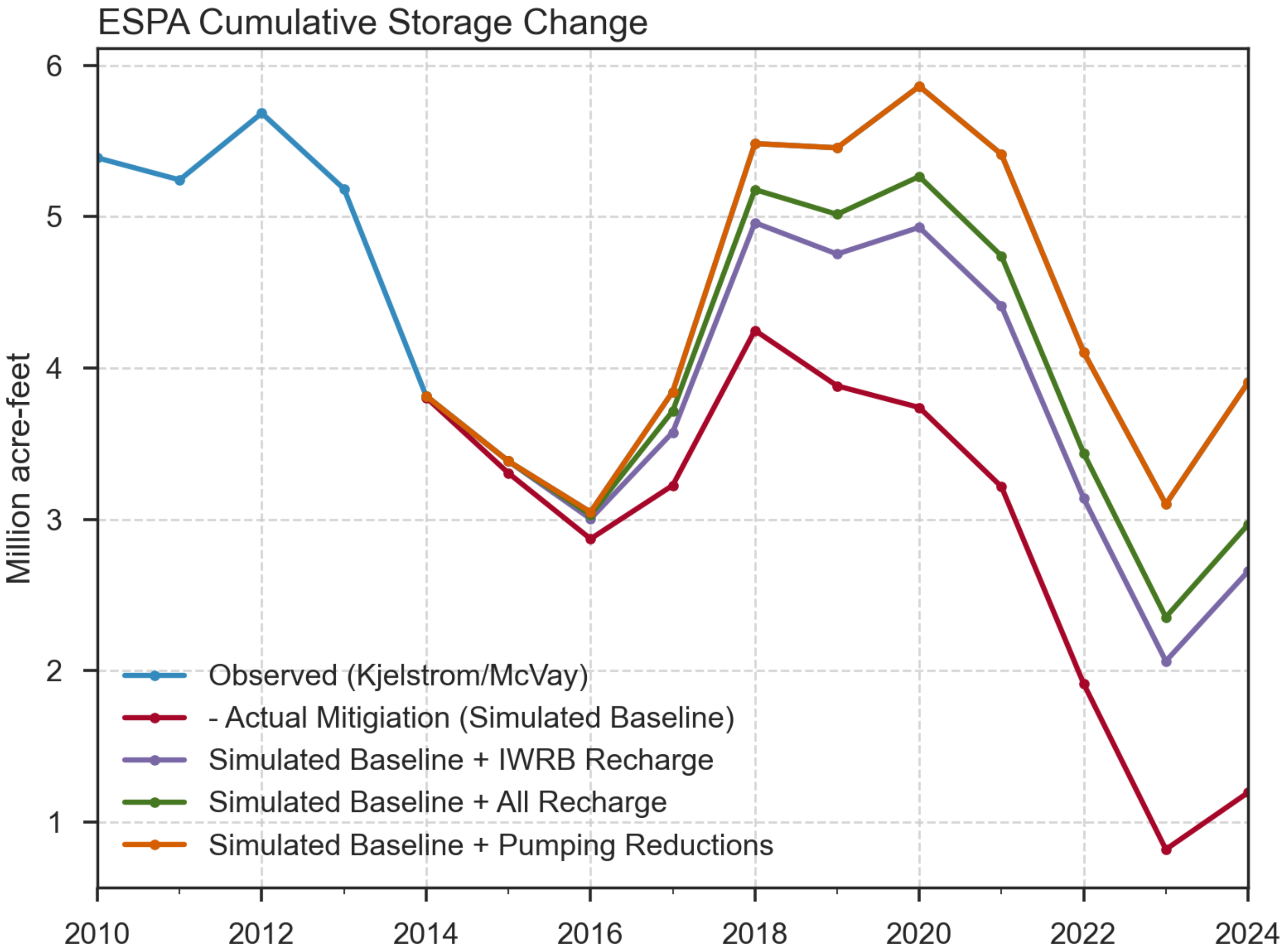
Natural aquifer storage change since 2010

- Simulated aquifer storage change given no management (new baseline)
- What would have happened without aquifer management (i.e. natural recharge only)



Managed aquifer storage change since 2010

- Varying levels of impact by management activity
- Management activities moderate the decline in aquifer storage



Visualizing impacts to the aquifer

- Animations of modeled changes to aquifer head since 2014, not current state of the aquifer (3)
    - Illustrates how Board recharge in lower valley can impact upgradient reaches
- Observed water level changes and attribution of change to modeled scenarios (1)
    - Board recharge, IGWA recharge and pumping reduction, Natural and incidental recharge

Water Level Animation Link

Aquifer water level response from IWRB recharge, 2014 on

* Water
ft and 0.

Aquifer water level response from IGWA, city, and donated storage recharge, 2014 on

* Water
ft and 0.

Aquifer water level response from pumping reductions below baseline, 2014 on

* Water
ft and 0.

Conclusions

- Over half of Board recharge impacts remains in storage
- Sentinel well index is 5 points higher with aquifer management, 3 points due to Board recharge
- Management has increased aquifer Storage by 2.63 million acre-feet and moderated storage decline
  - Natural recharge during the 2017-2018 wet spell was enhanced by management activities taking advantage of increased water supply

Memorandum

To: Idaho Water Resource Board (IWRB)

From: Craig Tesch, P.G., Hydrology Section Manager

Date: August 8, 2024

Re: Raft River Basin Hydrologic Investigation

Significant groundwater level declines and decreased stream flow in the Raft River Basin resulted in the establishment of the Raft River Critical Ground Water Area (CGWA) on July 23, 1963. Over the last 70 years, the Idaho Department of Water Resources (IDWR) and the U.S. Geological Survey have tracked the continuation of these issues through regular measurement of groundwater levels. Since 2000, the Raft River CGWA has seen groundwater declines of up to seven feet per year.

Due to long-term declining groundwater-levels, decreased streamflow, and concerns about groundwater resource availability, the Idaho Geological Survey (IGS) conducted a hydrologic characterization of the Raft River Basin from 2019 to 2024 in cooperation with IWRB and IDWR. The IGS will present a summary of findings, including the hydrogeologic framework and groundwater budgets developed for the characterization.

Idaho Geological Survey
Hydrogeologic framework and groundwater budget
Raft River Basin, Idaho-Utah

Idaho Water Resources Board

Boise, Idaho

August 8, 2024

Alexis Clark, P.G. #1533
Hydrogeologist
Idaho Geological Survey
University of Idaho
Boise, Idaho

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www.idahogeology.org

Raft River Basin – overview

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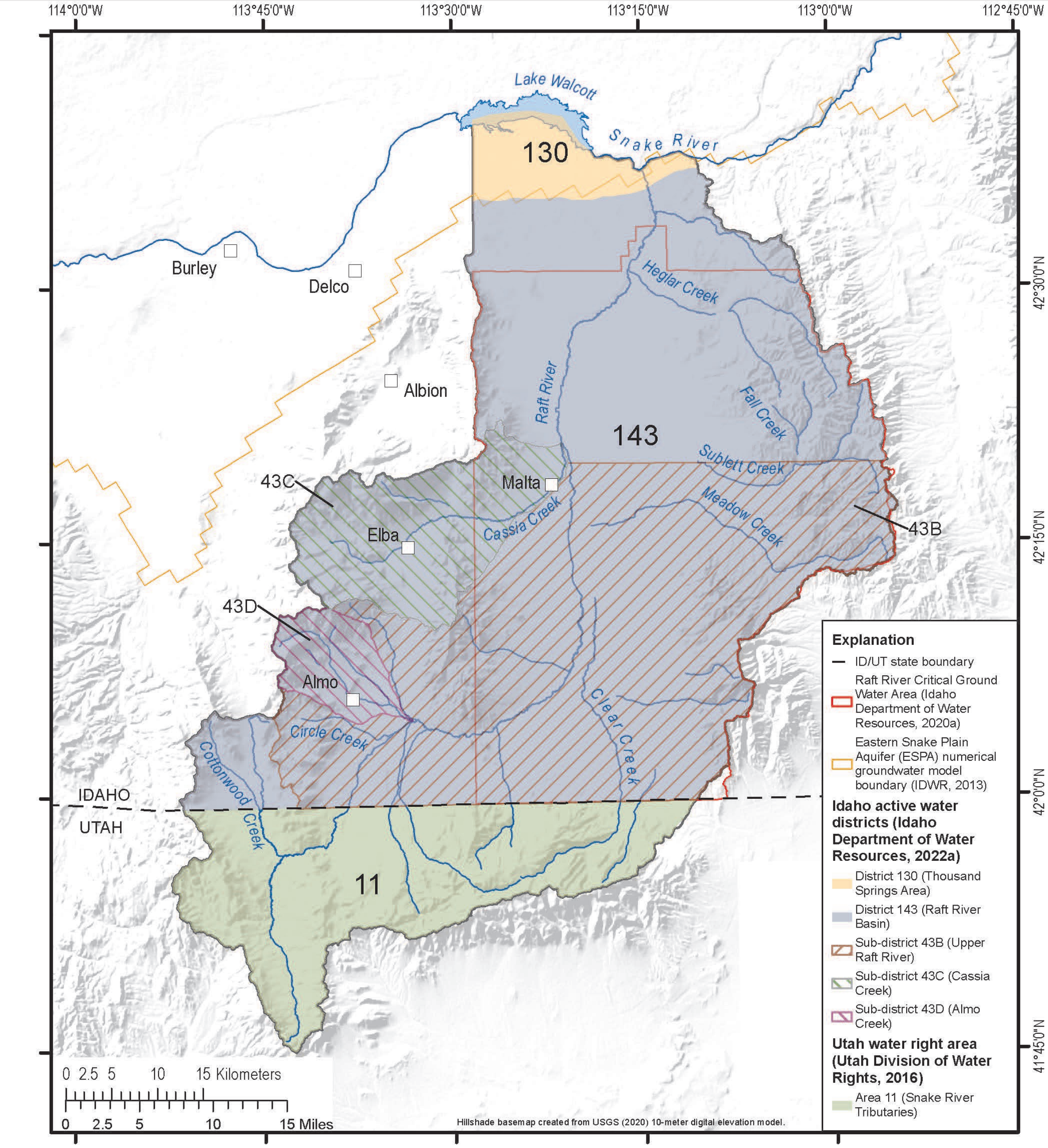

Raft River Basin – hydrogeologic investigation (2019-24)

- Overview
  - Tributary to the ESPA
  - Critical Ground Water Area (since 1963)
  - Administrative areas
- Project drivers
  - Groundwater availability
  - Groundwater level declines in central and northern parts of the basin
    - Well deepening
    - Land subsidence
  - Decreased streamflow and water quality TMDLs
- Watershed scale investigation – ID-UT
  - Phase 1 – data compilation and review, data gaps evaluation, support for IDWR-led field data collection
  - Phase 2 – hydrogeologic framework and groundwater budget

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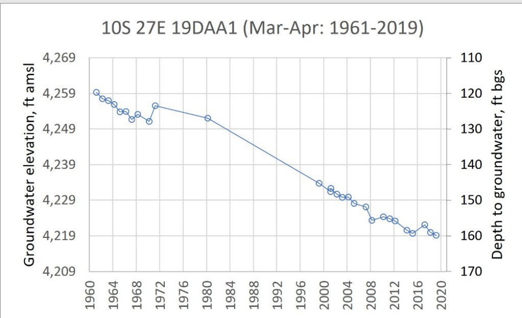
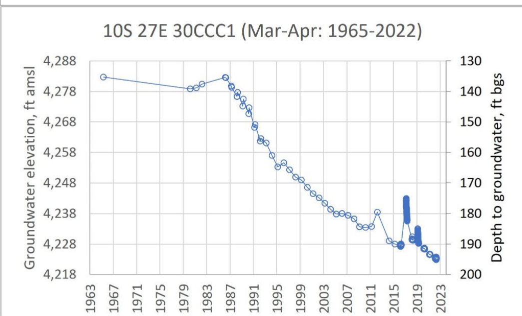
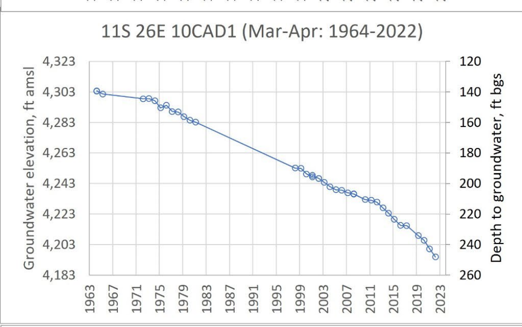
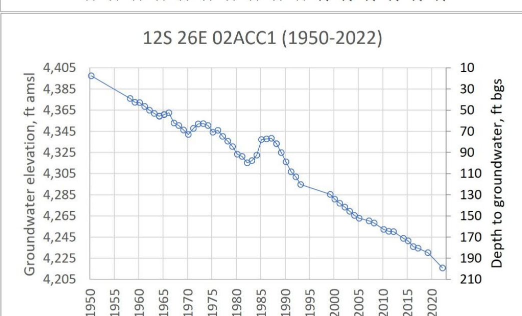
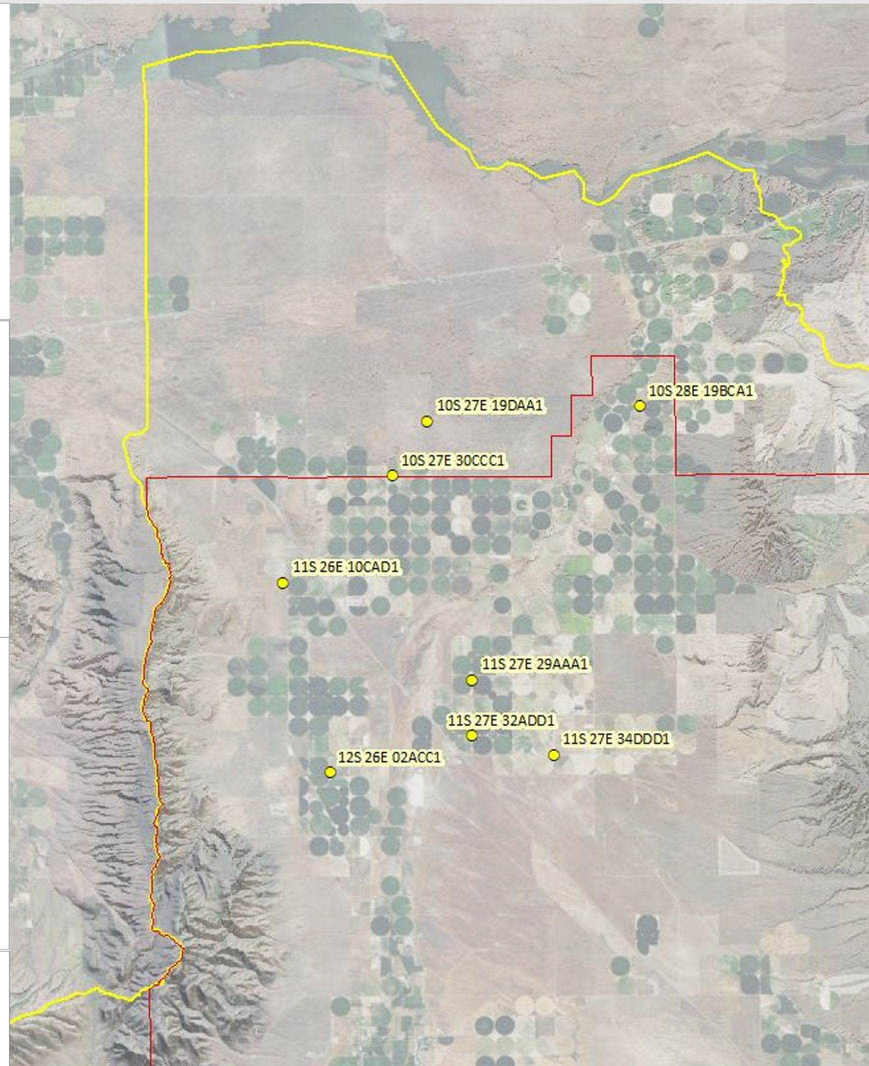
Groundwater level hydrographs – northern Raft River Basin

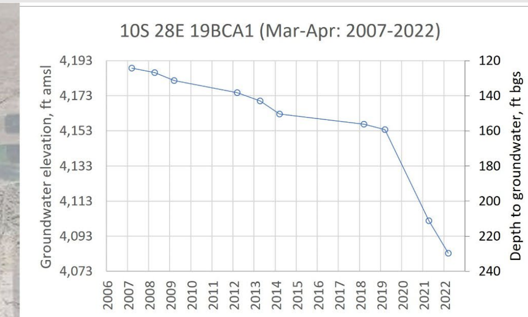


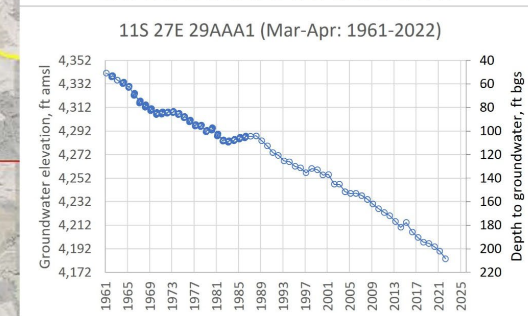


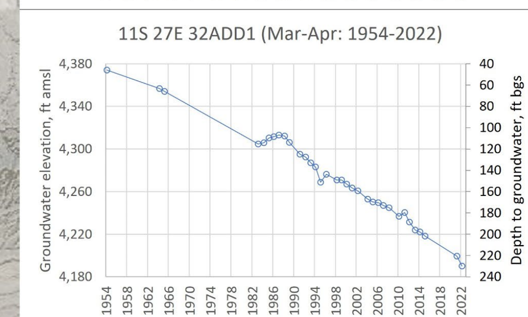


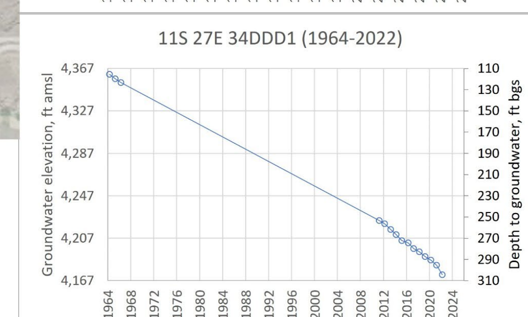












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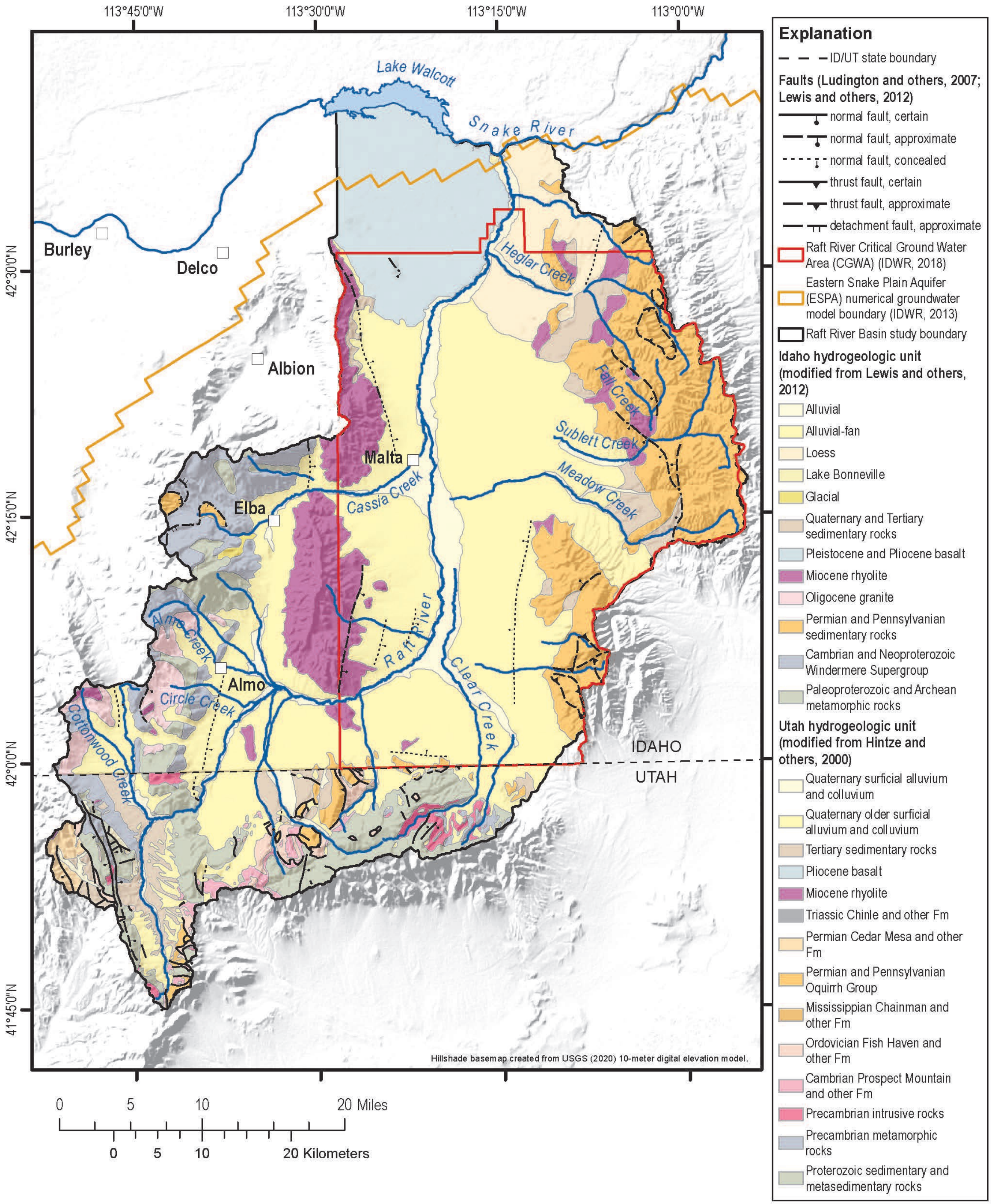

Raft River Basin – Geology

- Structural setting
  - Eastern Snake River Plain
  - Basin and Range
  - Albion-Raft River-Grouse Creek metamorphic core complex
- Precambrian to Recent exposures
- Shallow aquifer
  - Raft River and Salt Lake Fm.
  - Unconsolidated deposits and consolidated units
  - Basalt aquifer
- Deep aquifer geothermal resource
  - Raft River Geothermal Area
  - Precambrian Elba quartzite
  - 150°C or 300°F

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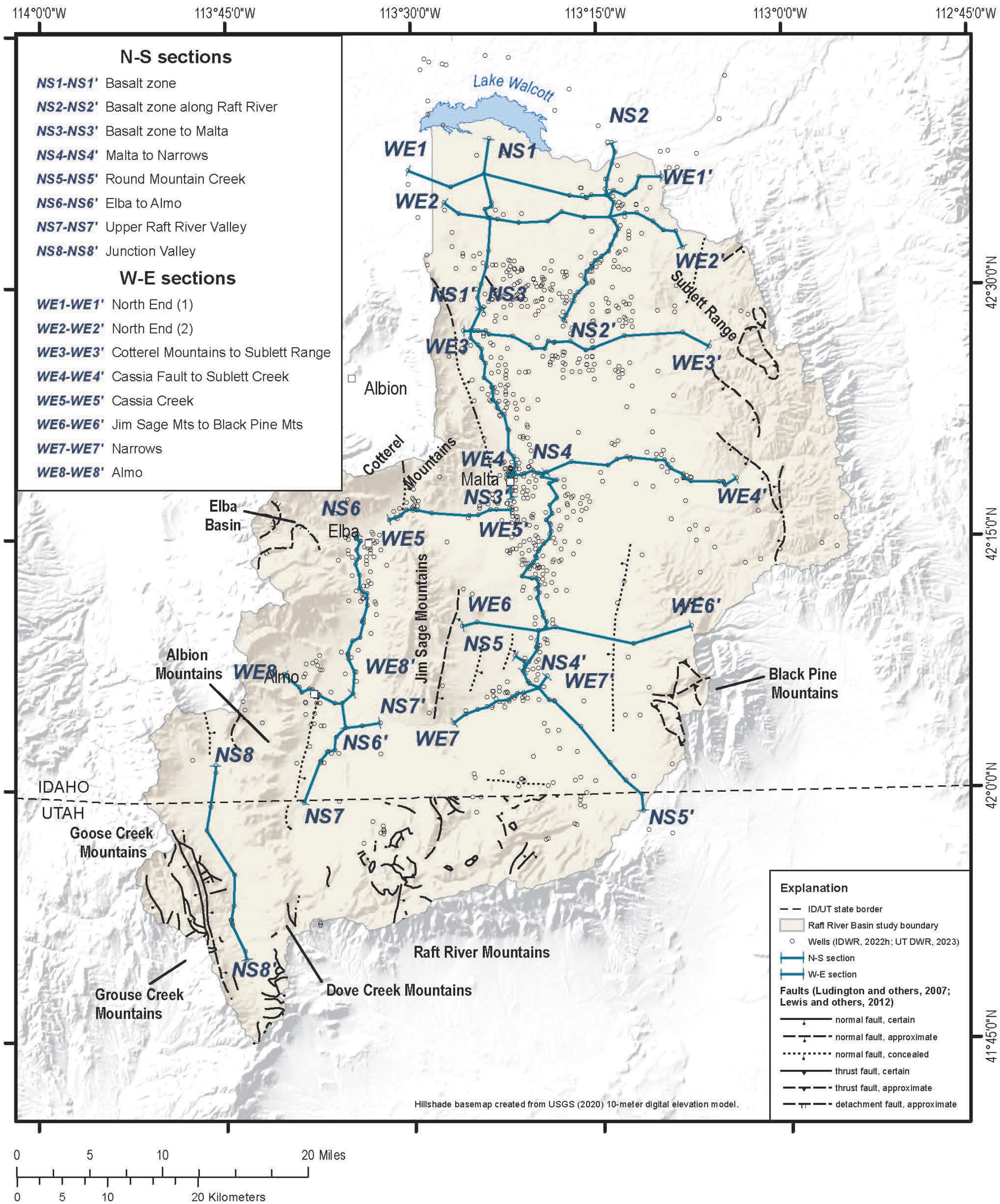

Raft River Basin - Geological model

- Well-driller reports
  - IDWR and IGS databases
  - 1,046 lithologic logs
  - Well completion details
- Three-dimensional geological model of the aquifer
- 16 cross sections
- Model-associated file publication
  - IGS website

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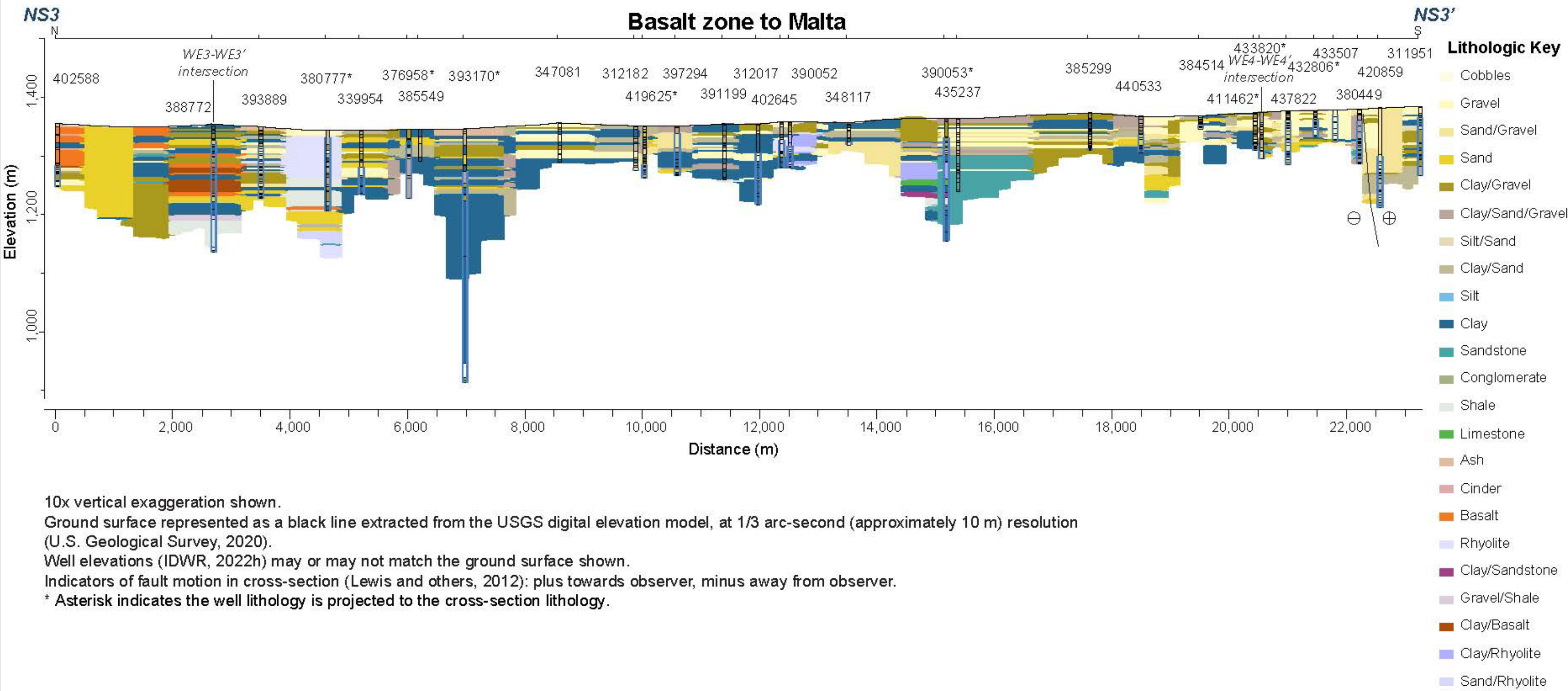
Explanation

Hydrogeologic unit—The spatial representation of units is defined by well-driller reports (IDWR, 2022h; UT DWR, 2023) and model interpolation (this study). Interpolation is based on wells present on and in proximity to the cross-section line. White (blank) areas indicate no data, insufficient data, or topsoil.

402588 **Well**—Labeled with well ID number; fill color shows hydrogeologic unit. Flanking blue bars convey the top of the uppermost well screen or open interval to the total well depth. This portrays the part(s) of the aquifer intercepted by the well and may not reflect multiple screens or open intervals. Multiple screens or intervals, if present, are not shown. Black horizontal lines on the well symbol reflect the vertical resolution of well-driller report descriptions, which may or may not be resolved at the cross-section vertical scale and model interpolation. Model interpolation honors the well lithology.

Basalt zone to Malta



10x vertical exaggeration shown.
Ground surface represented as a black line extracted from the USGS digital elevation model, at 1/3 arc-second (approximately 10 m) resolution (U.S. Geological Survey, 2020).
Well elevations (IDWR, 2022h) may or may not match the ground surface shown.
Indicators of fault motion in cross-section (Lewis and others, 2012): plus towards observer, minus away from observer.
* Asterisk indicates the well lithology is projected to the cross-section lithology.

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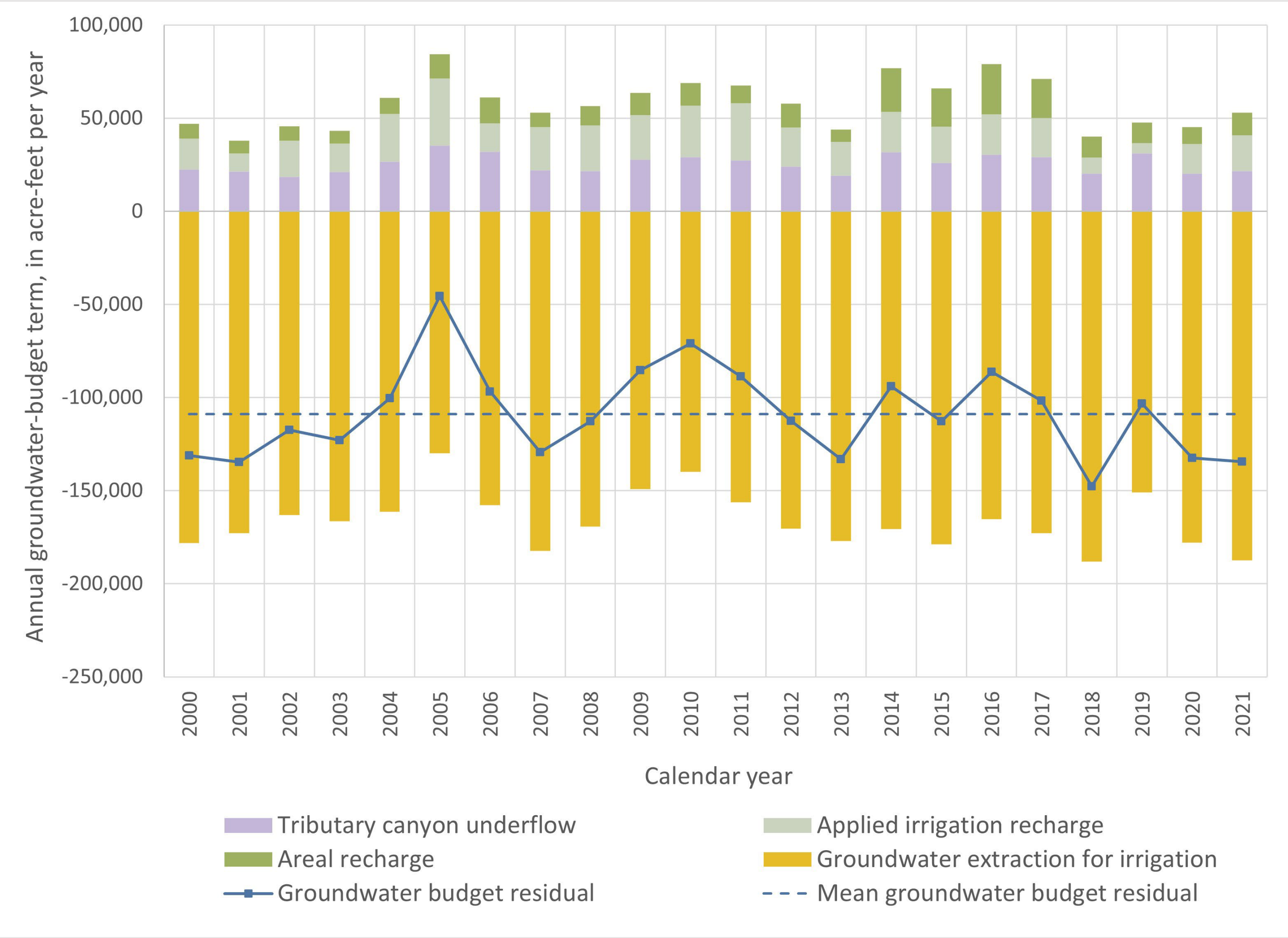
Raft River Basin - Groundwater-budget components and residuals (2000 – 21)



- Scope
  - Entire watershed
  - Annual estimates
- Inflow
  - Tributary canyon underflow
  - Applied irrigation recharge
  - Areal recharge
- Outflow
  - Groundwater extraction for irrigation
- Residual
  - Inflows minus outflows

IDAHO GEOLOGICAL SURVEY

Raft River Basin - Groundwater budget, aquifer storage change, and outflow to the ESPA (in acre-feet per year)

2000 - 21 (calendar years)	**Groundwater budget summary**					**Recharge component**[1]			**Discharge component**[1]
	Total inflow	Total outflow	Inflow minus outflow (**residual**)[1]	Annual groundwater **storage change** (*partial aquifer*)[2]	**Groundwater underflow exiting basin** (Residual minus *partial aquifer* storage change)[2]	Tributary canyon underflow	Applied irrigation recharge	Areal recharge	Groundwater extraction for irrigation
Mean	57,800	166,600	-108,800	-15,400[2]	-94,100[2]	25,400	20,000	12,400	166,600

[1]2000 – 21 (entire study area)
[2]2000 – 19 (based on available data for *partial aquifer* extent)

IDAHO GEOLOGICAL SURVEY

Raft River Basin hydrogeologic investigation – key findings

- Complex geologic conditions
  - Implications for groundwater occurrence
- Declining groundwater levels are concentrated within and to the north of the CGWA
- Limited available groundwater resources
  - Central and northern part of the Raft River Valley
- Mean annual budget residual
  - Negative for all study years (2000 – 21)
- Hydraulic gradient reversed in the northern part of the basin
- Average budget-estimated consumptive irrigation requirement for all irrigated lands
  - 2 acre-feet per acre throughout most of the basin

IDAHO GEOLOGICAL SURVEY

Raft River Basin – hydrogeologic framework and groundwater budget uses, limitations, and suggested next steps

- Uses
    - Assist water resource managers and water users
    - Future numerical groundwater flow modeling
    - Managed aquifer recharge

- Limitations
    - High uncertainty in some estimated budget terms, storage change, and outflow to the ESPA
    - Net change in storage and outflow to ESPA may be higher or lower than estimated

- Suggested next steps for IDWR
    - Continued data collection to reduce uncertainty
    - Numerical groundwater flow model to reduce and address uncertainty

IDAHO GEOLOGICAL SURVEY

Questions?

Thank you!

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IGS report web page:

https://www.idahogeology.org/product/B-32

Sublett Reservoir (IGS, 2022)

Memorandum

To: Aquifer Stabilization Committee

Date: August 06, 2024

Re: ESPA Recharge Program Conveyance Contracts

REQUIRED ACTION: No official action required. Guidance and feedback is requested.

The Idaho Water Resource Board's (IWRB) 2019 Resolution No. 18-2019 established terms for conveyance contracts with entities willing to deliver IWRB recharge water to the Eastern Snake Plain Aquifer (ESPA) in the Lower Valley of the Snake River (downstream of American Falls Dam). The resolution defined the payment structure, maximum term/length of conveyance contracts, and other requirements for conducting IWRB managed recharge. The 2019 contracts have expired or will expire by the end of this year.

Conveyance contract conditions for recharge in the Upper Valley (upstream of American Falls Dam) were established through IWRB Resolution No. 7-2016, passed in January of 2016. The conditions defined the payment structure for IWRB recharge in the Upper Valley, limit contracts to a one-year term, and establish other requirements for conducting IWRB managed recharge.

The payment structures and other contract requirements need to be reviewed to determine if they still align with the goals of the ESPA Managed recharge program and address current operational conditions. Staff has collected feedback from some of the IWRB's recharge partners. In the Lower Valley the IWRB's recharge partners appear to be satisfied with the current three-tier payment structure. While Upper Valley partners are generally satisfied with the existing payment structure, they acknowledge that private entities pay significantly more than the IWRB's current structure.

Potential Alternate Concepts to Explore:

1. Adopt a universal payment structure across the ESPA and potentially a specified dollar per acre-foot or a tiered system. This alternative would simplify end-of-season accounting for IWRB staff.
2. Issue an annual payment based on an average recharge volume. Given the variability of annual recharge volumes, particularly in the Upper Valley, this alternative may simplify the budget planning process for partners. In addition, averaging or annualizing payments may be helpful to recharge partners who are non-profit organizations that have difficulties managing a single large payment for IWRB managed recharge. However, developing an equable annual payment system will take time to develop.

Given the time needed to review potential options with IWRB members and partners, staff recommends execution of new one-year contracts for the 2024-2025 recharge season based on terms and conditions in the existing contracts. Depending on the availability of water associated with Surface Water Coalition

Agreements, the one-year contracts may be active as early as September or October. Over this next fall staff will develop alternative criteria for new multi-year conveyance contracts for the IWRB to consider.

For background a brief summary of the current criteria is provided below.

The Lower Valley three-tiered payment structure:

Board Conveyance Payment Date Ranges	**Payment Rate per AF Recharged**
August 1st – November 15th	$7
November 16th – February 15th	$10
February 16th – July 31st	$5

The Upper Valley payment structure is also a tiered payment structure dependent on aquifer retention of the location of the managed recharge:

Board Conveyance Payment based on 5-year Retention*	**Payment Rate per AF Recharged**
Greater than 40% retention	$6
20% to 40% retention	$5
15% to Less than 20% retention	$4

- Retention as determined by the most recent ESPAM groundwater flow model

- **Added Incentive for Delivery** – $1.00/af when recharge is conducted at least 75% of the time that IWRB recharge right is in priority and IWRB issues a Notice to Proceed.
- **Added Winter-time Incentive for Delivery** – $1.00/af when IWRB recharge right is conducted between December 1st and March 31st and IWRB has issued a Notice to proceed.