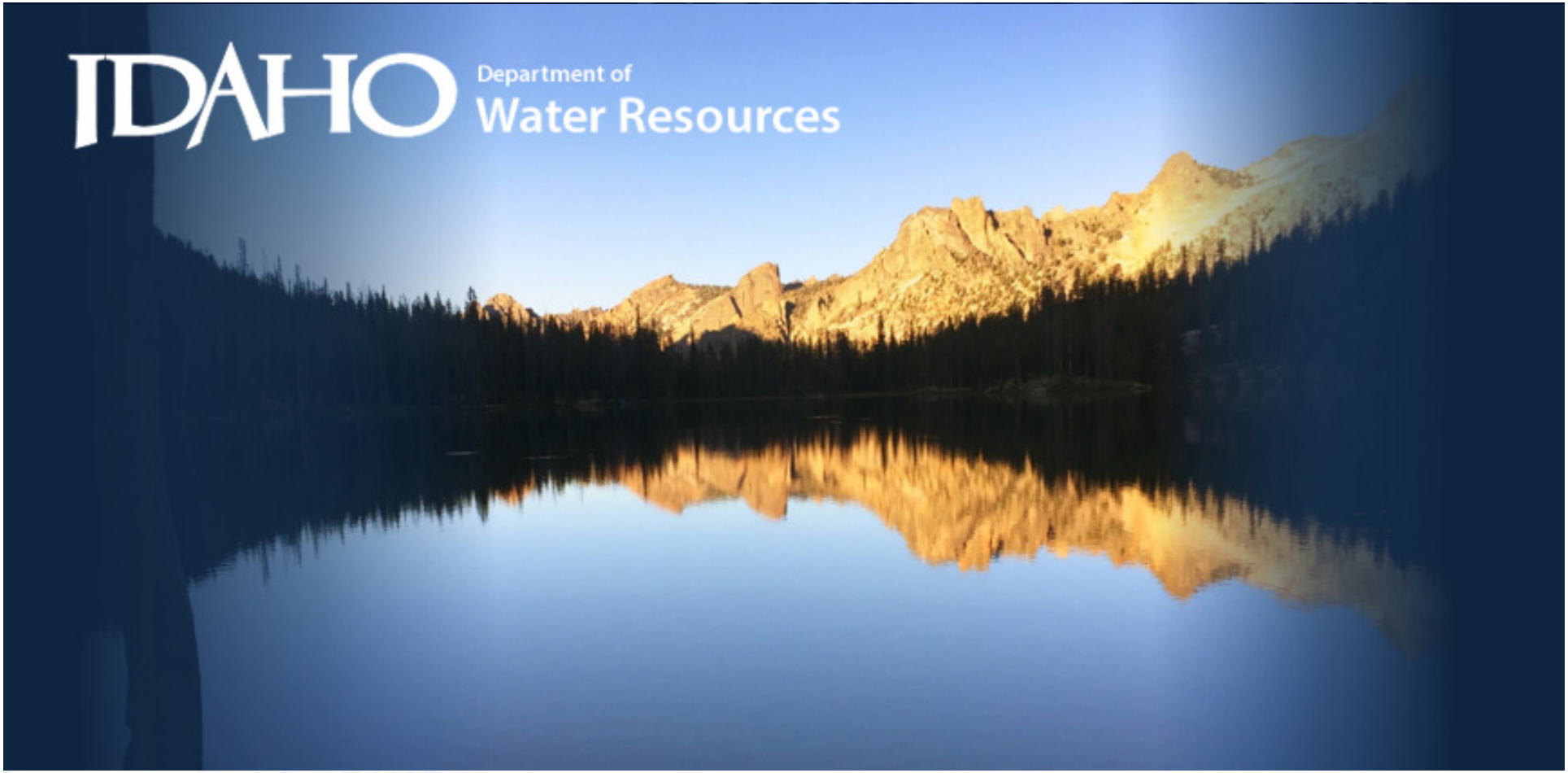


Saving an Aquifer: Review of Implementation of the IGWA-SWC Settlement Agreement and Idaho's Managed Aquifer Recharge Program

Presented to the Association of Western States Engineers

August 28, 2017

Presentation Overview

1. Conjunctive Management and the SWC Delivery Call
2. The IGWA-SWC Settlement Agreement
3. State Sponsored Managed Aquifer Recharge
4. Additional Actions: Measurement and GWMA

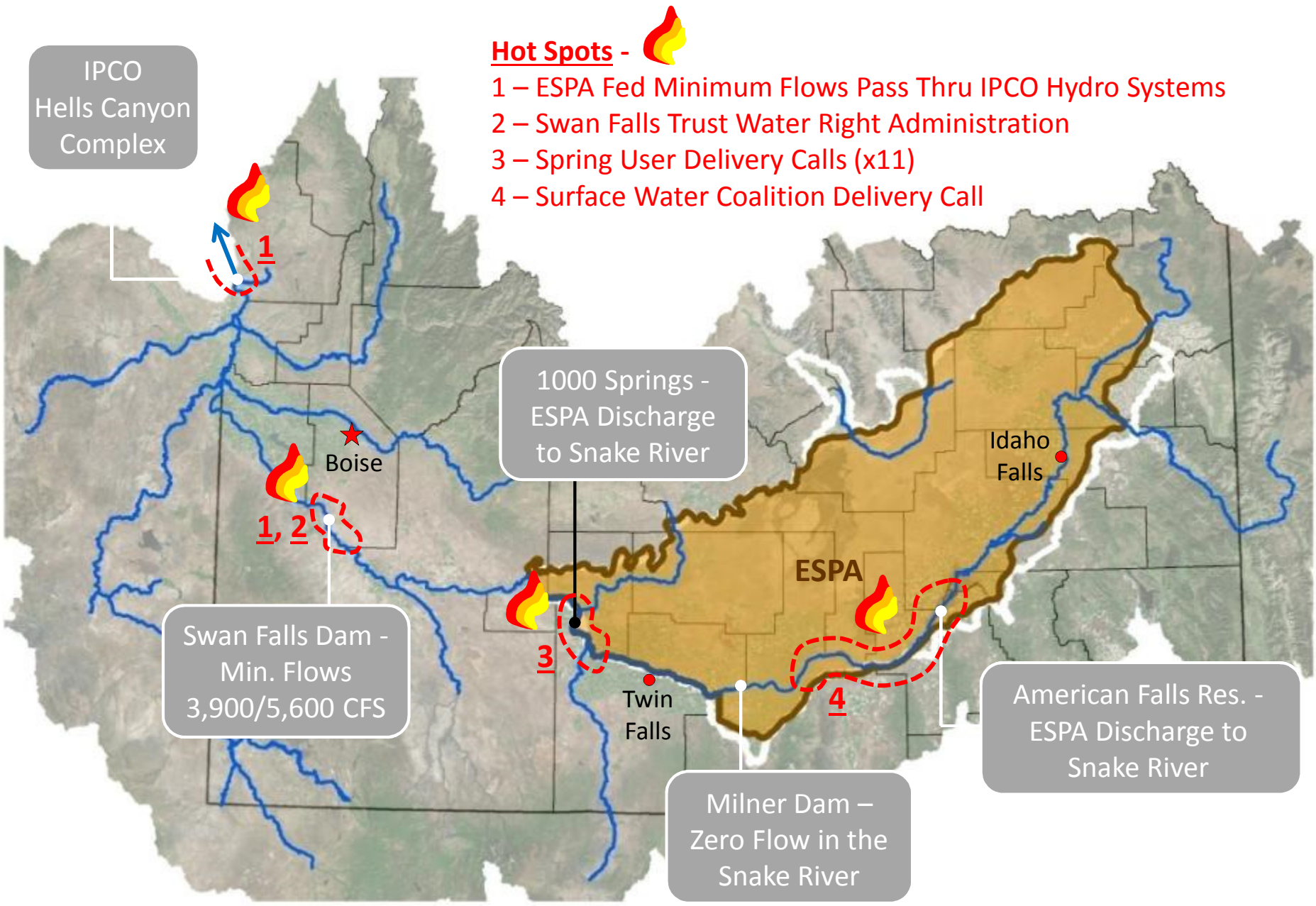
Idaho Falls, 2016

Conjunctive Management

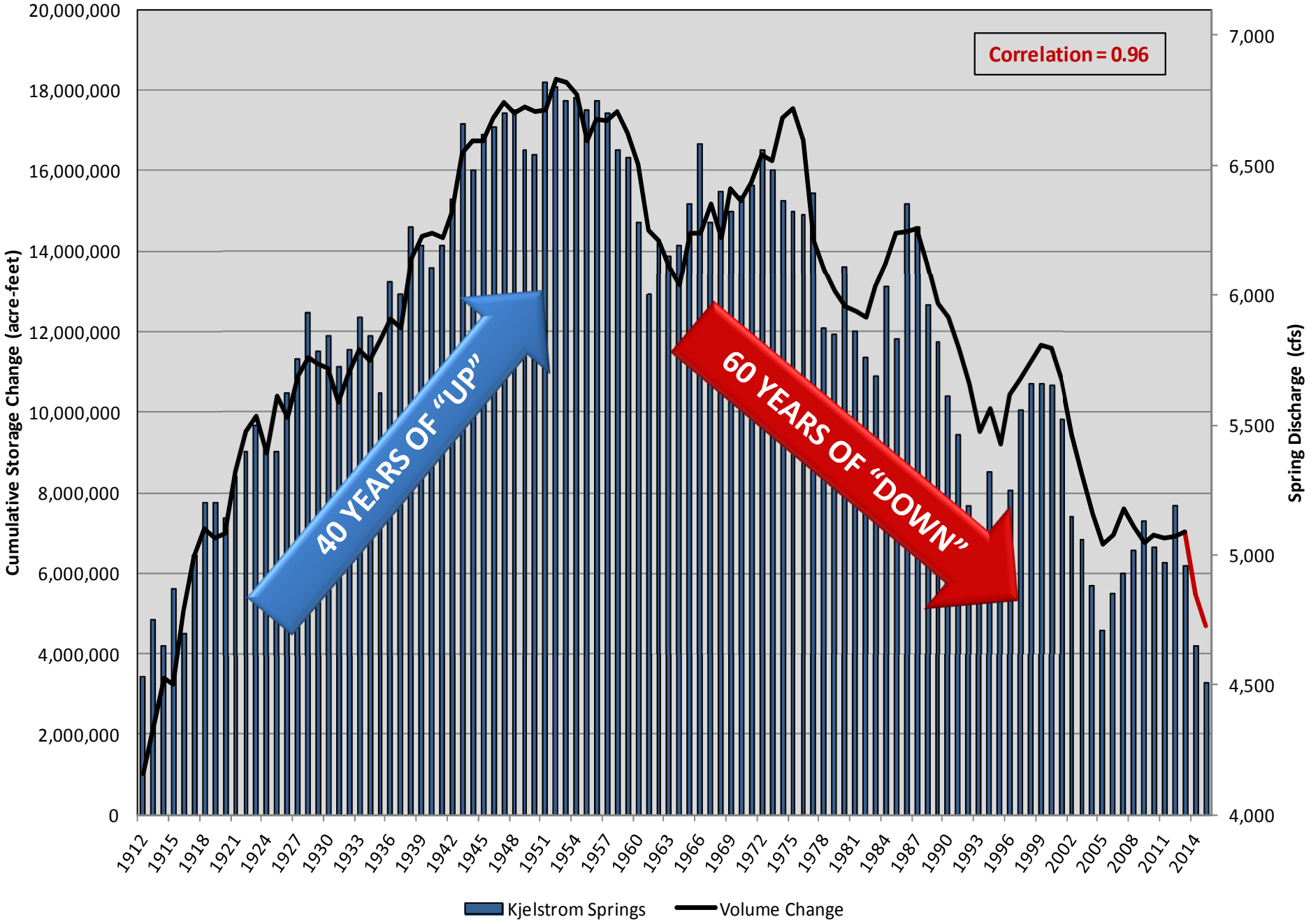
- IDAPA 37.03.11, Rules for Conjunctive Management of Surface and Ground Water Resources (1994)
- Conjunctive Management Defined (010.03):
  - Legal and hydrologic integration of administration of the diversion and use of water under water rights **from surface and ground water sources**, including areas having a common ground water supply.
- Or, administration of surface water and ground water rights together from a common source.

Owyhee Dam, 2017.

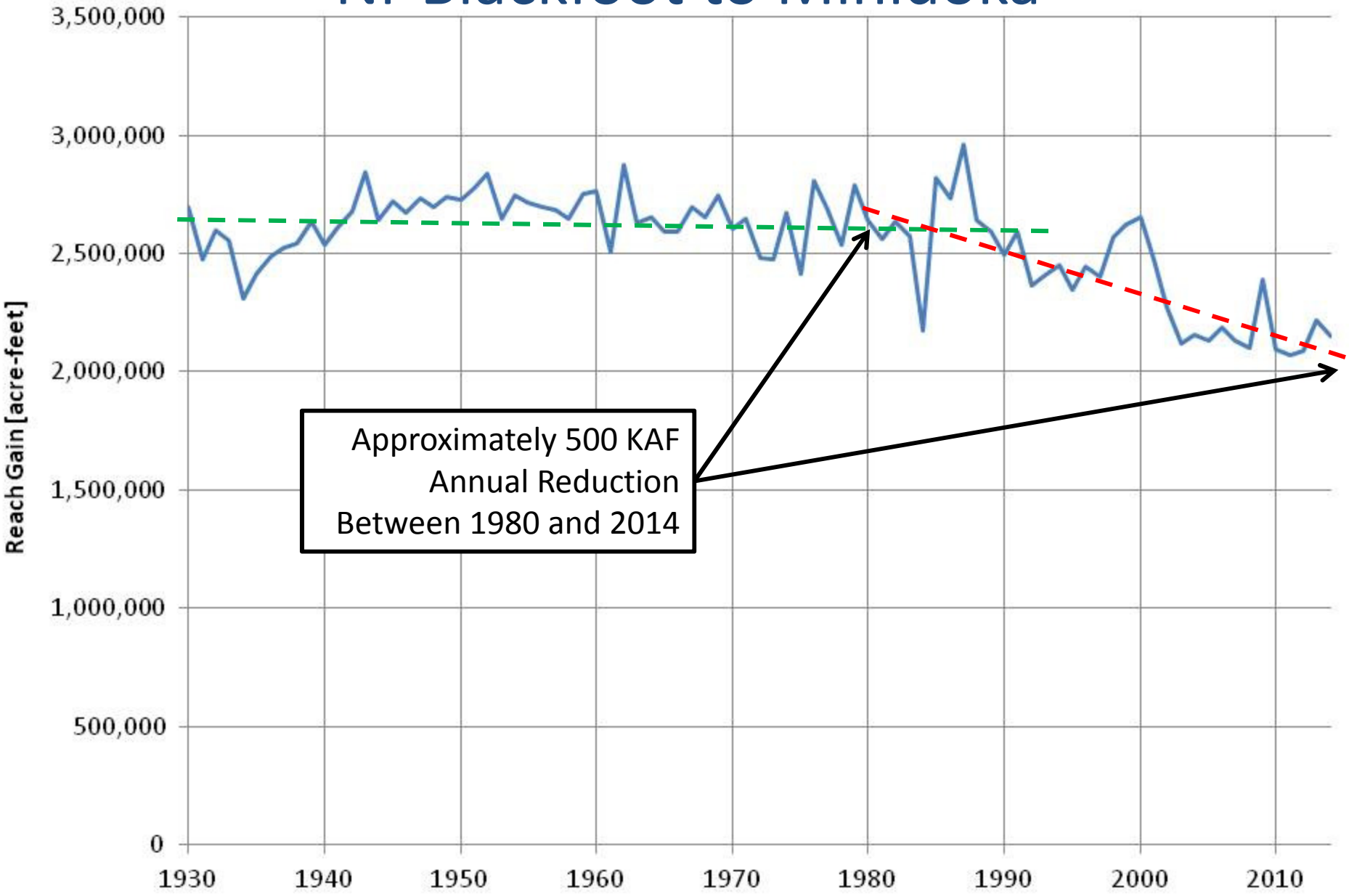
ESPA and the Snake River – A Combined System



Cumulative Change in Volume of Water Stored Within ESPA: K-Springs

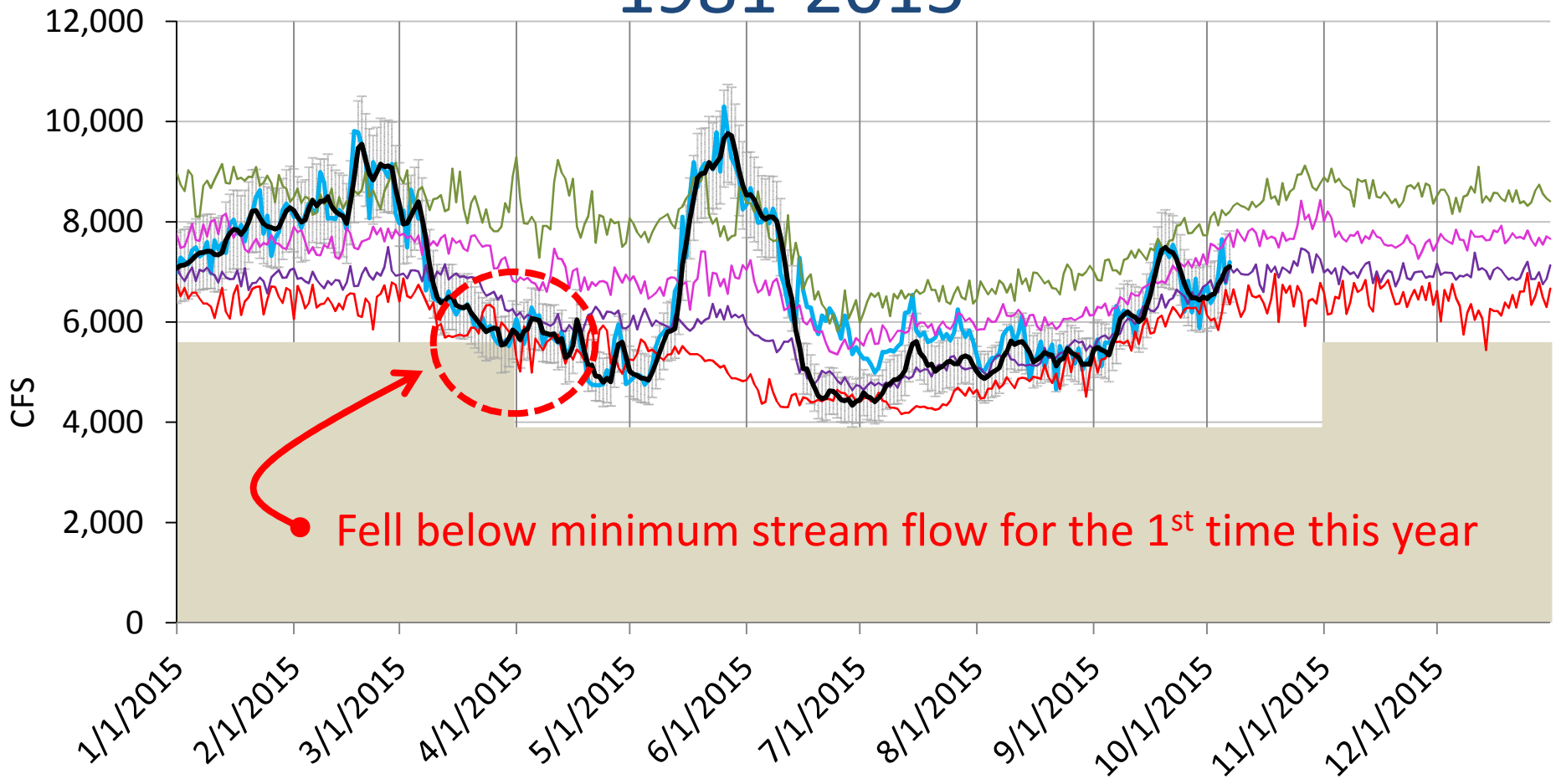


Nr Blackfoot to Minidoka



Note: *2013 and 2014 data values are preliminary.*

Summary Hydrograph Snake River NR Murphy 1981-2015



Minimum Streamflow at the Murphy Gaging Station

Unadjusted Average Daily Flow 2015

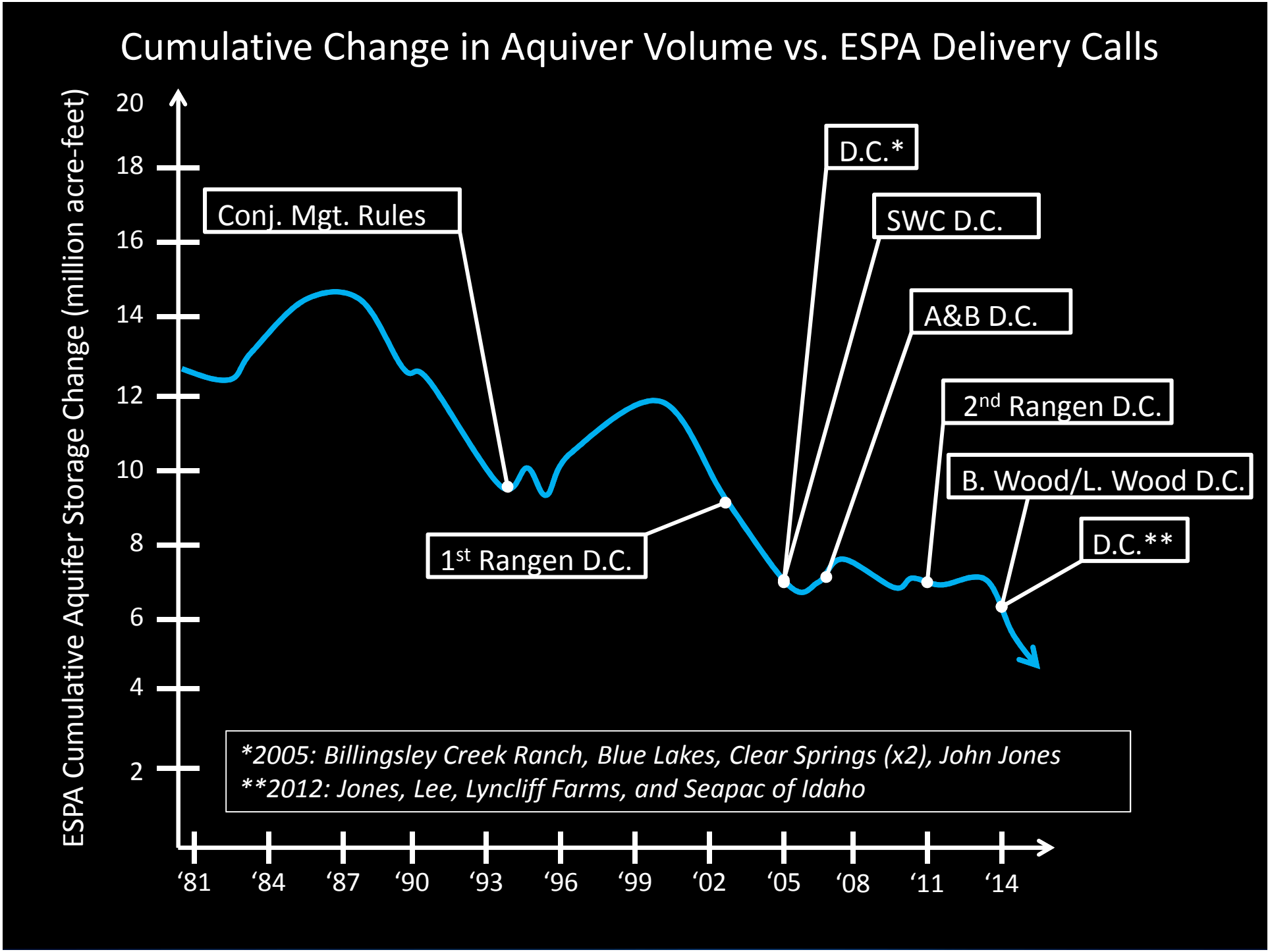
Minimum of Record (1981-2014)

10th Percentile (1981-2014)

30th Percentile (1981-2014)

Median (1981-2014)

3-day Average of the Adjusted Average Daily Flow (AADF)

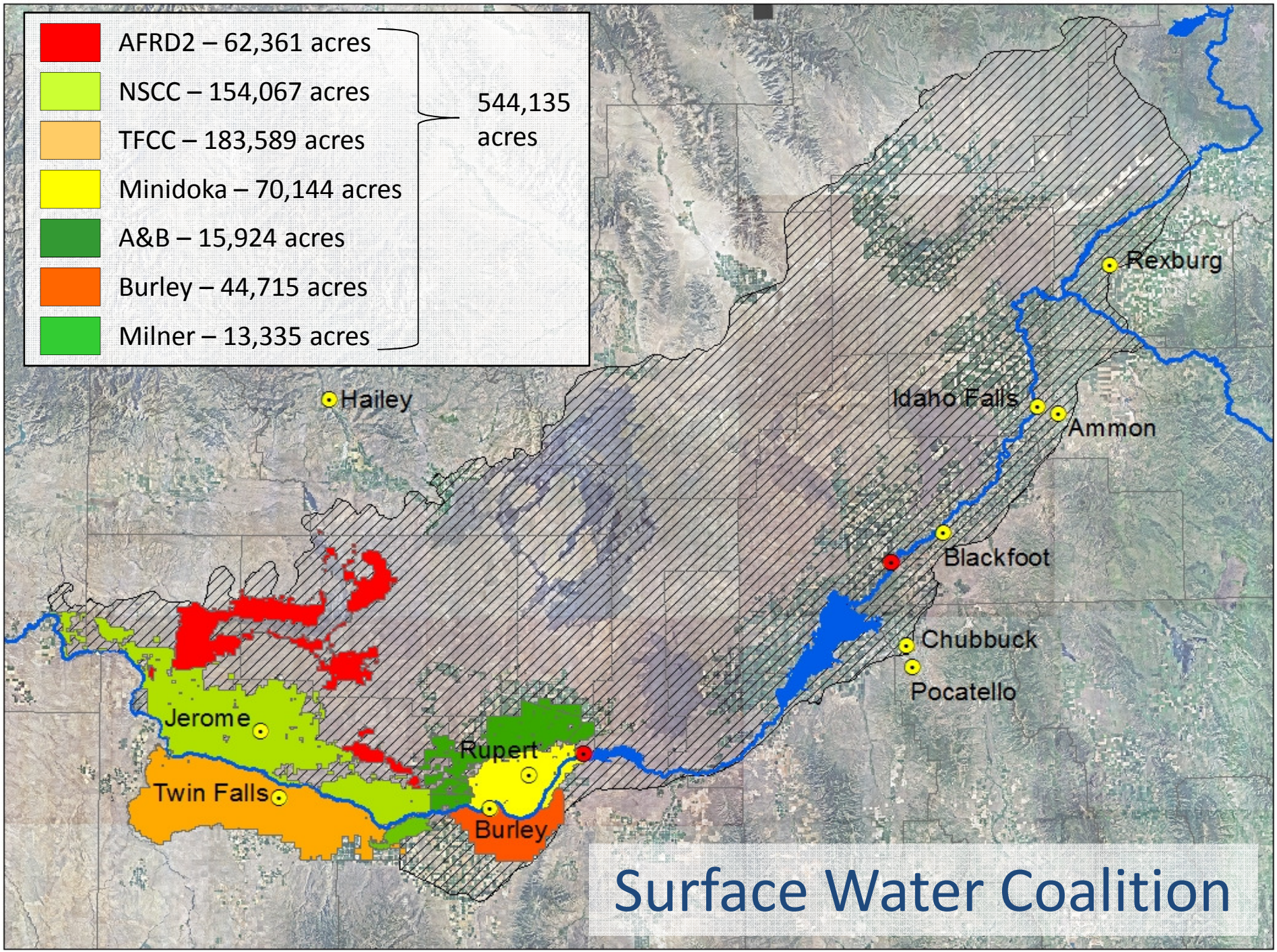

Cumulative Change in Aquiver Volume vs. ESPA Delivery Calls
ESPA Cumulative Aquifer Storage Change (million acre-feet)
20
18
16
14
12
10
8
6
4
2
Conj. Mgt. Rules
1st Rangen D.C.
D.C.*
SWC D.C.
A&B D.C.
2nd Rangen D.C.
B. Wood/L. Wood D.C.
D.C.**
*2005: Billingsley Creek Ranch, Blue Lakes, Clear Springs (x2), John Jones
**2012: Jones, Lee, Lyncliff Farms, and Seapac of Idaho
'81
'84
'87
'90
'93
'96
'99
'02
'05
'08
'11
'14

Surface Water Coalition Delivery Call

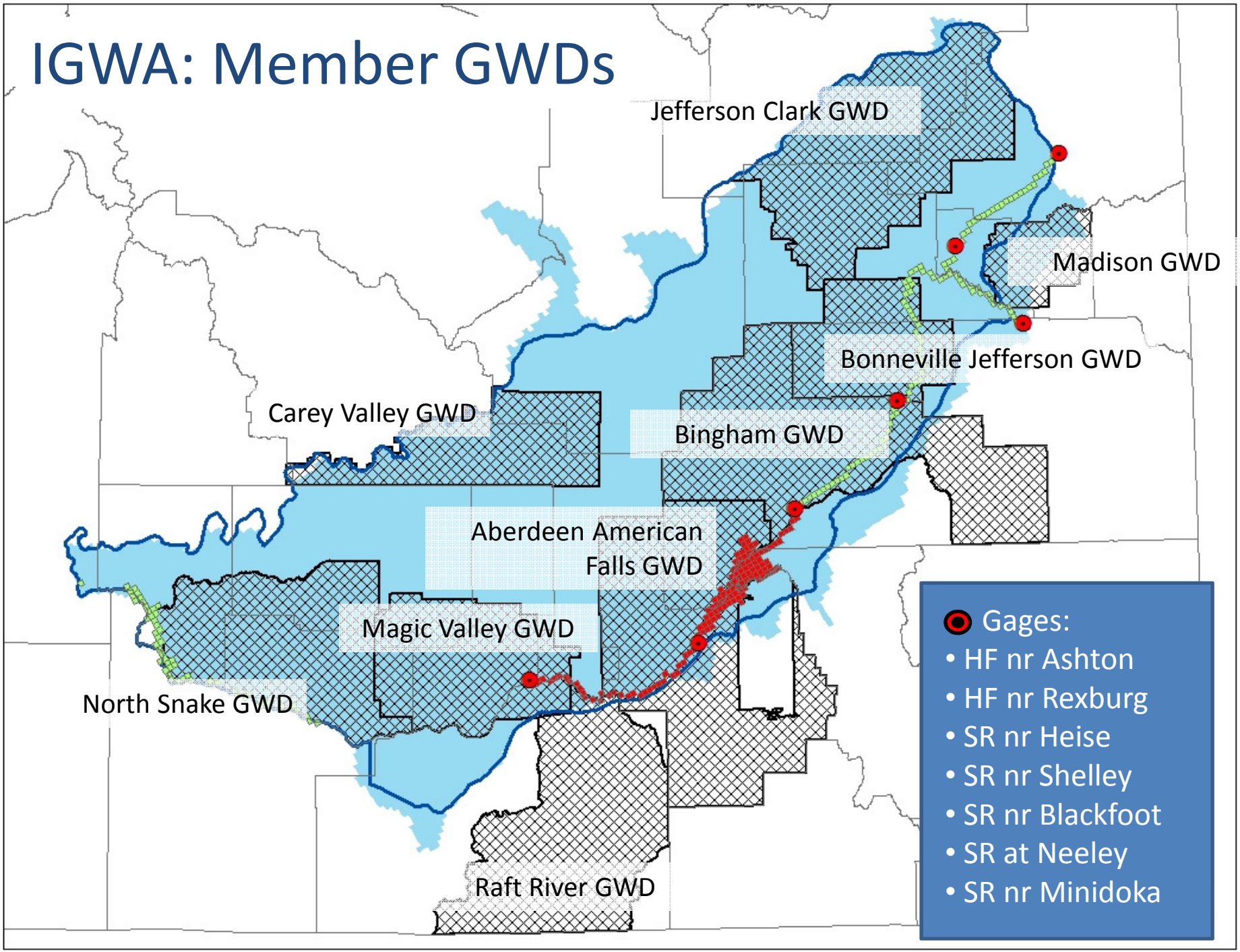
- Delivery Call Filed in 01/14/2005*
- Final Order 09/05/2008
- Second Amended Methodology Order 06/23/2010
- Third Amended Methodology Order 04/16/2015
- Fourth Amended Methodology Order 04/19/2016
- Delivery Call Injury Based on Water Supply for Current Year
- Injury: (1) in-season; and (2) "reasonable carryover"
- Because the Water Supply changes from year to year, so does the injury obligation
- Uncertainty is the great frustration of the Junior…and the Senior

*SWC delivery call was filed under IDAPA 37.03.11 *Rules for Conjunctive Management of Surface and Ground Water Sources (https://adminrules.idaho.gov/rules/current/37/0311.pdf)*

Department archived SWC delivery call documents are maintained on our webpage: *https://idwr.idaho.gov/News/WaterCalls/Surface%20Coalition%20Call/*


AFRD2 – 62,361 acres
NSCC – 154,067 acres
TFCC – 183,589 acres
Minidoka – 70,144 acres
A&B – 15,924 acres
Burley – 44,715 acres
Milner – 13,335 acres
544,135 acres
Hailey
Idaho Falls
Ammon
Rexburg
Blackfoot
Chubbuck
Pocatello
Jerome
Rupert
Twin Falls
Burley
Surface Water Coalition

IGWA: Member GWDs



Summary of Demand Shortfall Projections on May 3, 2015				
	April As-Applied Order (4/16/15)	April As-Applied w/ May 1 Forecast	July As-Applied w/ April Div. & BLY	July As-Applied w/ April Div. & 2012 Analog Yr.
A&B	0	0	0	0
AFRD2	-15,300	-35,464	-54,728	-67,938
BID	0	0	0	0
Milner	0	0	0	0
Minidoka	0	0	0	0
NSCC	0	0	-26,327	-184,543
TFCC	-73,700	-90,250	-170,259	-318,387
Total	**-89,000**	**-125,714**	**-251,314**	**-570,868**
Approx. Curtailment Priority Date	1982	1980	1974	1957
Approx. Curtailed Acres	86,000	121,000	259,000	594,000

These numbers are calculated using the 3rd Amended Methodology Order for the Surface Water Coalition Delivery Call. Natural flow supplies are predicted using the NRCS's May 1 50% Exceedance Forecast of April-July Runoff Volume at the Heise Gage (i.e. 2,239,000 AF).

Settlement Agreement – 2015 Timeline

- May – Preliminary Agreement Reached by Parties, Delivery Call Orders Stayed
- July 2 - Parties legal counsel agreed to final settlement
- August 1 – All participating irrigation districts, canal companies, and ground water districts signed onto agreement as individual entities with conditions of understanding
- September – IGWA and GWDs held 1st and 2nd Technical Workshops to begin implementing the Term Sheet
- October – All participating irrigation districts, canal companies, and ground water districts finalized signatures to the agreement

Final Settlement Agreement

1. **Objectives**
   - Mitigate for material injury to senior water users in the Surface Water Coalition (SWC) Delivery Call
   - Provide safe harbor to participating ground water users in participating Ground Water Districts (GWD)
   - Minimize economic impact to water users and State economy
   - Increase reliability and enforcement of use, measurement, and reporting across the Eastern Snake Plain (ESP)
   - Develop adaptive management plan to stabilize and enhance the Eastern Snake Plain Aquifer (ESPA) ground water levels

Final Settlement Agreement

2. Near Term Practices (i.e. 2015 irrigation year)

- 110,000 AF storage water
  - Satisfied in-season mitigation obligation
  - All rental contracts in to WD01 by July 1

- $1.1 Million dedicated to conversion projects

Final Settlement Agreement

3. **Long Term Practices (i.e. 2016 and beyond)**
   - Consumptive use reduction of ground water by 240,000 AF
   - Annual storage water delivery of 50,000 AF
   - Irrigation season reduction: April 1 – October 31
   - Mandatory Measurement Devices by 2018
   - Support state sponsored recharge program of 250 KAF annually
   - Additional support for the following: NRCS conservation programs; new conversion projects; management of Trust Water Rights; and participation in review and possible recommendations of changes to IDWR administrative processes on the ESPA.

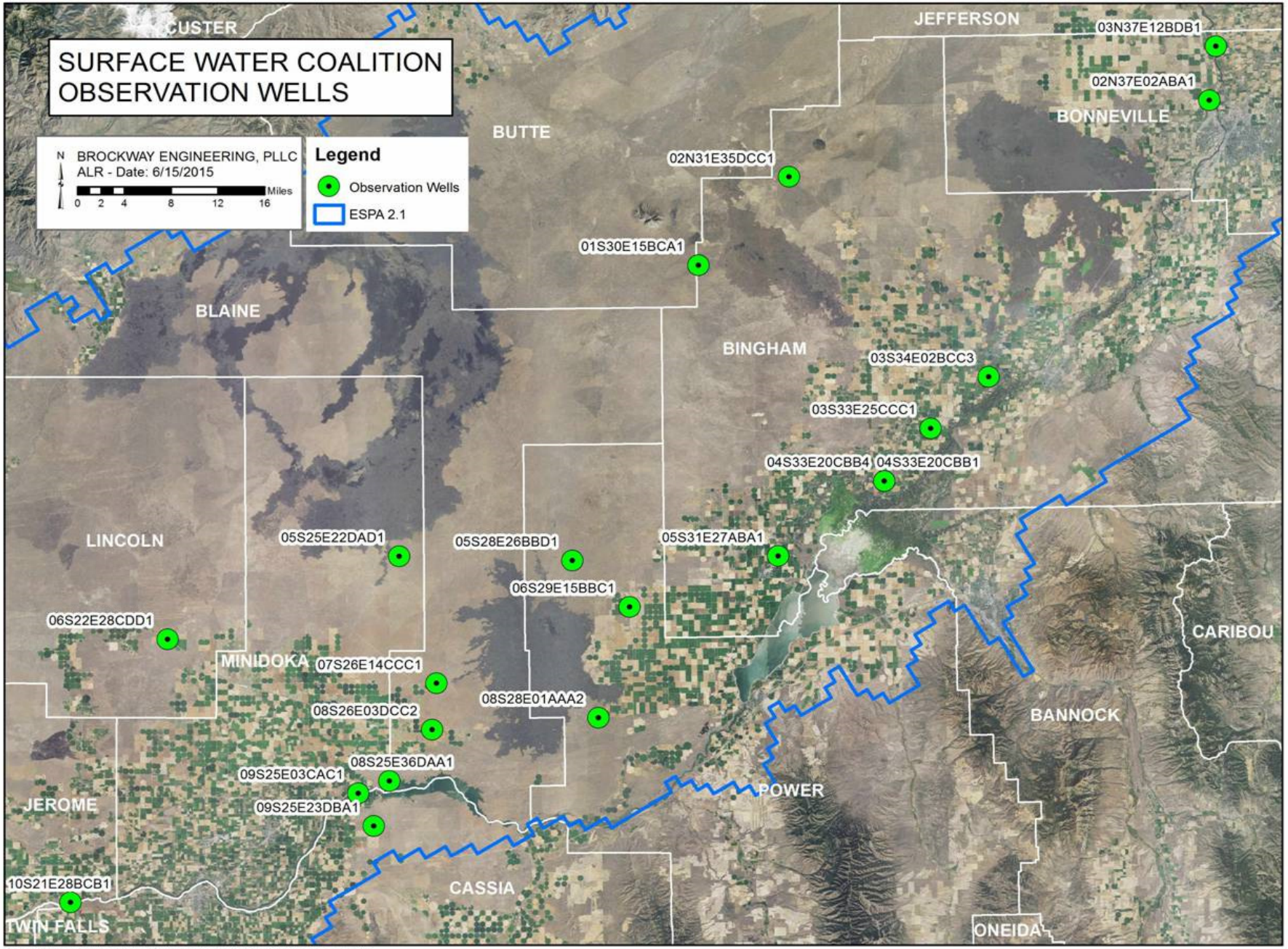
Final Settlement Agreement – Goal and Benchmarks

3. Term Sheet Benchmarks and Ground Water Level Goal

- Goal: "stabilize and ultimately reverse the trend of declining ground water levels and return ground water levels to levels equal to the average ground water levels from 1991-2001"

- Benchmarks: (1) by 2020 ground water levels will equal ground water levels in 2015; (2) by 2023 ground water levels will be halfway between 2015 ground water levels and goal; and (3) by 2026 goal is reached and ground water levels equal or exceed 1991-2001 average.

- Metrics: ground water levels as measured in 19 mutually agreed to "sentinel" observation wells



Path: F:\Projects\Surface Water Coalition\Arcview 9\observation well map.mxd

Final Settlement Agreement

4. Adaptive Water Management Measures

"If any of the benchmarks or the ground water level goal is not met, additional recharge, consumptive use reduction, or other measures as recommended by the Steering Committee shall be implemented by the participating ground water parties to meet the benchmarks or ground water level goal"

Aquifer Sustainability Practices

- Managed Recharge
  - State Sponsored (natural flow)
  - Private (storage and natural flow)
- Voluntary Reduction in Consumption
- Conversion Projects
  - GWD Projects
  - A&B ID Project
- Cloud Seeding

Hazelton Butte Pump Station, 2012.

Fall recharge Main North Side Canal, 2012.

Operating End Gun, Fort Hall 2012.

Settlement Agreement – 2nd Addendum Language

Covenant 2.b.iii reads:

> *The Parties will request the Department to verify each District's annual diversion volume, and other diversion reduction data (recharge, CREP, conversions, end-gun removals, etc.) to confirm the accuracy of the data. The Department's analysis shall be provided to the Steering Committee no later than July 1 for the previous irrigation season.*

Department's Goals:

- Conduct an objective review
- Support the Parties in any way necessary to close out the final numbers for the 2016 irrigation season

IDWR Analysis – Data Summary

	IGWA	IDWR
5-Year Baseline (AF)[1]	1,643,377	1,593,182
-		
2016 Usage (AF)	1,517,388	1,496,527
=		
Reduction (AF)	125,989	96,655
+		
Recharge (AF)[2]	100,499	101,274
=		
Total Conservation (AF)	226,488	197,929
240,000 - T.C. (AF)	13,512	42,071

[1] Baseline for WD31 updated to 82,405. Previous amount was 89,884.

[2] Additional recharge contracts and amounts were confirmed for Bingham GWD (2,716 AF) and at the Sandy Ponds (2,733 AF).

Flow Meter Installation

1	2	3	4
	# of Records	**# of Flow Meter - Preferred Method**	**% with Flow Meter - Preferred Method**
WD31	-	-	-
WD34	397	290	73%
WD100	82	23	28%
WD110	758	69	9%
WD120	314	184	59%
WD130	276	203	74%
WD140	306	211	69%
NS GWD	918	534	58%
MV GWD	549	322	59%
CV GWD	21	10	48%
AFA	767	103	13%
BNG GWD	954	132	14%
BJ GWD	247	93	38%
FMID & MID	-	-	-

The number of records does not include "waived from measurement " and "unused – no water rights"

IWRB Managed Recharge Program

- **Legislative Action**

  ✓ **HB 547 – 2014:** Legislature allocates $5 million annually from cigarette tax to IWRB for ***"statewide aquifer stabilization"***

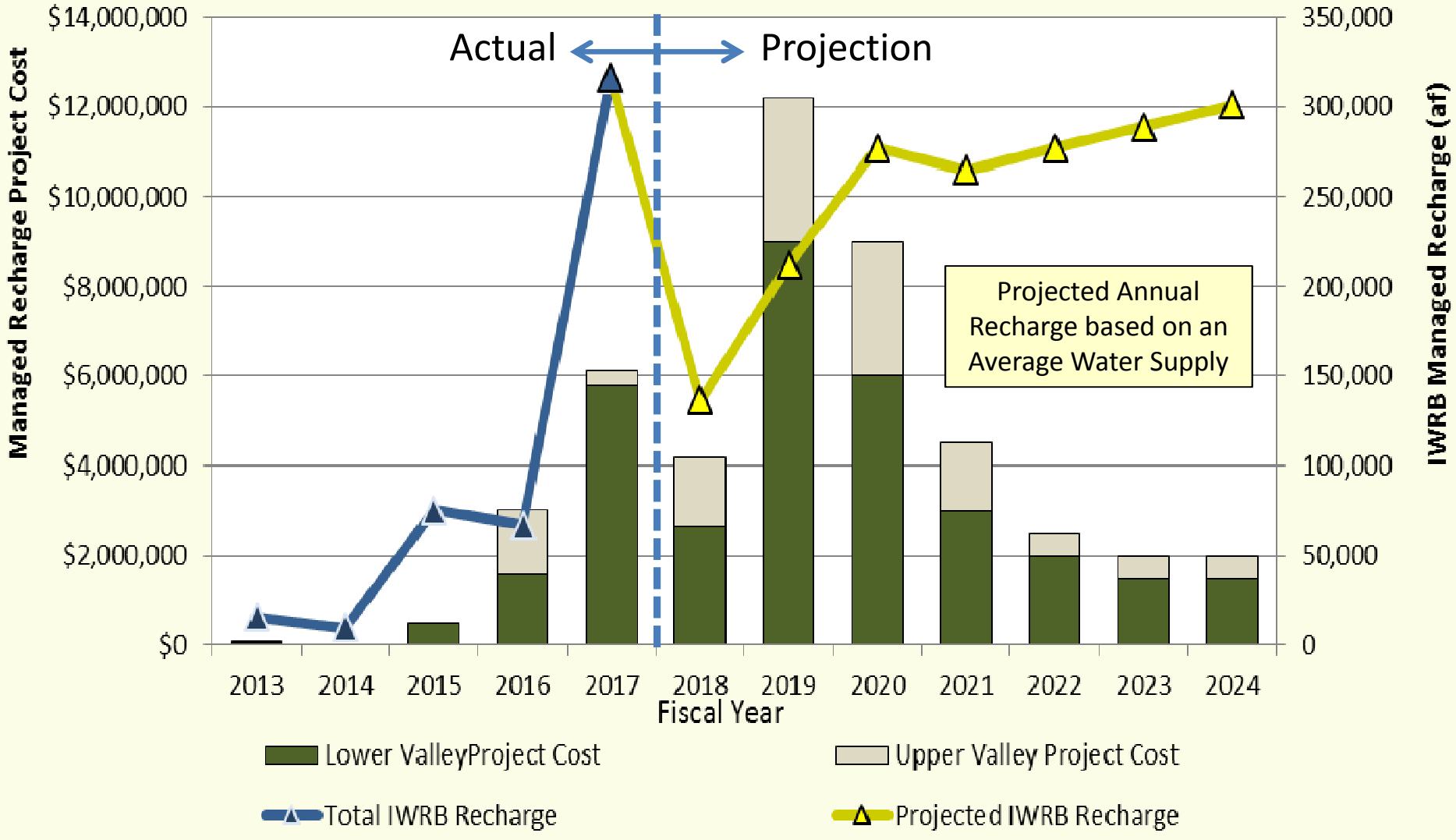
  ✓ **SB 1402- 2016:** Firmed up funding for managed recharge

Recharge in the Egin Lakes area – Spring 2017

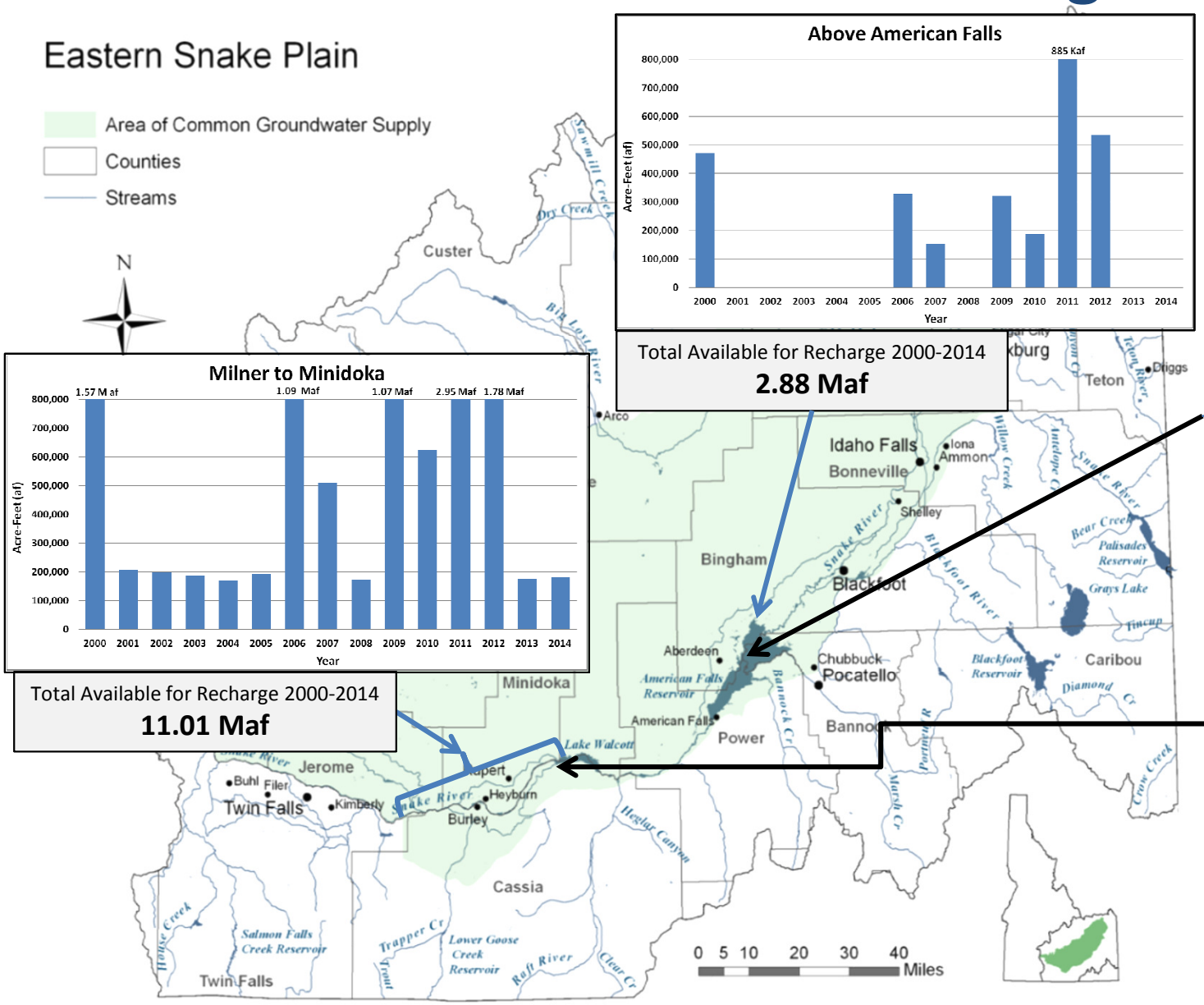
  ✓ **Senate Concurrent Resolution 138 – 2016:** Directs IWRB to develop capability to accomplish an average of **250,000 AF** of managed recharge annually by **2024** in the ESPA

IDAHO Department of Water Resources

Capital Project Cost vs IWRB Recharge



Water Available for Recharge in the Eastern Snake Plain



Total Available for Recharge 2000-2014
2.88 Maf

Total Available for Recharge 2000-2014
11.01 Maf

American Falls Reservoir:
1.6 million AF
1921 priority

Unsubordinated hydropower rights at Minidoka Dam:
2,700 cfs
1909/1912 priority

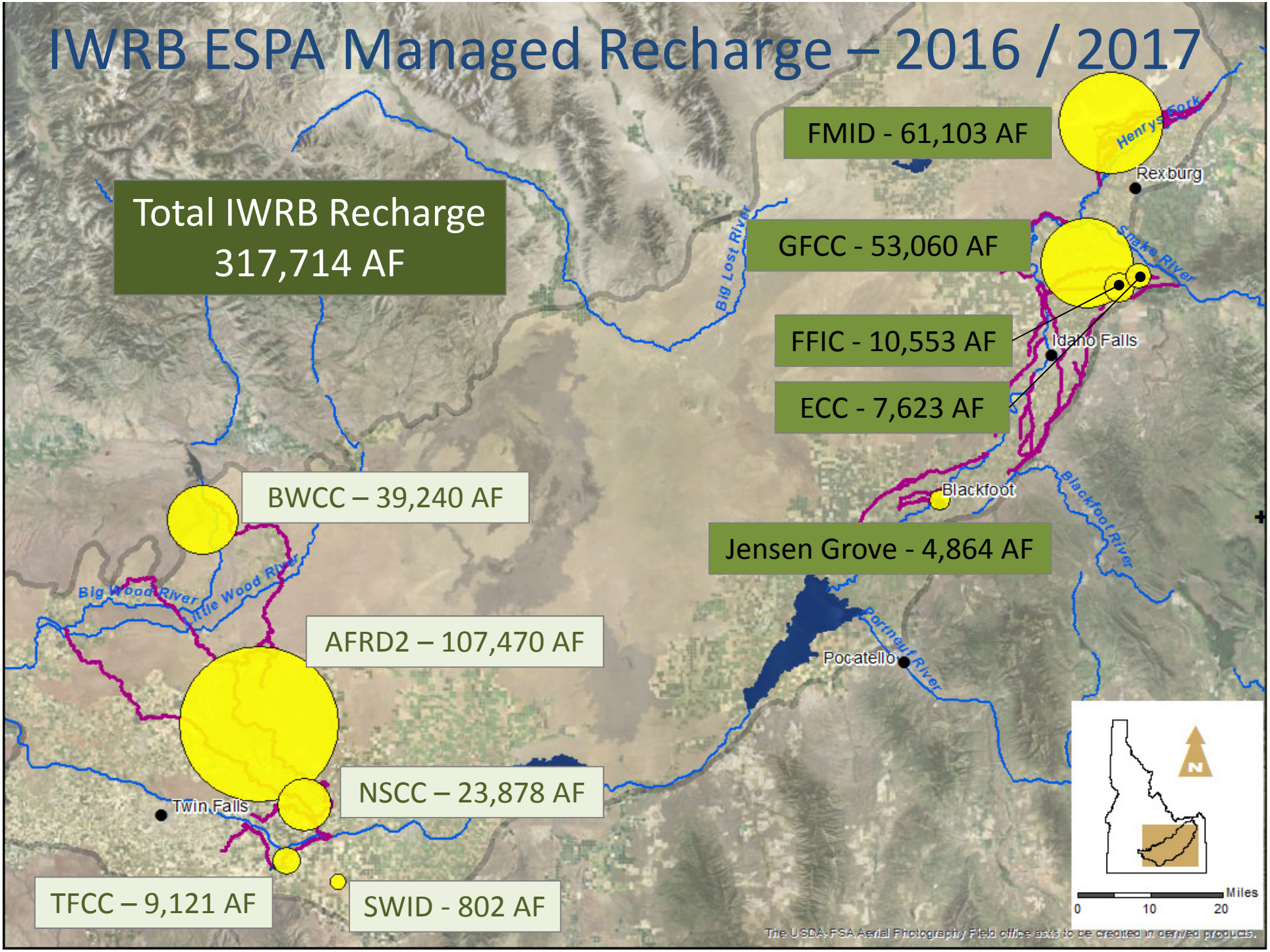
Components of Managed Recharge

- Source of Water to Recharge
  - Natural Flow Water Right for Recharge
  - Transfer/Rental
    - Storage
    - Natural Flow

Components of Managed Recharge

- Developing Managed Recharge Capacity

IWRB ESPA Managed Recharge – 2016 / 2017

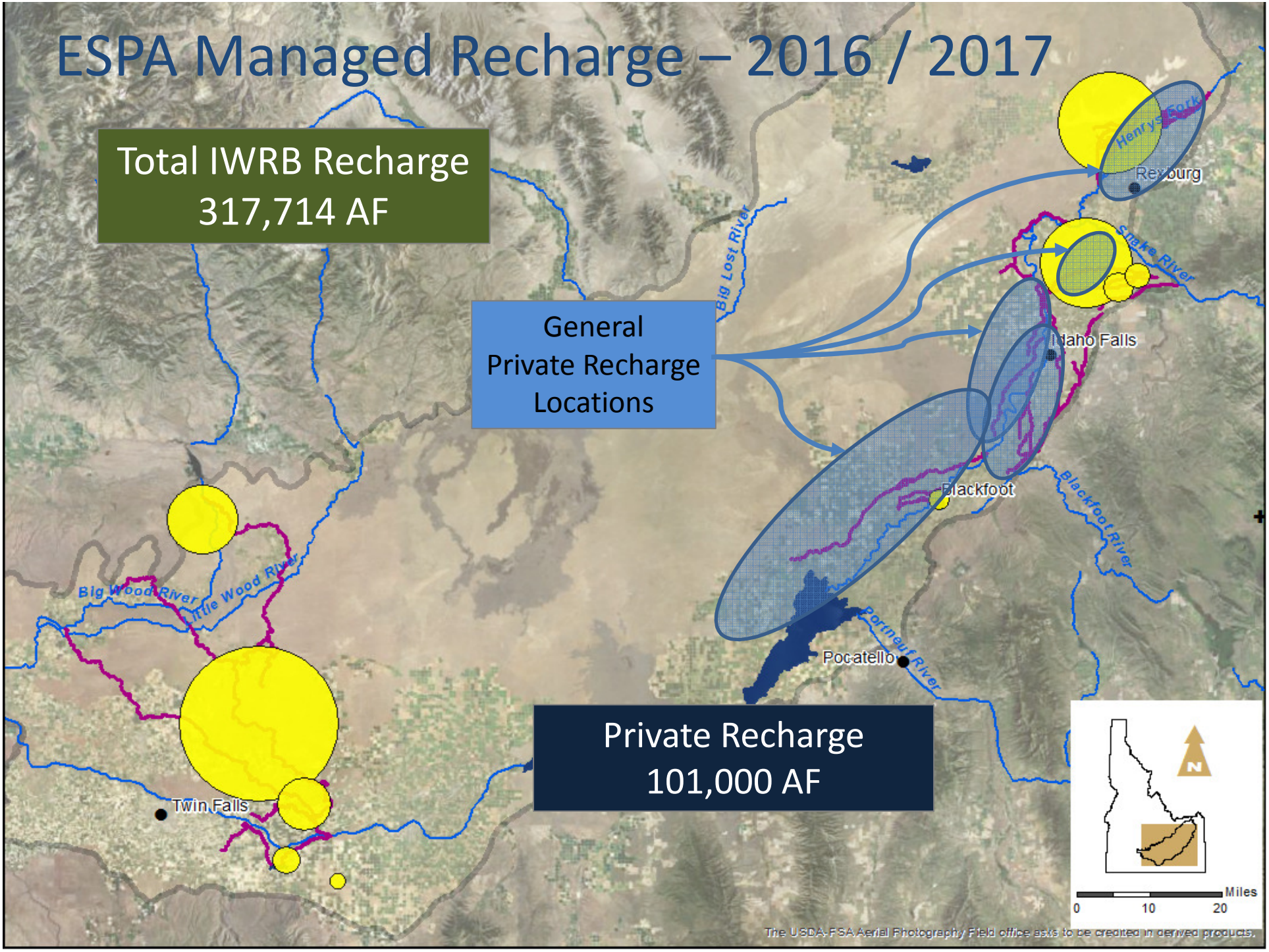


IWRB ESPA Recharge 2016/2017

System	Area	Start/End of Water Right	Recharge (Days)	Median Recharge Rate (cfs)*	Volume Recharged (Acre-feet)*	IWRB Delivery Cost*
Snake River	Lower Valley	Oct 26 / July 2	221	214	141,271	$1,416,836
	Upper Valley	Feb 28 / July 2	102	629	137,203	$804,928
	Snake River Total			**843**	**278,474**	**$2,221,765**
Big/Little Wood River	Below Magic & Little Wood Res.	Feb 22 / Jun 23	121	53	39,240	$183,888
	Big/Little Wood Total			**53**	**39,240**	**$183,888**
TOTAL				**896**	**317,714**	**$2,405,653**

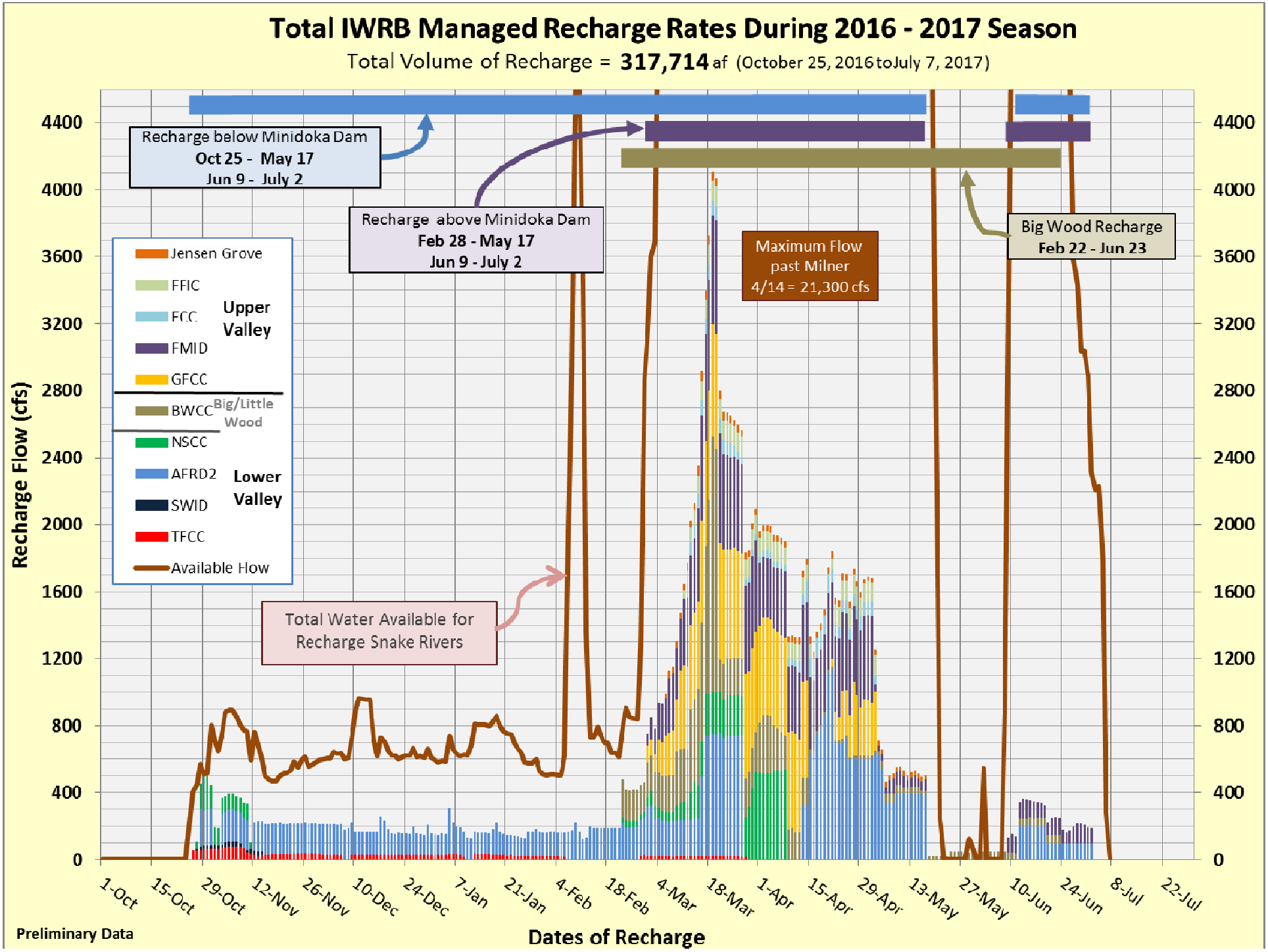
**Subject to Revision as not all Data is Final*

ESPA Managed Recharge – 2016 / 2017

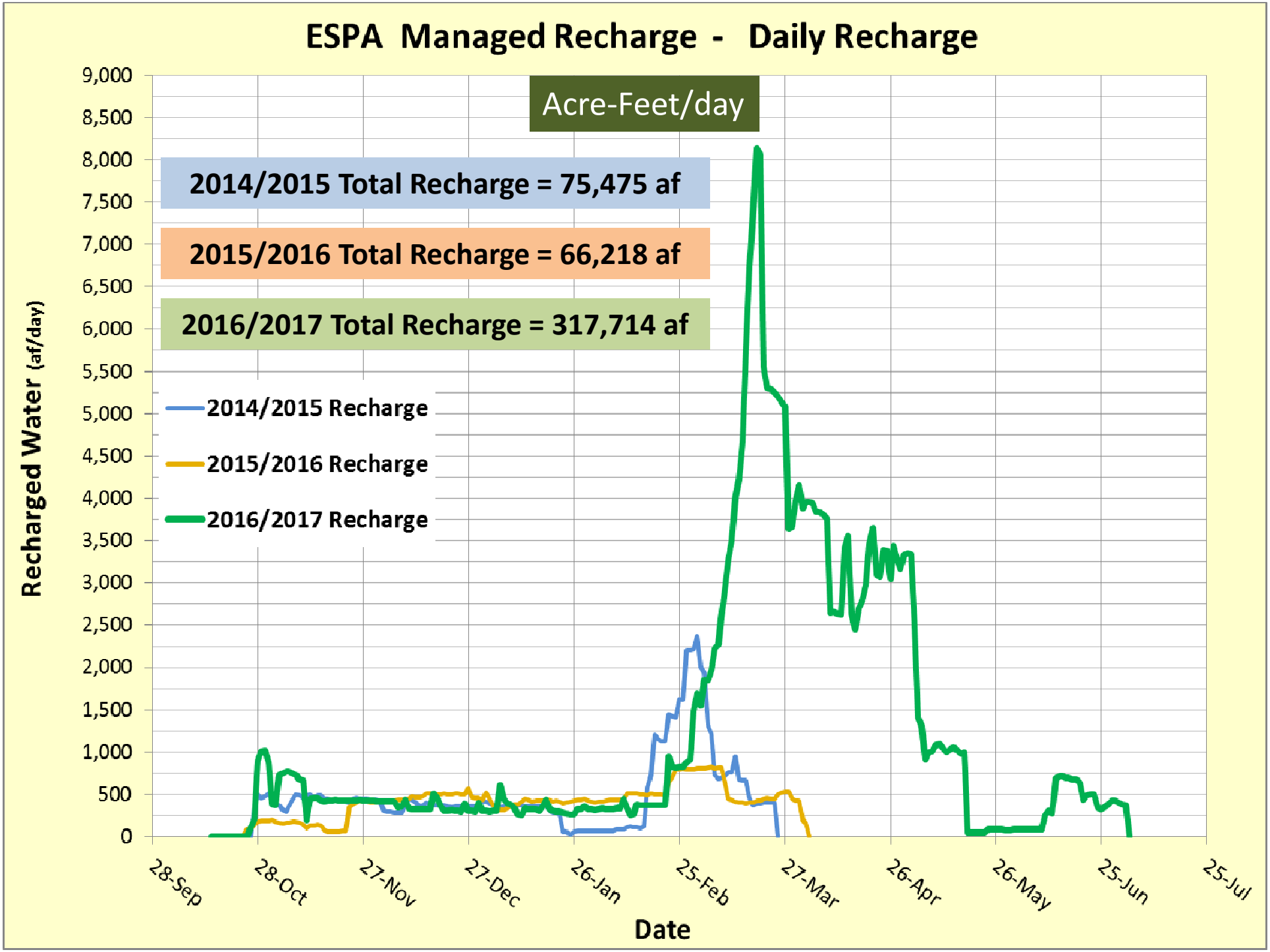


Total IWRB Managed Recharge Rates During 2016 - 2017 Season

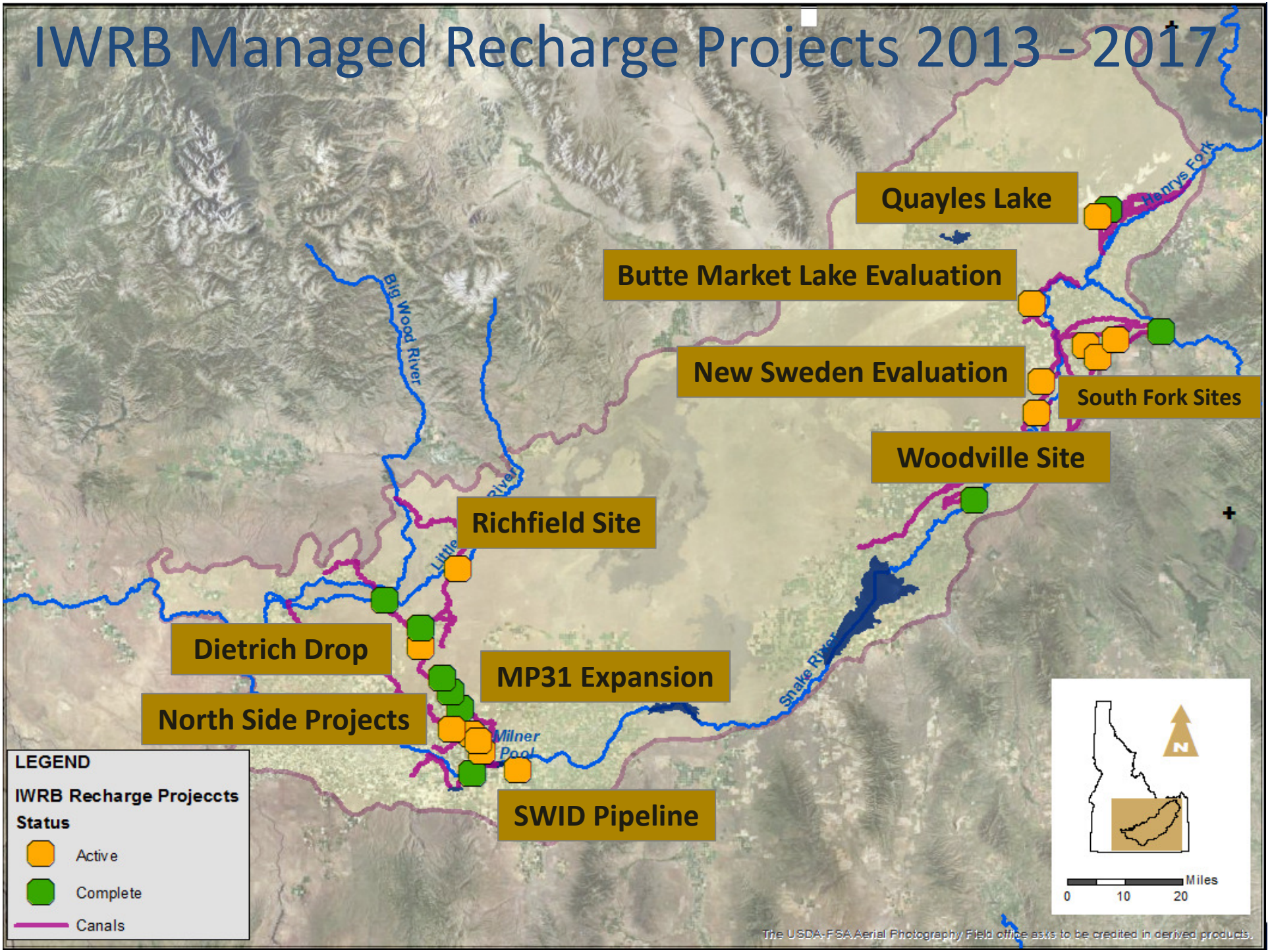
Total Volume of Recharge = **317,714** af (October 25, 2016 to July 7, 2017)



Preliminary Data


ESPA Managed Recharge - Daily Recharge
Acre-Feet/day
2014/2015 Total Recharge = 75,475 af
2015/2016 Total Recharge = 66,218 af
2016/2017 Total Recharge = 317,714 af
2014/2015 Recharge
2015/2016 Recharge
2016/2017 Recharge
Recharged Water (af/day)
9,000
8,500
8,000
7,500
7,000
6,500
6,000
5,500
5,000
4,500
4,000
3,500
3,000
2,500
2,000
1,500
1,000
500
0
28-Sep
28-Oct
27-Nov
27-Dec
26-Jan
25-Feb
27-Mar
26-Apr
26-May
25-Jun
25-Jul
Date

IWRB Managed Recharge Projects 2013 - 2017



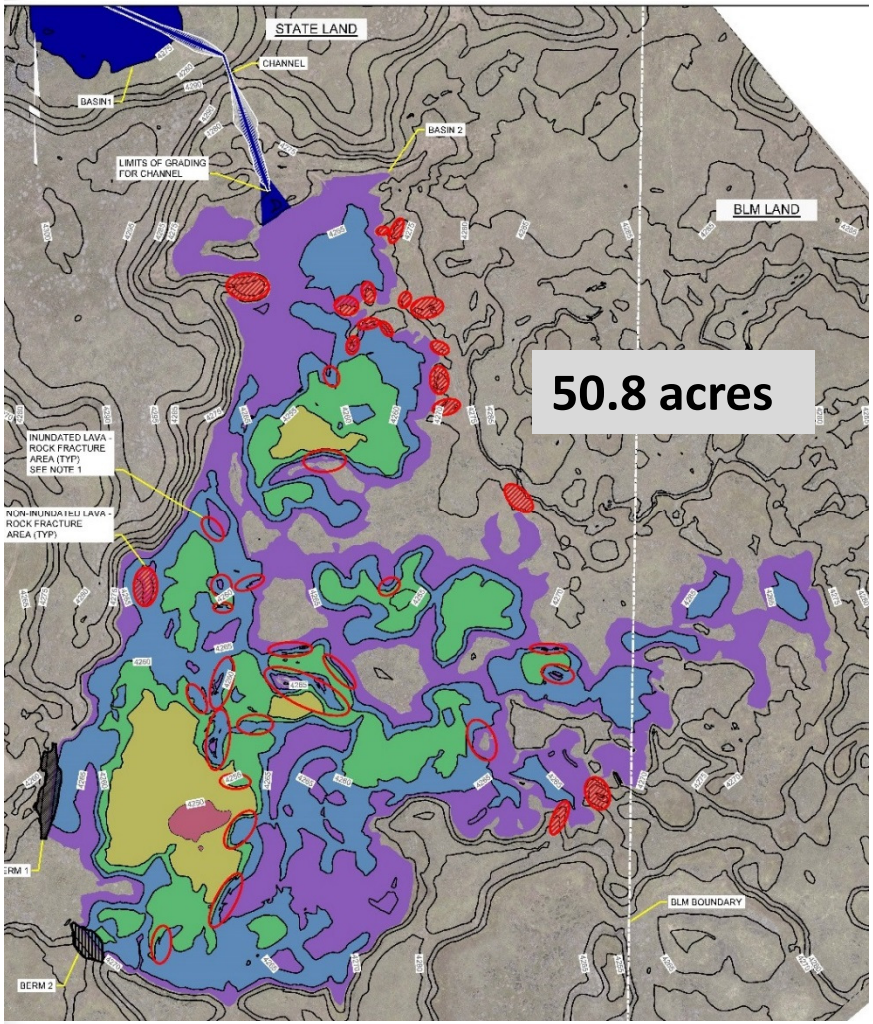
Milner-Gooding Canal – Mile 31 Expansion

Expand the Recharge Capacity from 200 cfs to 500cfs
(Complete)

SWID – New Pipeline

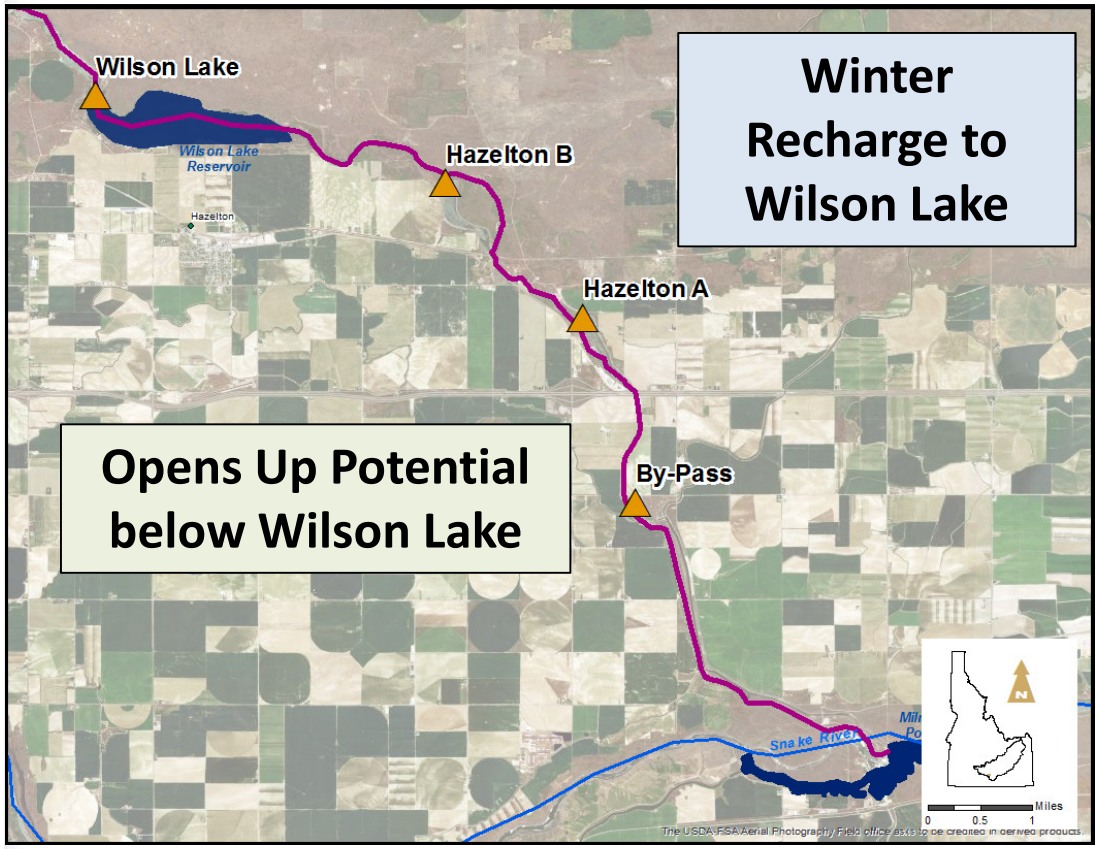
Adding infrastructure to allow for winter-time recharge – 50 cfs
(Complete)

Richfield Site – Dietrich Canal



Potential Recharge Capacity
95 cfs - Big/Little Wood Rivers
(Fall 2017/2018)

North Side Canal Hydro-Bypass Projects

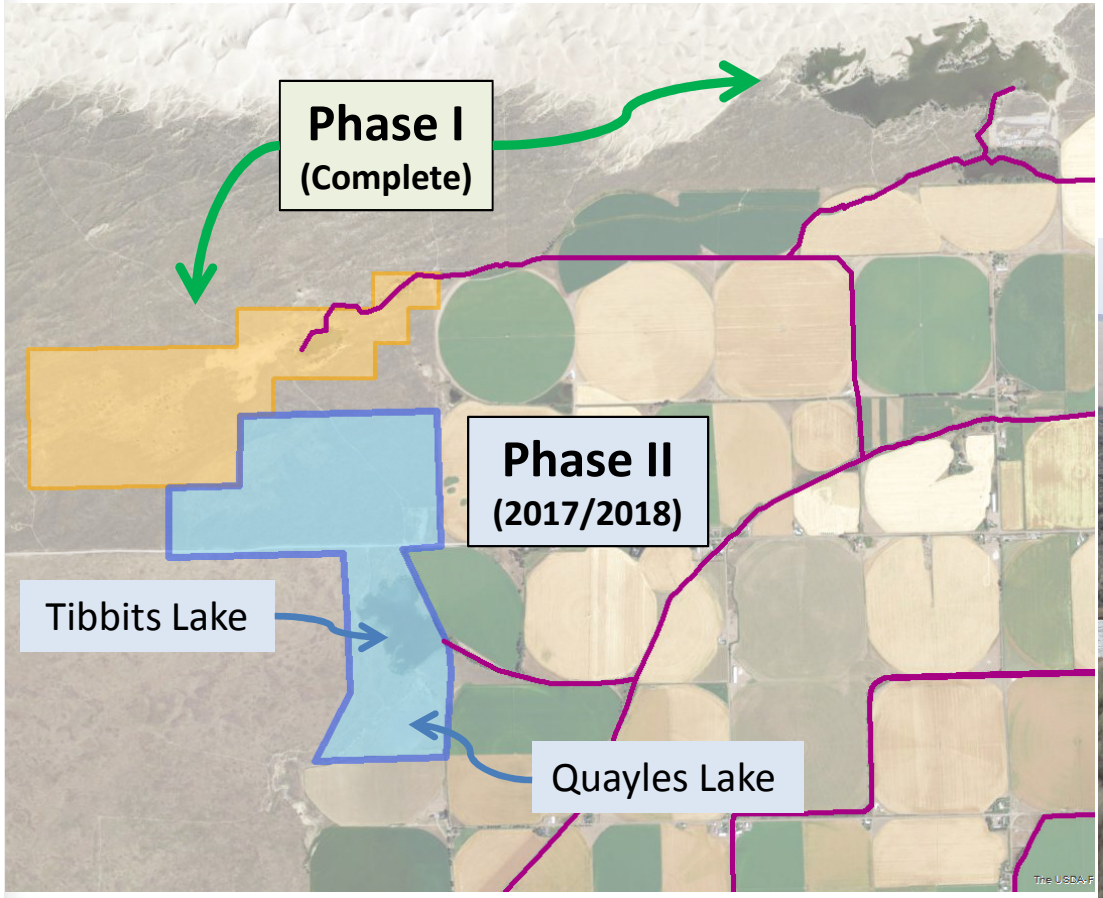


Winter Recharge to Wilson Lake

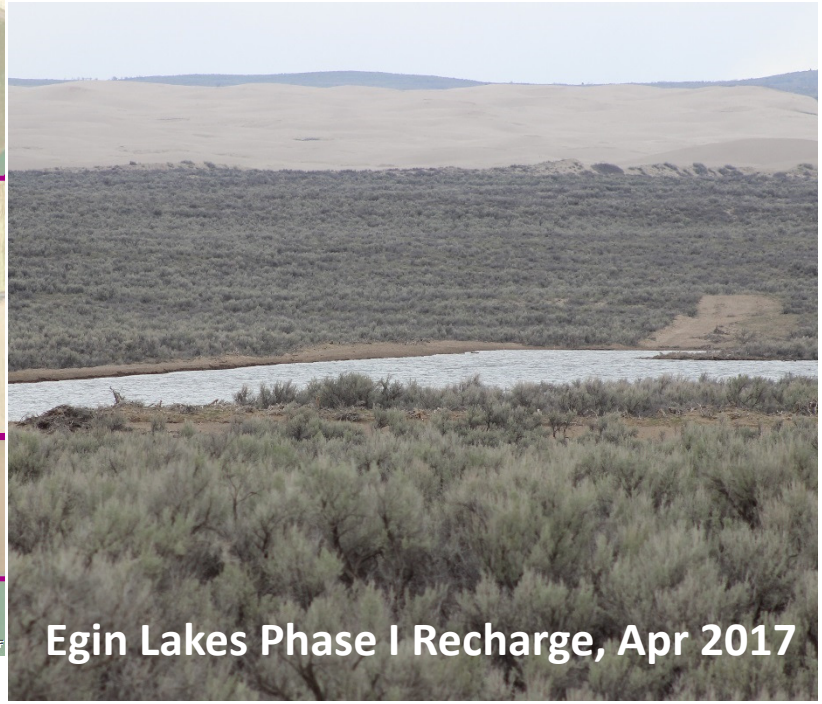
Opens Up Potential below Wilson Lake

Recharge Capacity
130 cfs
(Summer/Fall 2017)

Egin Lakes Phase I & Phase II



Potential Recharge Capacity
150 cfs
(2017/2018)



Recharge Challenges

- On-going funding ($2.5-3.0 million/year in conveyance fees alone)
- Infrastructure needs to recharge all available water
- Competition between state funded and private manage recharge
  - Settlement agreement and recharge occurring in lieu of reductions
  - Getting out bid by private recharge that is willing to pay $15-$25/AF flat rate
- Formal water quality monitoring and enforcement…injection wells have permit process, canals no permitting, and basins ???
- Understanding the effects on aquifer from recharge…measure water in well…but to tease out effects on system from recharge still a challenge

Using Water-Level Data to Estimate Changes in Aquifer Storage

The aquifer storage volume changes have been calculated as follows:

1. Water-level data have been differenced to produce water-level changes at discrete points (at the wells).
2. Changes at the wells have been interpolated across the ESPAM2.1 model area to create water-level change maps.
   a. This results in a volume of water and rock (area of model domain x depth of changes).
3. 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.
4. Therefore, the water-level changes have been multiplied by the average, calibrated Sy from EPAM2.1 (0.06) to calculate the change in volume of water.

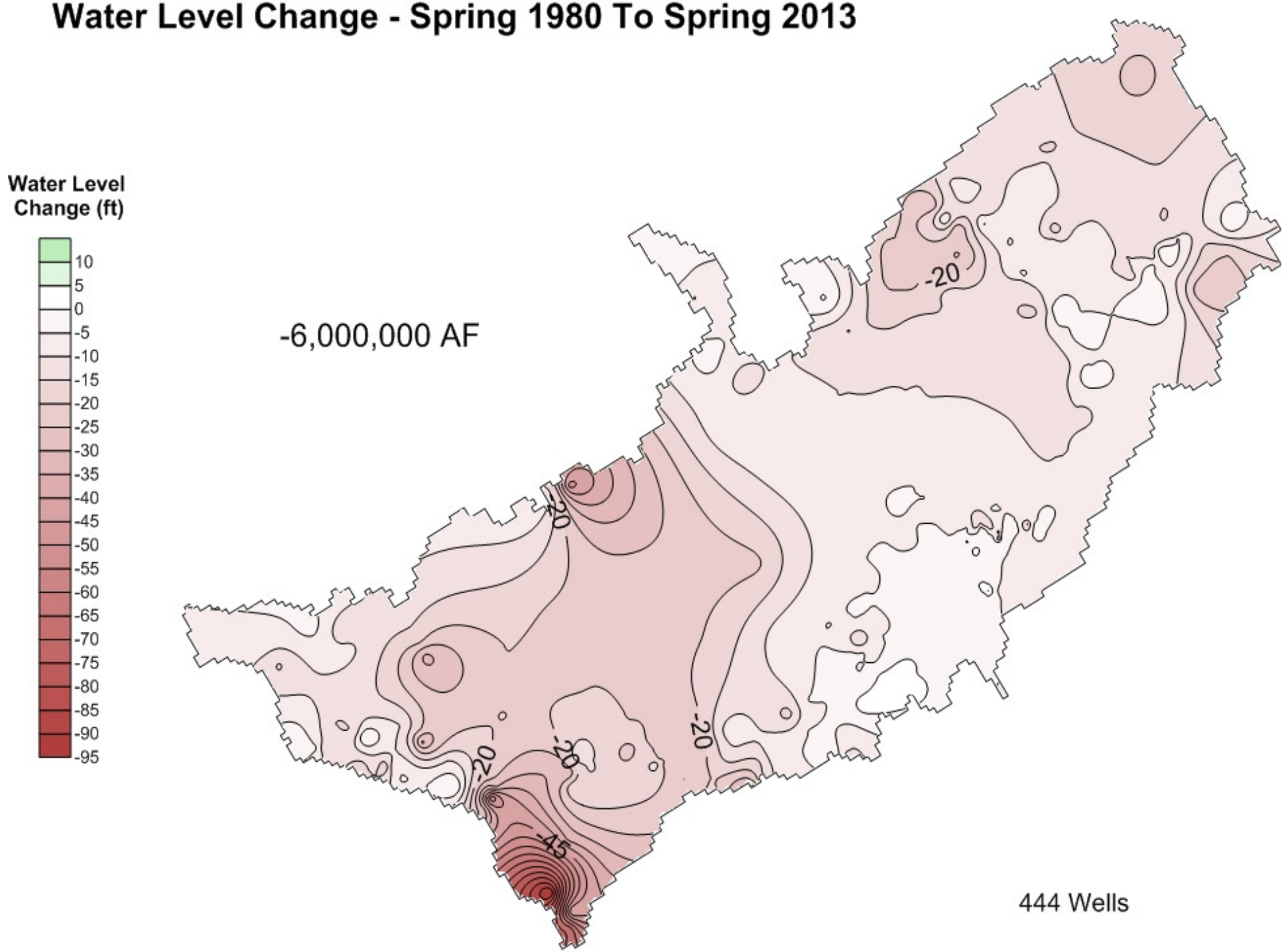
Rationale for using March/April Water Levels

- Using water-level changes has provided a straight-forward, reliable method for calculating changes in aquifer storage.
  - Water levels necessarily reflect the amount of water in the aquifer.
  - Conducting measurements in the March/April integrates the impacts due to irrigation-season activities from the previous year into a resulting condition (aquifer storage change).

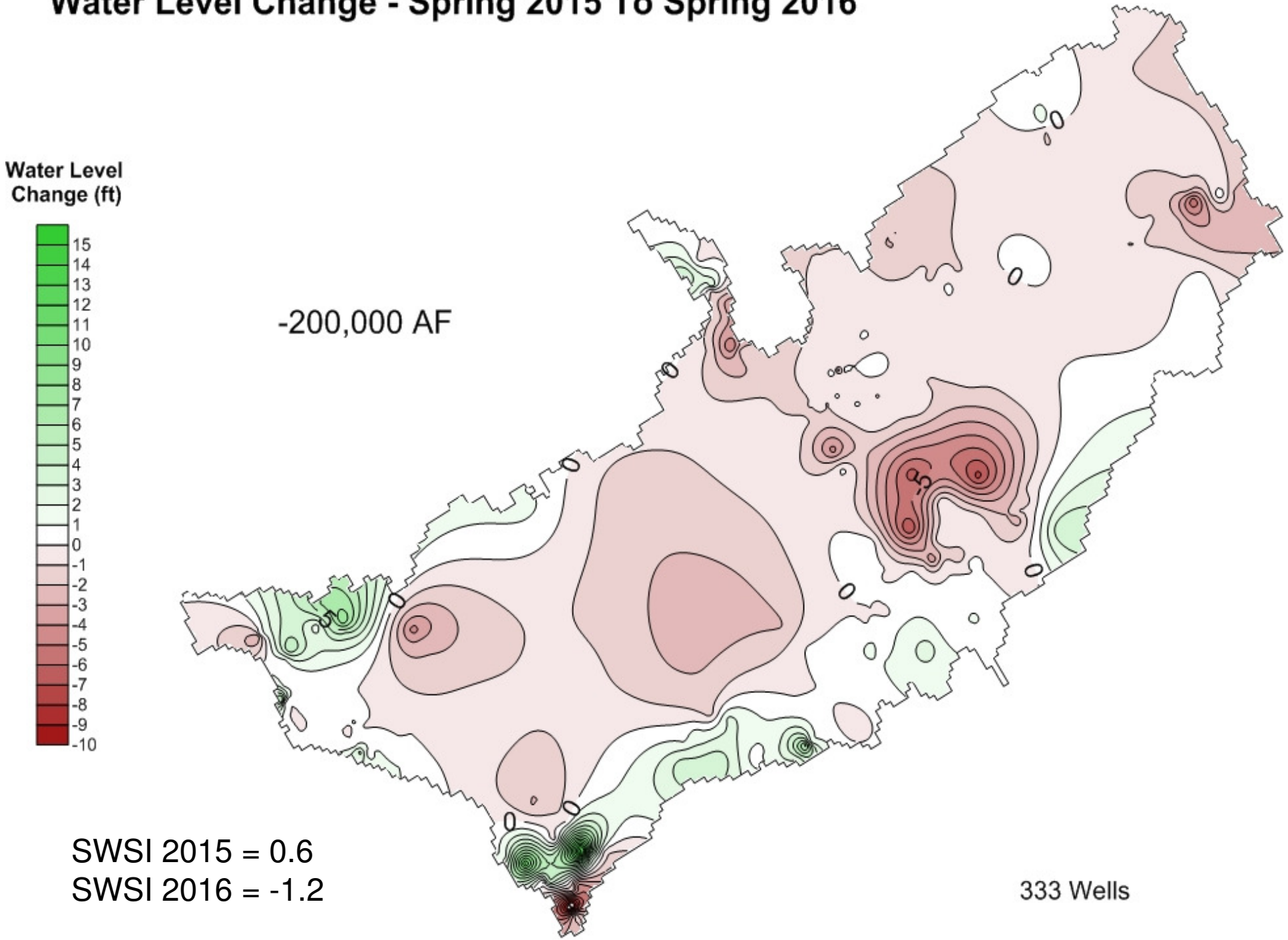
Storage Change between Mass Measurements

- Mass measurements provide an efficient method for calculating storage changes every few years.
- Mass measurements indicate the volume of water stored in the aquifer is declining over time; however, it is difficult to make management decisions with this information.
- Hundreds of wells are measured in the spring each year. We have been using these annual data to calculate storage changes (1980-2017).
- Beginning in the spring of 2016, IDWR now conducts coordinated measurement of the ESPA well network to facilitate storage-change calculation.

Water Level Change - Spring 1980 To Spring 2013



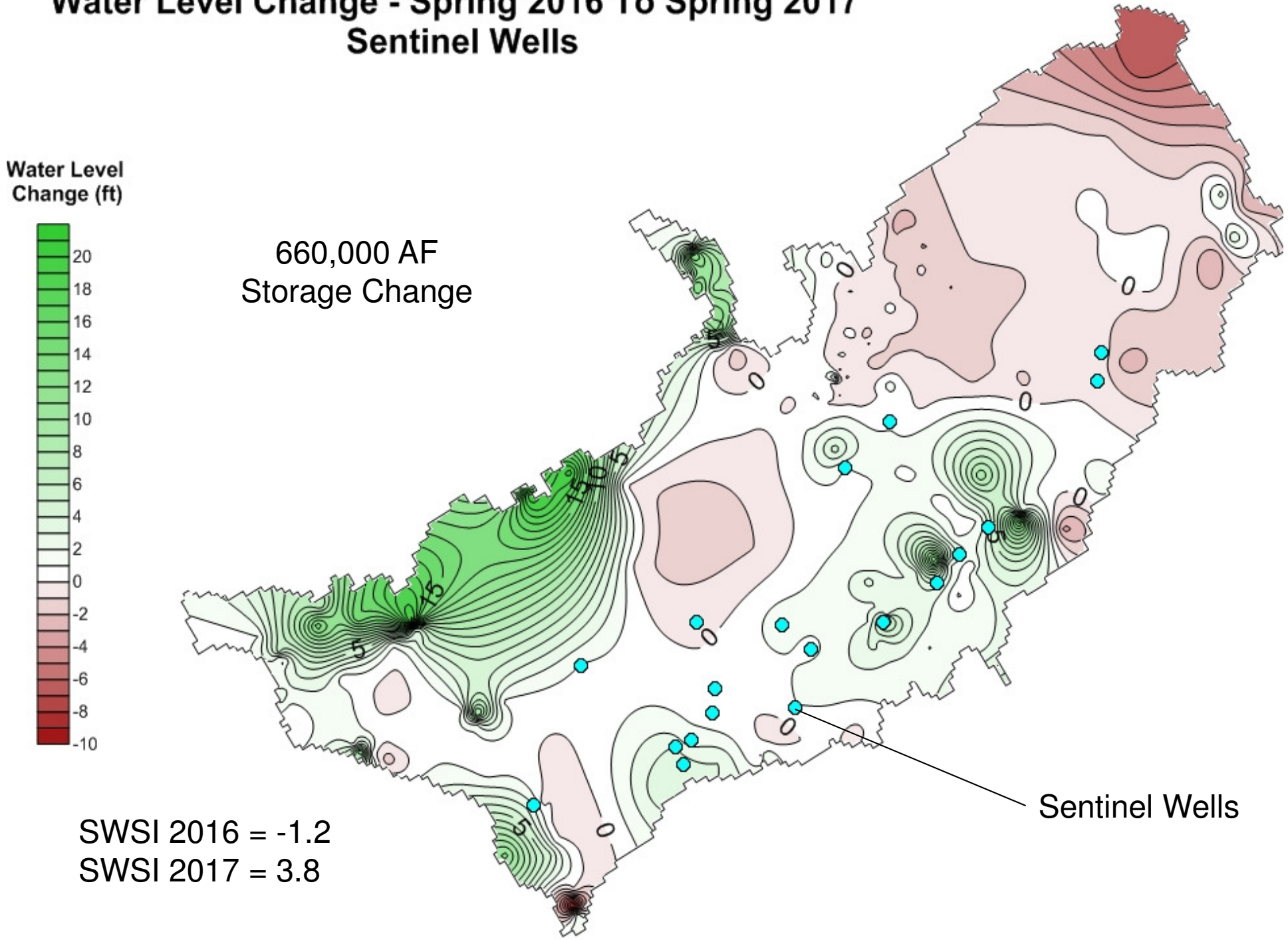
Water Level Change - Spring 2015 To Spring 2016



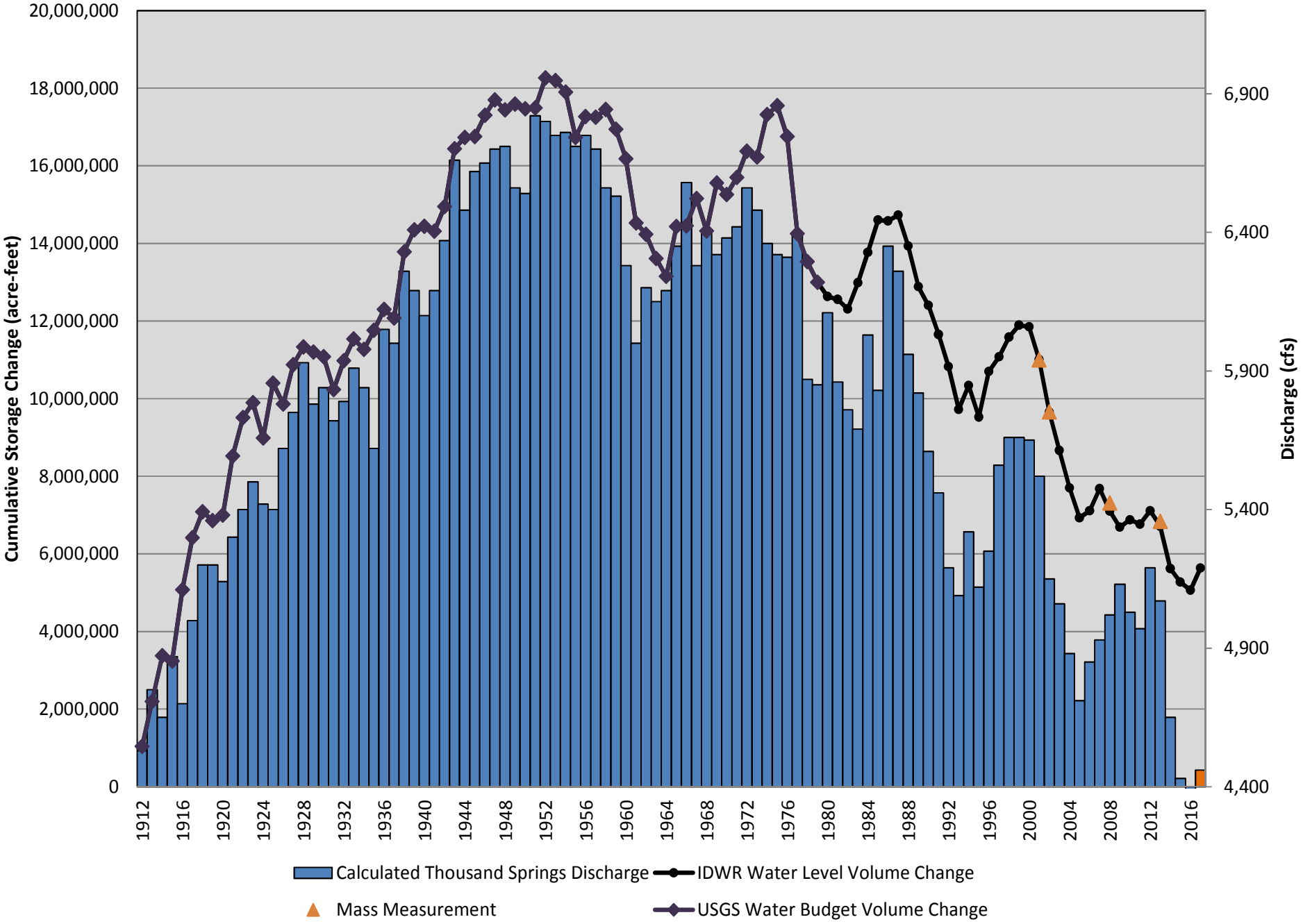
Aquifer Storage Change: 2016-2017

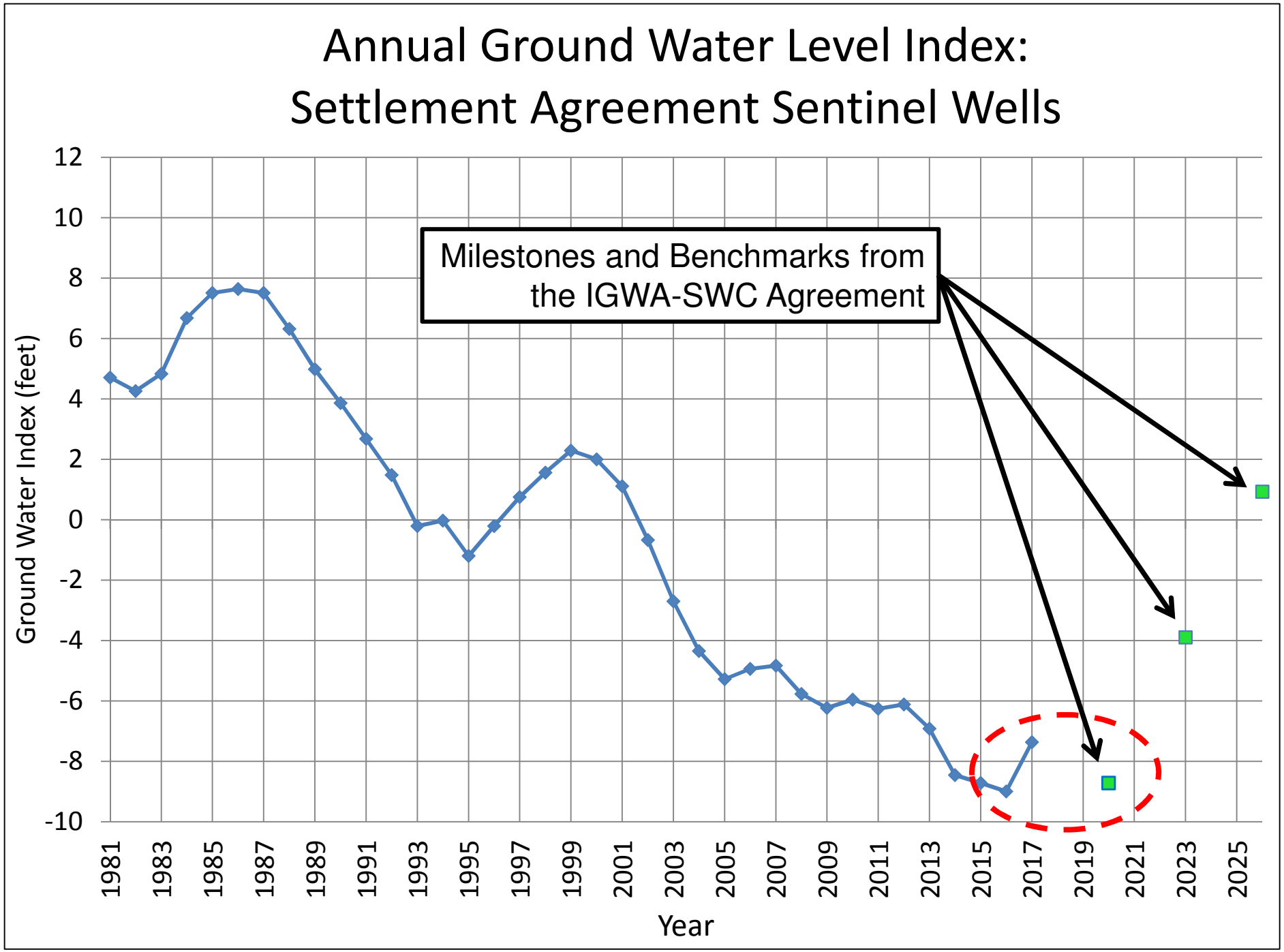
- Groundwater diversion reductions and managed recharge associated with the Settlement Agreement began in 2016, and the State-sponsored Managed Recharge program increased substantially.
- Exceptional water supply year.
- Large volume of runoff occurred at unusual times.
- Managed recharge was conducted shortly before and during the spring 2017 synoptic measurements.
- Managed recharge presents new complexities that we are working through.
- The storage-change calculations are still useful, but not nearly as straightforward.

Water Level Change - Spring 2016 To Spring 2017
Sentinel Wells



ESPA Volume of Water and Thousand Springs Discharge



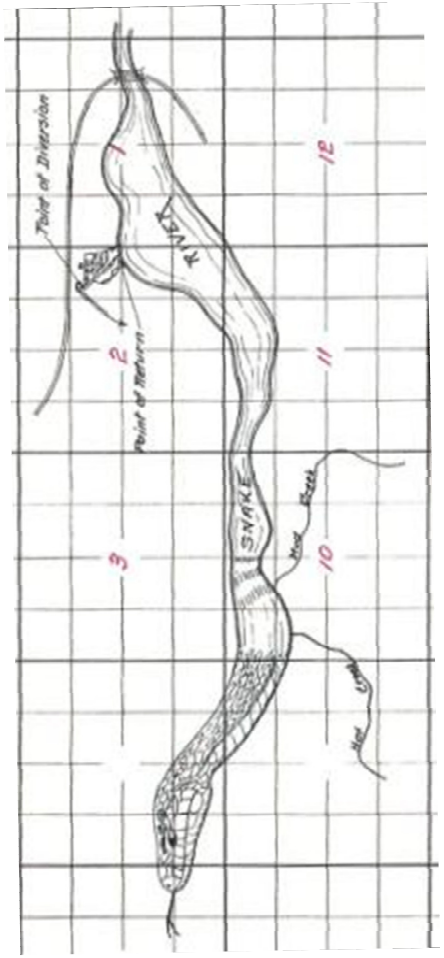

Annual Ground Water Level Index:
Settlement Agreement Sentinel Wells
Milestones and Benchmarks from the IGWA-SWC Agreement
Ground Water Index (feet)
12
10
8
6
4
2
0
-2
-4
-6
-8
-10
1981
1983
1985
1987
1989
1991
1993
1995
1997
1999
2001
2003
2005
2007
2009
2011
2013
2015
2017
2019
2021
2023
2025
Year

Questions and/or Discussion?

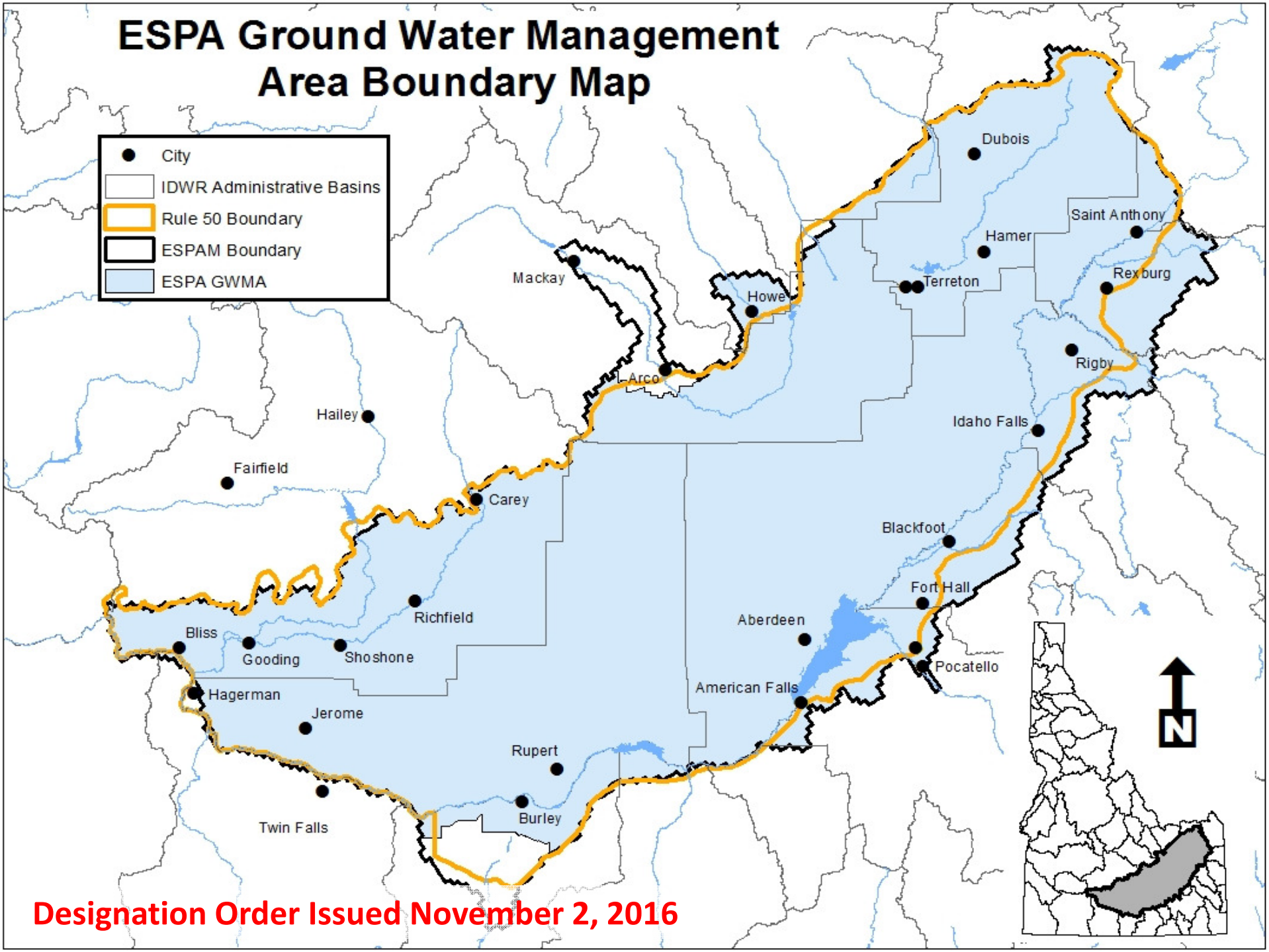
Shoshone Fall, March 2017.

Comprehensive ESPA Measurement Order

1. Order mailed to ~3,000 water users (~5,000 WRs) on July 22, 2016
2. WD 31, 34, 100, 110, 120, 130, & 140 overlying ESPA Rule 50
3. Excluded WRs:
   - Dom/stock (I.C. 42-111)
   - Irrigation <5 acres
   - Non-irrigation <0.24 CFS
4. Deadline: Irrigation April 1, 2018; non-irrigation January 1, 2018
5. PCC usage: *"…consist of one (1) well and one irrigation discharge point or one distinct flow and demand condition…"*



IDWR Beneficial Field Report, 1940


ESPA Ground Water Management Area Boundary Map
City
IDWR Administrative Basins
Rule 50 Boundary
ESPAM Boundary
ESPA GWMA
Dubois
Saint Anthony
Hamer
Rexburg
Terreton
Mackay
Howe
Rigby
Arco
Hailey
Idaho Falls
Fairfield
Carey
Blackfoot
Fort Hall
Richfield
Aberdeen
Bliss
Gooding
Shoshone
Pocatello
American Falls
Hagerman
Jerome
Rupert
Twin Falls
Burley
N
Designation Order Issued November 2, 2016