
# Maximizing Water Supply and Storage Capacity in Idaho

AWSE Spring Workshop

June 27, 2018

# Presentation Overview

- **Water Sustainability and Aquifer Stabilization – Priorities and Directives**
- **ESPA Managed Aquifer Recharge**
- **Surface Water Storage Investigations**
- **Cooperative Cloud Seeding Program**

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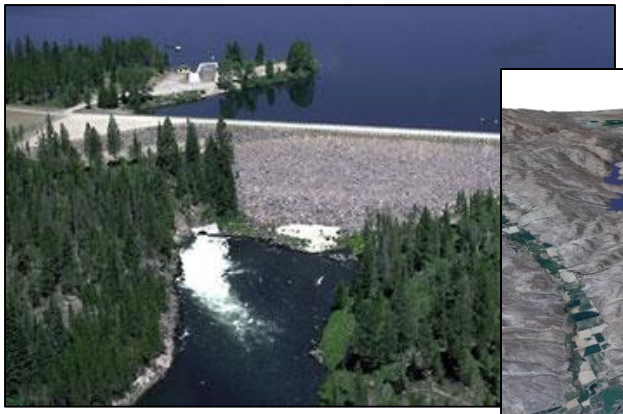
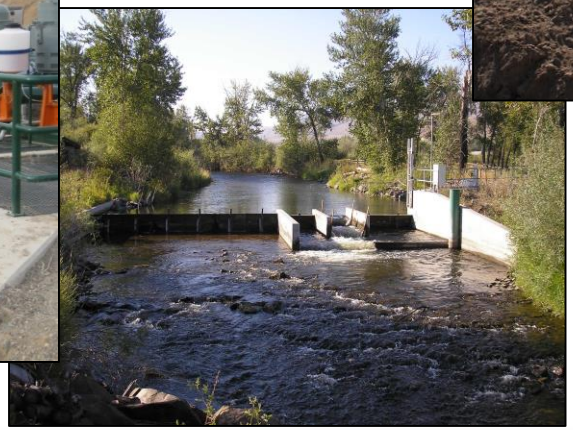
# Water Sustainability & Aquifer Stabilization






## Idaho Department of Water Resources (IDWR)

Director appointed by Governor

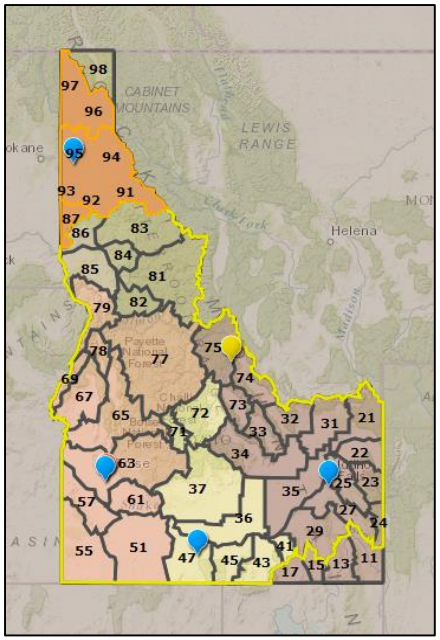
- Water rights administration and compliance
- Delivery of water per water rights
- Resource Protection Programs
- Other regulatory functions

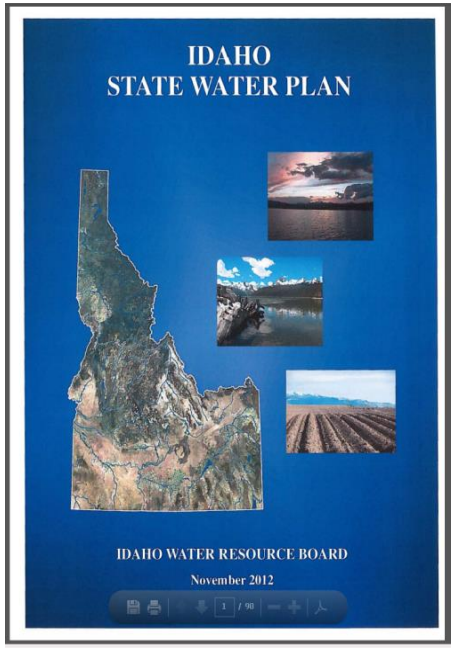
## Idaho Water Resource Board (IWRB)

Members appointed by Governor & confirmed by Senate

- State Water Plan; Water planning
- Water projects development and project financing
- Water Supply Bank
- Minimum stream flow water rights
- Problem solving

## Shared Staff



# Idaho Water Resource Board

Idaho Constitution Article XV, Section 7 grants Board the authority:

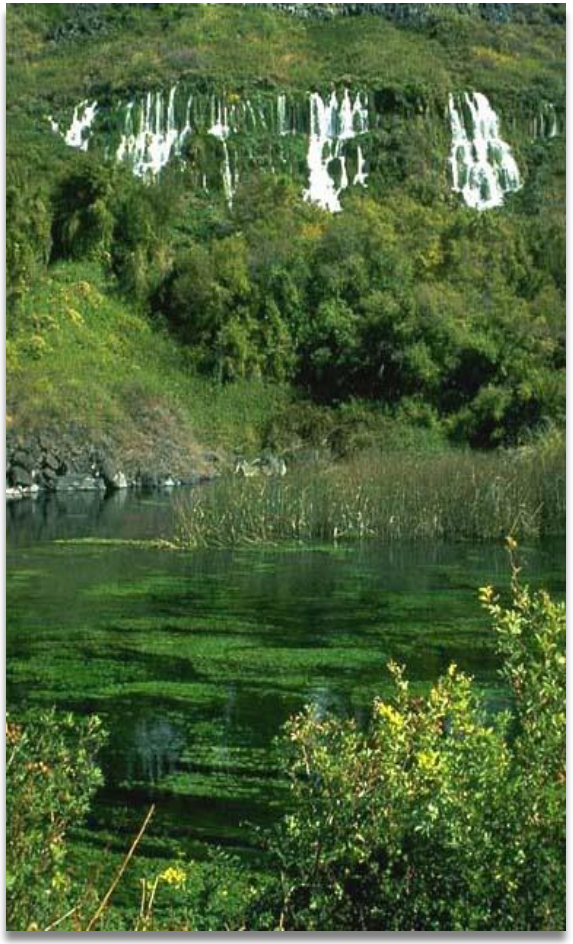
- to construct and operate water projects
- to issue bonds, without state obligation, to be repaid from revenues of projects
- to generate and wholesale hydroelectric power at the site of production
- to appropriate public waters as trustee for Agency projects
- to acquire, transfer and encumber title to real property for water projects and to have control and administrative authority over state lands required for water projects

Idaho Code 42-1734 to 42-1780 grants additional authority:

- eminent domain
- to enter into partnerships with federal, state, local governments and private enterprises
- finance projects with such funds as available

# Statewide Water Management Drivers

- Aquifer declines statewide: ESPA, Mountain Home, Big & Little Wood, Treasure Valley, Palouse, Lewiston, Big Lost, Raft River, Malad Valley, etc.
- Water Right Administration: Conjunctive Administration, Delivery calls, Minimum Streamflows, etc.
- Flow Augmentation on Snake & Clearwater Rivers for ESA Listed anadromous fisheries downriver
- Balancing population growth and economic development
- Climate change: projections indicate more winter rain & less winter snow; results in less snow water



# Legislative Direction/Actions

**2014:**

- $15M one-time funds – Aquifer recharge, surface water storage development, Water Supply Bank improvements, Northern Idaho projects, water right acquisition to supply Mountain Home AFB
- $5M ongoing cigarette tax (sunset 2019) - Statewide aquifer stabilization; ESPA first priority, other aquifers identified (HB 547)

**2015:**

- $500,000 one-time appropriation for ESPA managed recharge

**2016:**

- $5M ongoing allocation from the General Fund for aquifer recharge and aquifer stabilization projects
- Senate Concurrent Resolutions 136 and 138 supporting Surface Water Coalition Delivery Call Settlement, the IWRB's ESPA recharge, and state-wide aquifer stabilization and sustainability efforts.

# Legislative Direction/Actions

**Joint Resolution No. 137 (2016)**

WHEREAS, ground water levels and aquifer storage in some aquifers are inadequate to sustain a supply of water for surface and ground water irrigation, hydropower, municipal, industrial uses, and other uses, the curtailment of which would cause severe economic harm to the State of Idaho; and

WHEREAS, stabilizing and enhancing aquifer water levels is in the pubic interest and will sustain the water supply for consumptive and non-consumptive uses and minimize harm to Idaho's economy arising from water supply shortages.

NOW, THEREFORE, BE IT RESOLVED by the members of the Second Regular Session of the Sixty-third Idaho Legislature, the Senate and the House of Representatives concurring therein, that the Legislature requests that the Idaho Water Resource Board address statewide aquifer stabilization and sustainability projects including managed recharge.

# Comprehensive State Water Plan

**State Water Plan (latest version adopted November 2012)**

*The board shall, subject to legislative approval, progressively formulate, adopt and implement a comprehensive state water plan for conservation, development, management and optimum use of all unappropriated water resources and waterways of this state in the public interest…*

*(Policy 1 addresses Optimum Use including: Aquifer Recharge, Surface Water Enhancement and Weather Modification)*

**Sustainability Section requested by Governor & Legislature (Adopted November 2016)**

*Policy 8A - Sustainability is the active stewardship of Idaho's water resources to satisfy current uses and assume future uses of this renewable resource in accordance with state law and policy.*

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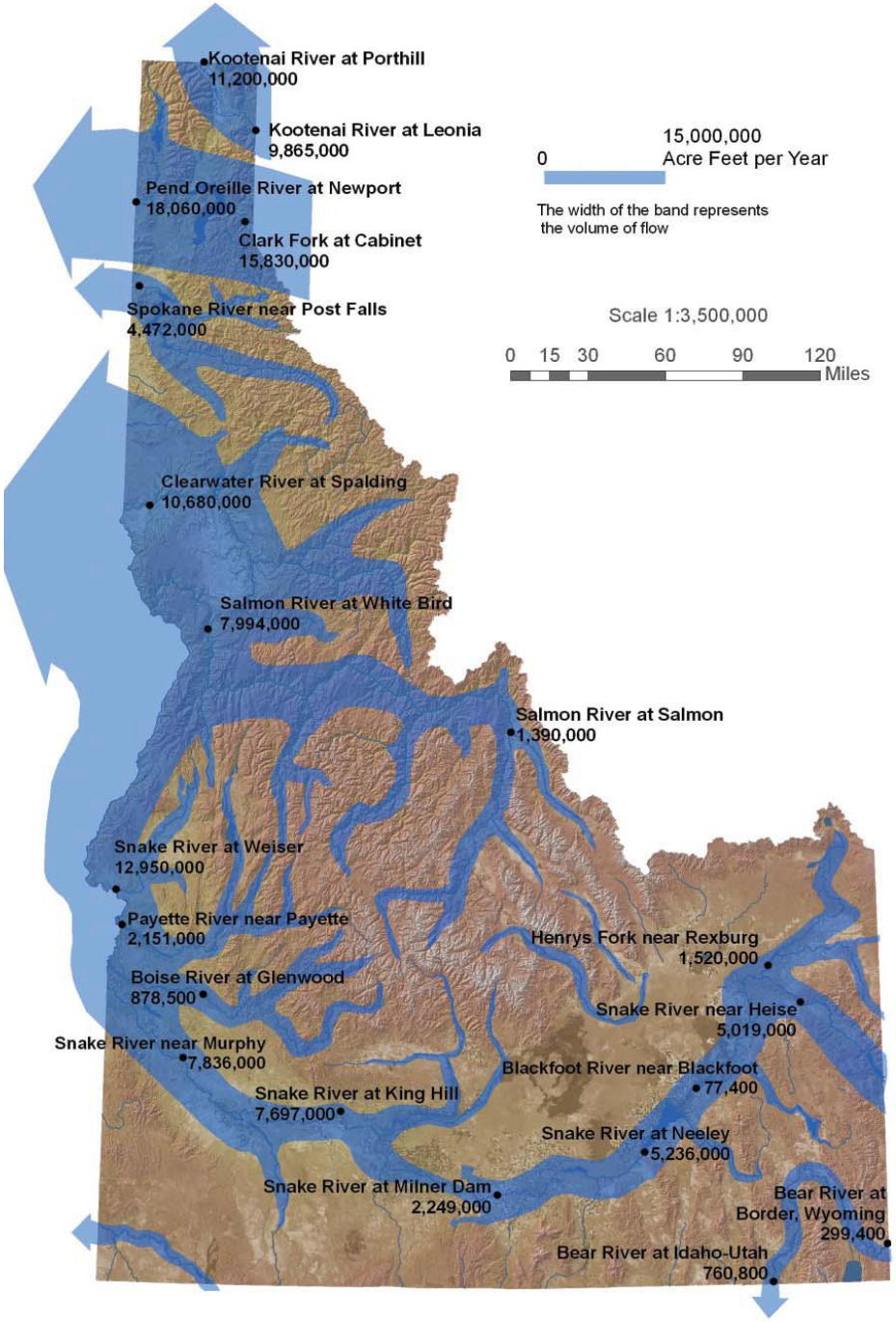
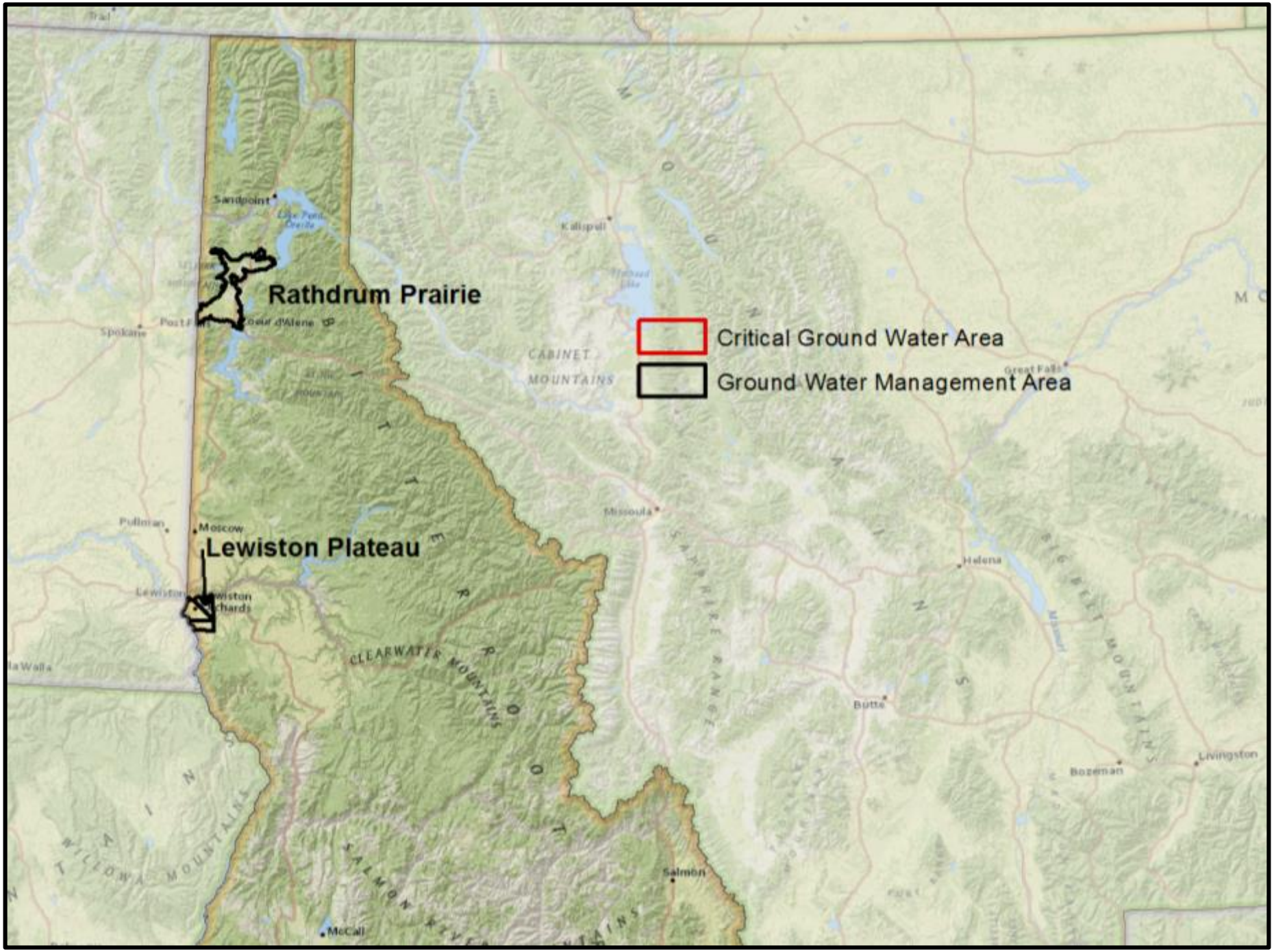
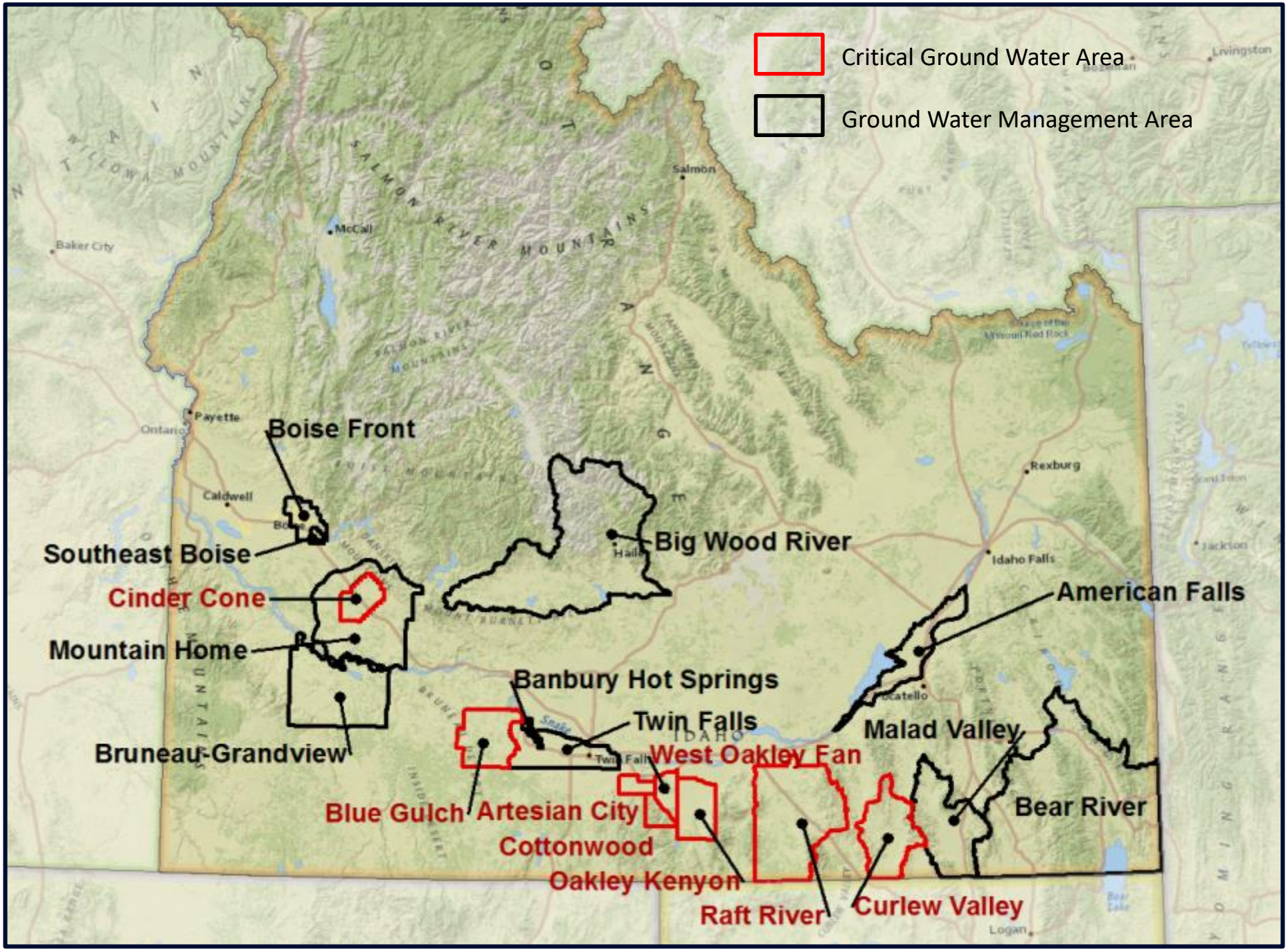
# Idaho Surface Water

- 95,000 miles of rivers & streams
- 100 lakes and reservoirs




Rathdrum Prairie
Lewiston Plateau
Critical Ground Water Area
Ground Water Management Area
Sandpoint
Kalispell
Spokane
Coeur d'Alene
CABINET MOUNTAINS
Pullman
Moscow
Lewiston
Missoula
Helena
Great Falls
Butte
Bozeman
Livingston
Salmon
McCall
CLEARWATER MOUNTAINS
SAWTOOTH RANGE
BITTERROOT
BIG BELT MOUNTAINS


Critical Ground Water Area
Ground Water Management Area
Boise Front
Southeast Boise
Cinder Cone
Mountain Home
Bruneau-Grandview
Big Wood River
Banbury Hot Springs
Twin Falls
Blue Gulch
Artesian City
West Oakley Fan
Cottonwood
Oakley Kenyon
Raft River
American Falls
Malad Valley
Bear River
Curlew Valley
Salmon
McCall
Baker City
Payette
Ontario
Caldwell
Rexburg
Idaho Falls
Jackson
Logan
Livingston
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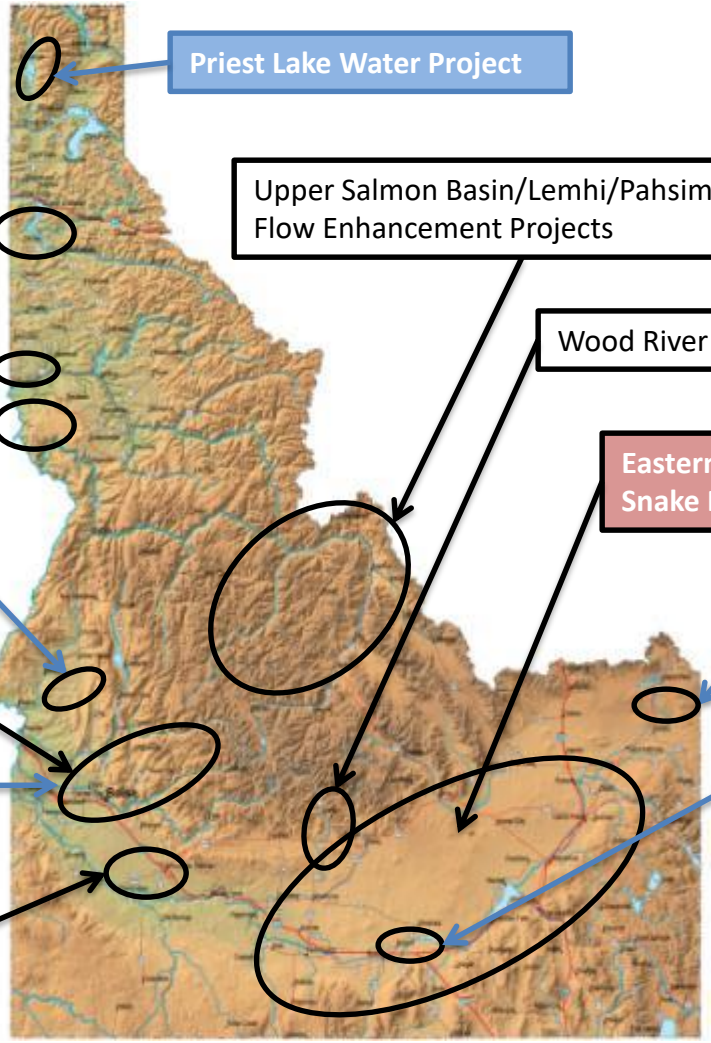
# Statewide Water Sustainability Projects



Priest Lake Water Project

Rathdrum Prairie Aquifer CAMP

Palouse Basin Aquifer Future Water Supply Study

Lewiston-Area Deep Regional Aquifer Investigation

Upper Salmon Basin/Lemhi/Pahsimeroi Flow Enhancement Projects

Wood River Aquifer Ground Water Model

Potential Galloway Dam & Reservoir, and Lost Valley Dam Raise

Eastern Snake Plain Aquifer & Snake River Efforts

Treasure Valley CAMP, Recharge Study, and Ground Water Model

Island Park Reservoir Potential Enlargement (IWRB & USBOR)

New Storage Feasibility Studies on Boise River (IWRB, USBOR, USACE)

Minidoka Dam Raise (IWRB & USBOR)

MHAFB Water Supply Project, Elmore County Water Supply Study & Recharge Project

Cooperative Cloud Seeding Program – Payette, Boise, Wood River, & Upper Snake River Basins

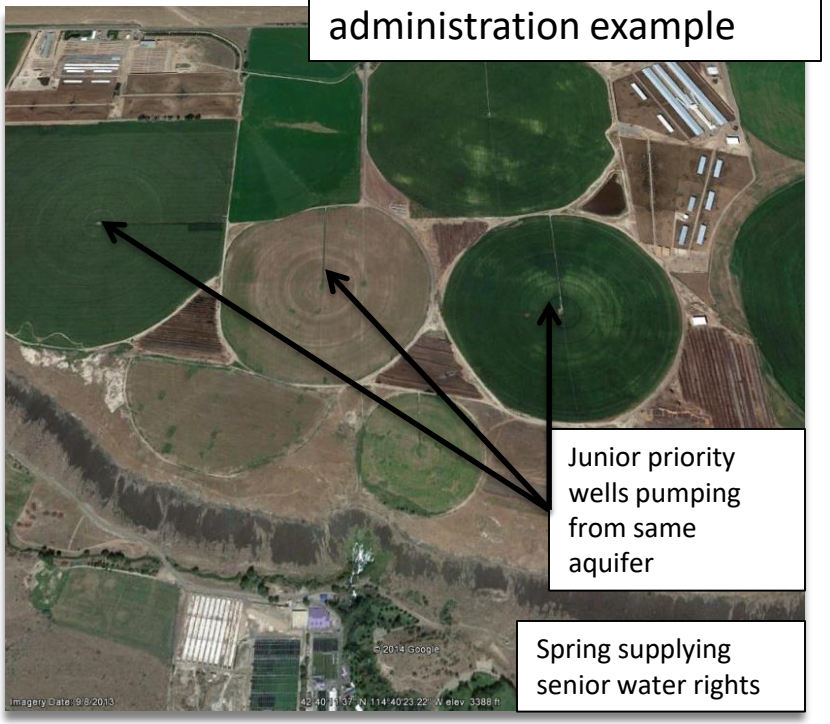

Arrow Lakes
Duncan
Keenleyside
Kootenay Lake
Canada
U.S.
Grand Coulee
Chief Joseph
Wells
Albeni Falls
Libby
Hungry Horse
Noxon
Rocky Reach
Columbia R.
Pend Oreille Lake
Flathead Lake
Rock Island
Kerr
Seattle
Wanapum
Lower Monumental
Little Goose
Lower Granite
MT
N
WA
Priest Rapids
Dworshak
The Dalles
Ice Harbor
Portland
Bonneville
McNary
John Day
Hells Canyon
Oxbow
Brownlee
ID
Willamette R.
OR
Cascade
Deadwood
Jackson Lake
Lucky Peak
Arrowrock
Palisades
Anderson Ranch
Swan Falls
American Falls
C.J. Strike
Snake R.
Minidoka
Upper Salmon Falls
Milner
Corps of Engineers Dams
Dams owned by Others
Bureau of Reclamation Dams
CA
NV

# ESPA Managed Recharge

- **ESPA Background**
- **ESPA Managed Recharge**
- **Aquifer Response**

# Water Rights in Idaho

- Water is the property of the state
- Water user (individual or organization) holds right to use water from defined source for defined purpose
- Prior appropriate state: first in time, first in right
- IDAPA 37.03.11, Rules for Conjunctive Management of Surface and Ground Water Resources (1994)
  - Rule 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.



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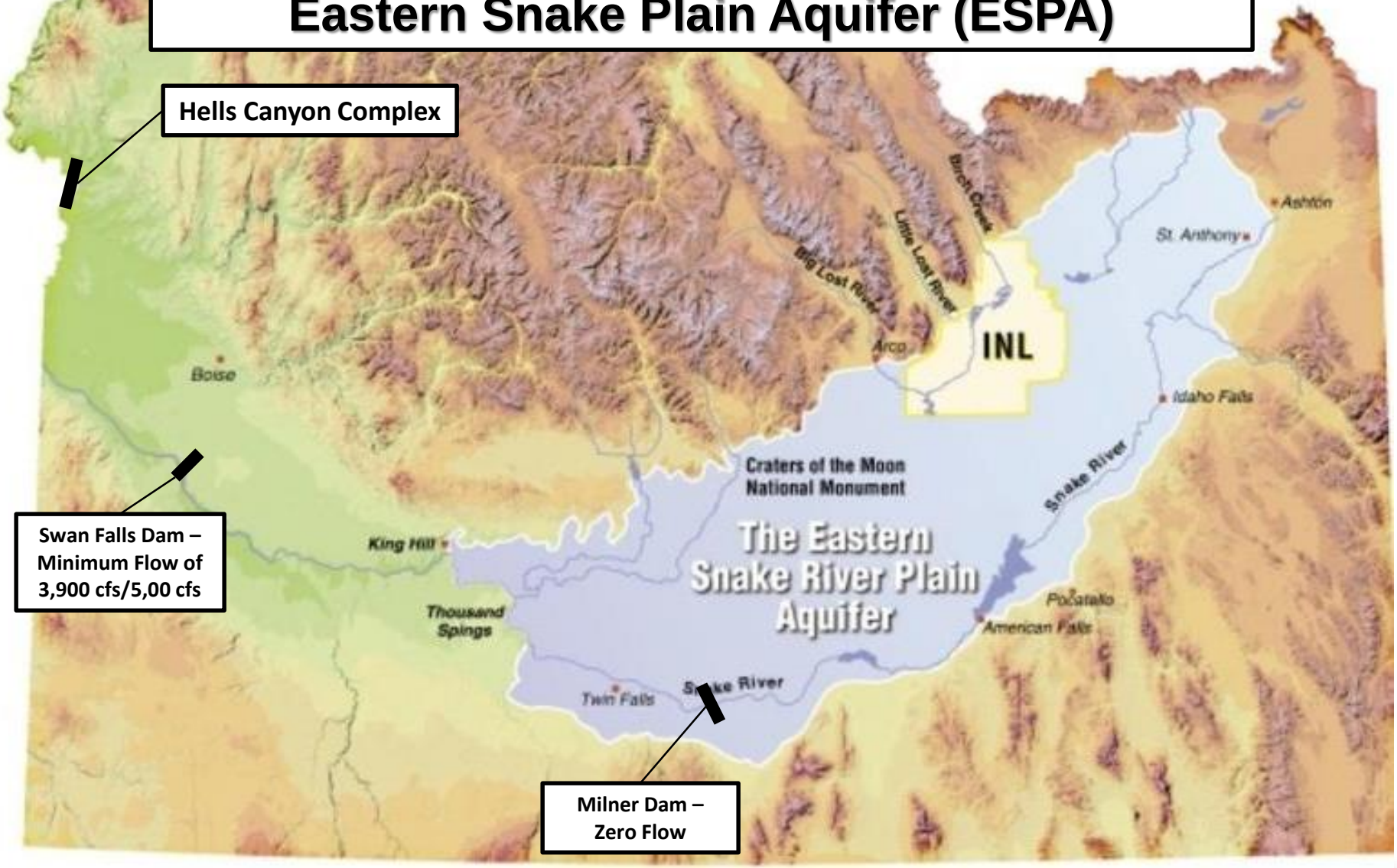
# Eastern Snake Plain Aquifer (ESPA)



# Eastern Snake Plain Aquifer (ESPA) Facts

- 2.1 million irrigated acres on the ESPA (60% of Idaho's total): 871K acres surface water; 889K acres ground water; and 348K acres mixed sources. (2009, *ESPA CAMP)*
- *~50% of Idaho's power needs are met by hydropower supplied from the ESPA-Snake River system* (2009, *ESPA CAMP)*
- *~33% of all goods and services ($14.9 billion annually) are produced on the ESPA (2012, Division of Financial Management – Derek Santos, State Economist)*.
- Idaho's six-county "Magic Valley region" is ranked as a top 12 U.S. manufacturing community *(2015, Industry Week Magazine)*.
- Idaho is the 3rd largest milk producing state in the country (dairy industry contributes $2.2 billion to GDP) *(2012, Dairyman's Association)*.
- *Idaho's Aquaculture Industry raises 75% of the nation's trout*
- ESPA is the sole source of drinking water for majority of cities and rural residents on the ESPA.
- Providing water for DCMI uses is vital to the future growth of the state and local economies.

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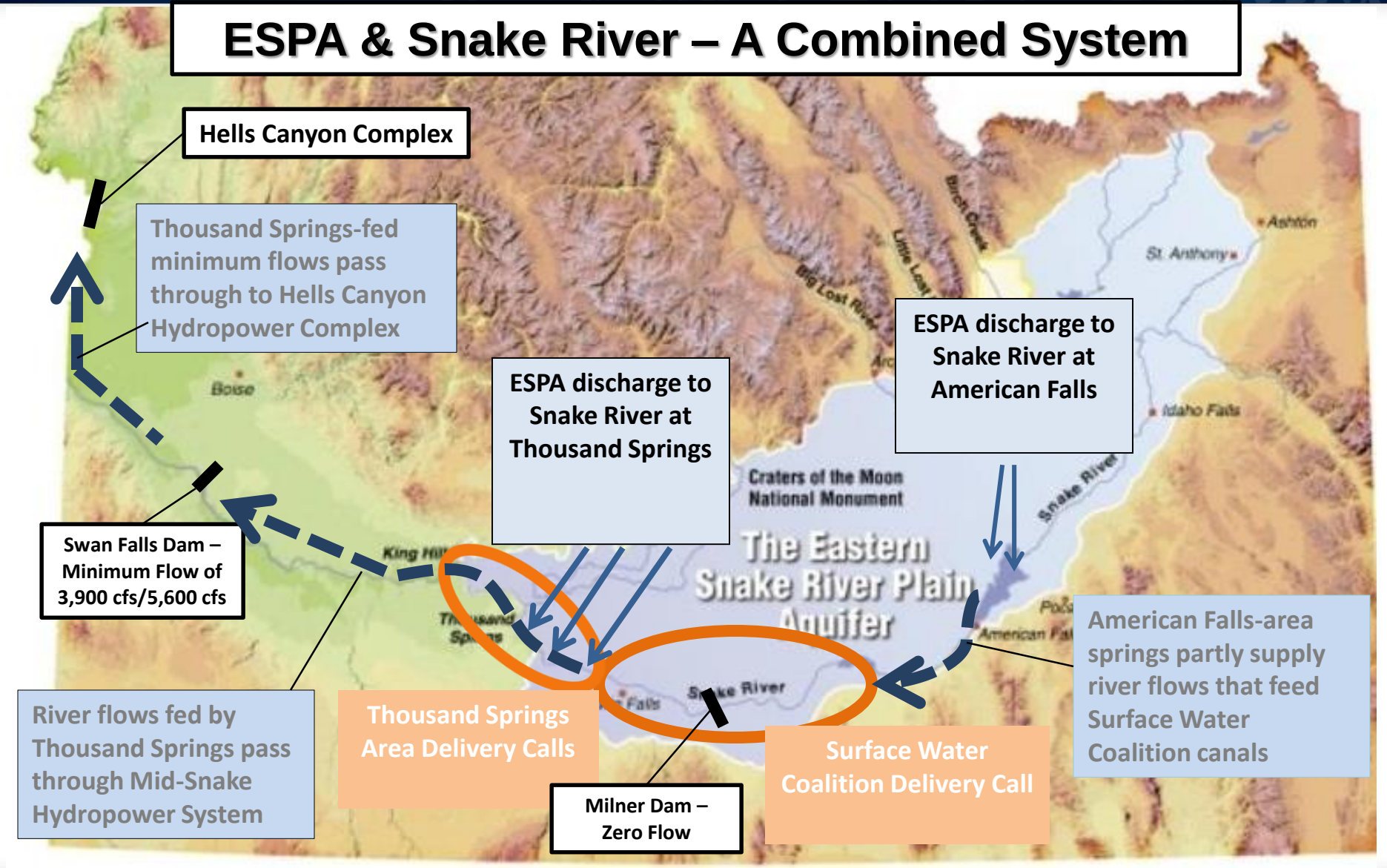
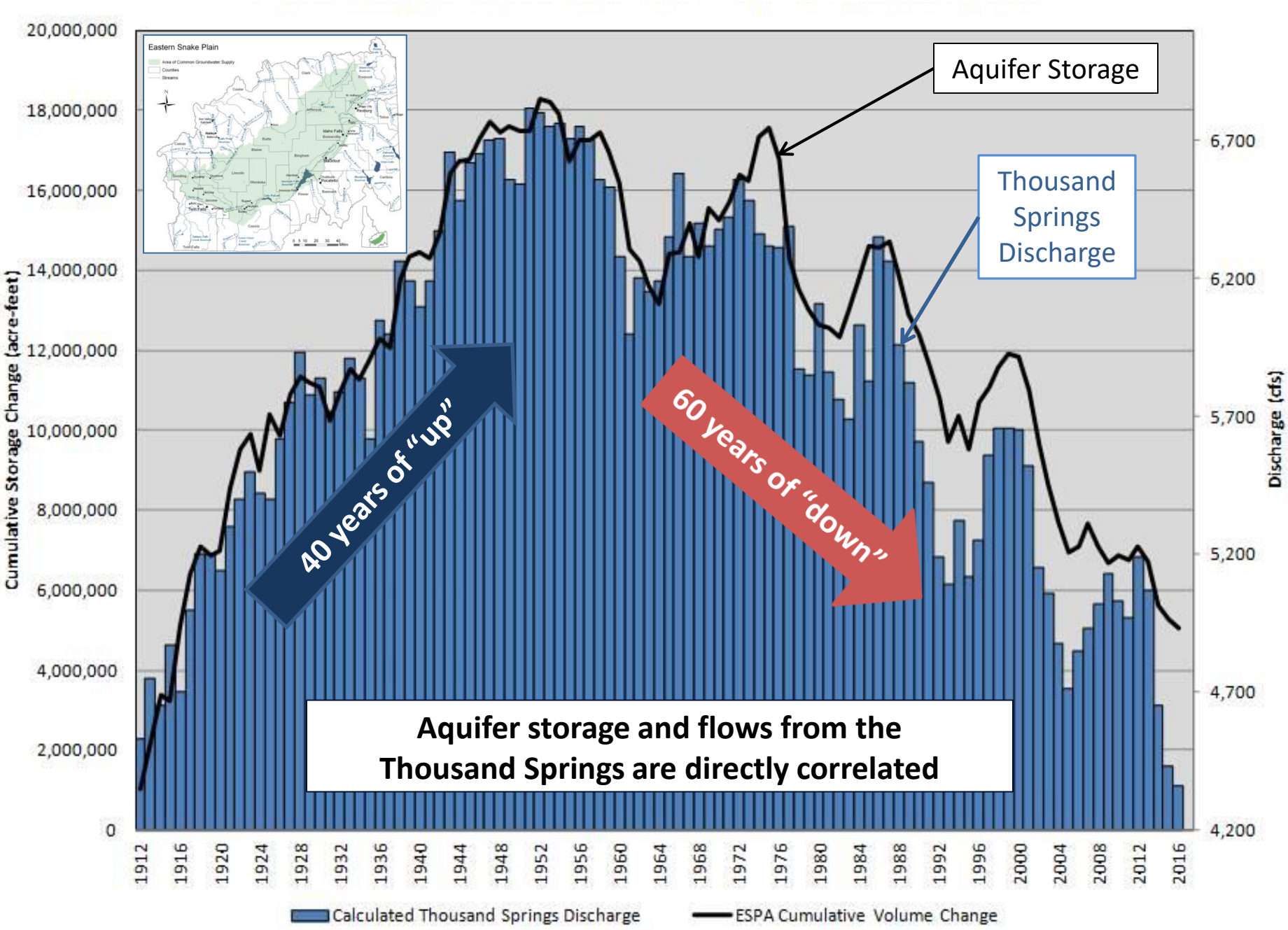
# ESPA & Snake River – A Combined System



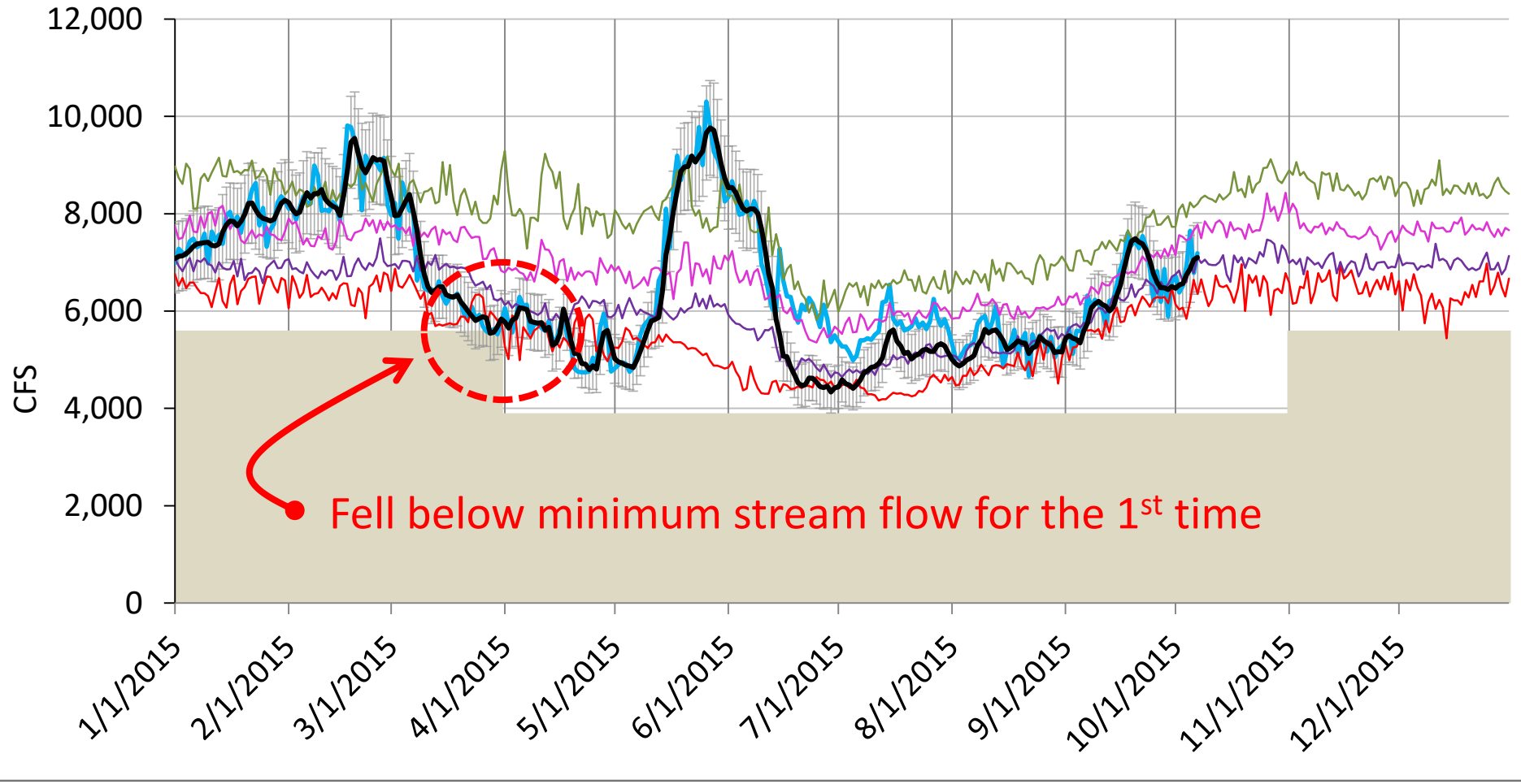
# Cumulative Change in Water Volume Stored in ESPA & Thousand Springs Discharge



# Factors Effecting Declines in the ESPA

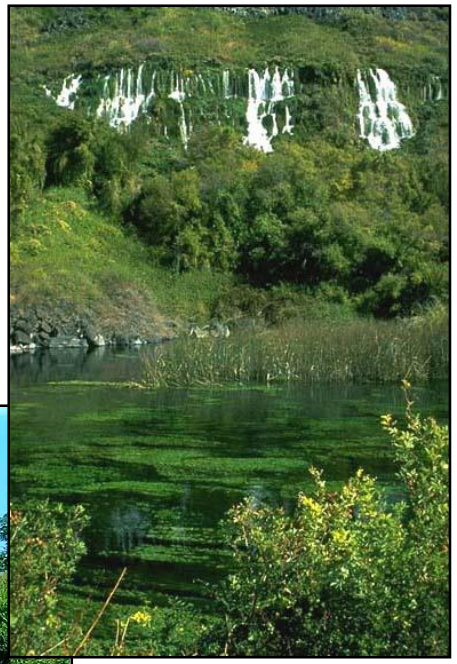
- Increase in GW Diversions
- Increase irrigation efficiencies (i.e. less incidental aquifer recharge)
- Changing Climate: (1) drought cycles; and (2) declining precipitation
- Winter Water Savings (i.e. Palisades Reservoir water supply, 1958)
- Flow Augmentation Releases (i.e. salmon recovery, 1992)

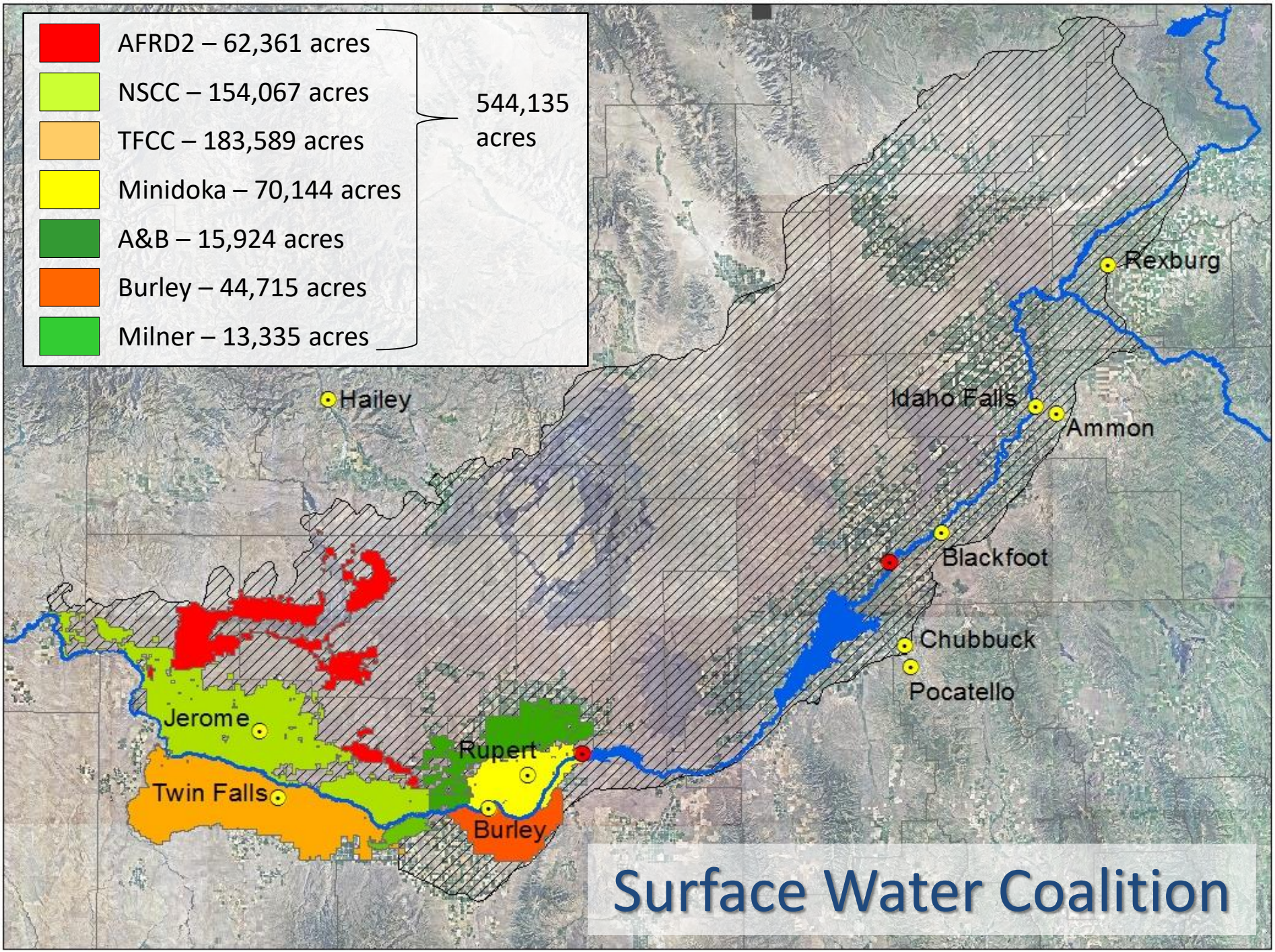
# Summary Hydrograph Snake River NR Murphy 1981-2015

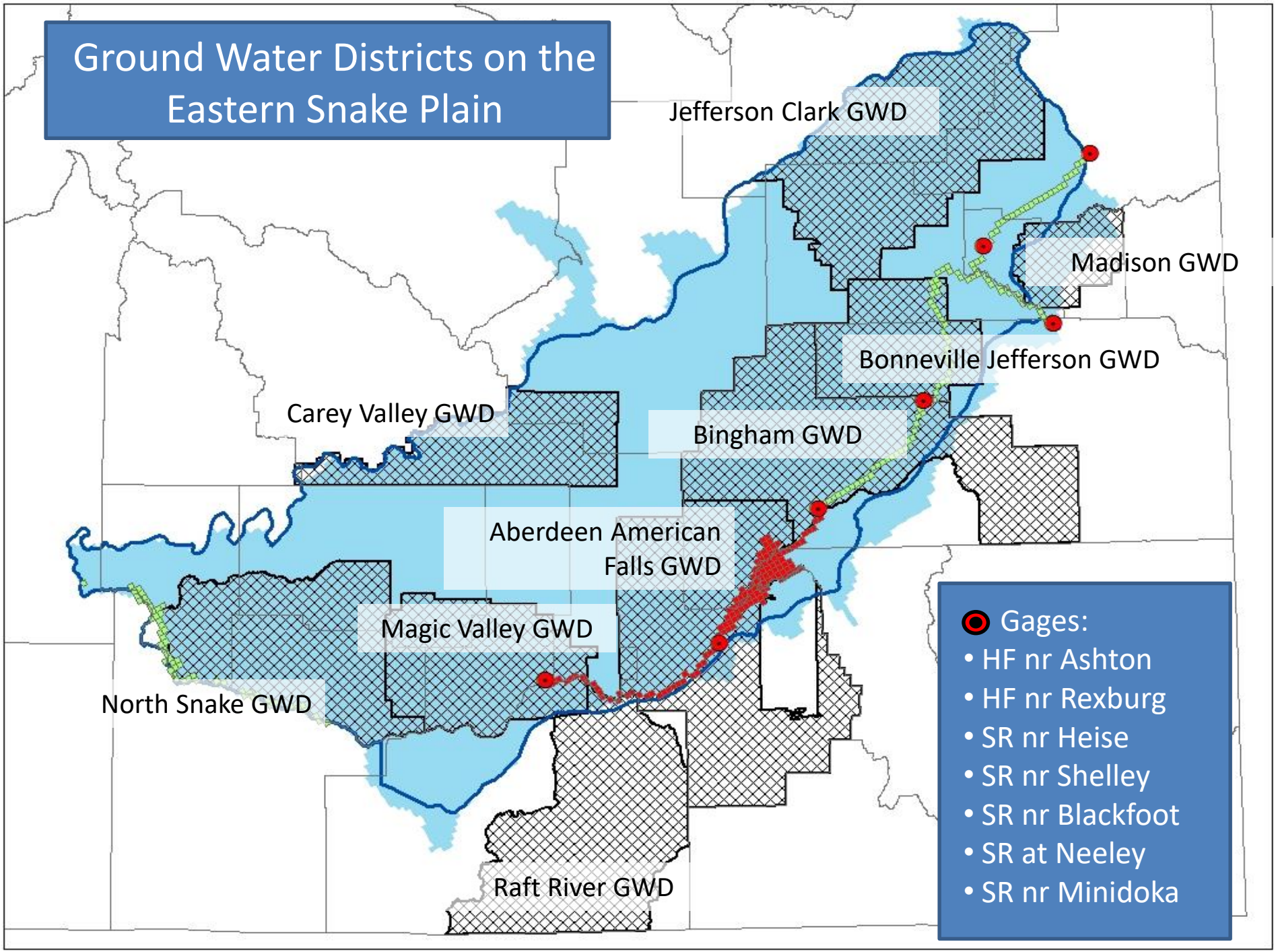


# Summary of Aquifer Situation

- ESPA must be managed to sustain spring flows sufficient to meet the Swan Falls minimum flows
- ESPA must be managed to sustain spring flows sufficient to reduce need for conjunctive water delivery calls
- Current situation is due to "deferred maintenance" of the ESPA
- Need to "re-build" the ESPA (stabilize and recover)




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
Rexburg
Hailey
Idaho Falls
Ammon
Blackfoot
Chubbuck
Pocatello
Jerome
Rupert
Twin Falls
Burley
Surface Water Coalition


Ground Water Districts on the Eastern Snake Plain
Jefferson Clark GWD
Madison GWD
Bonneville Jefferson GWD
Carey Valley GWD
Bingham GWD
Aberdeen American Falls GWD
Magic Valley GWD
North Snake GWD
Raft River GWD
Gages:
• HF nr Ashton
• HF nr Rexburg
• SR nr Heise
• SR nr Shelley
• SR nr Blackfoot
• SR at Neeley
• SR nr Minidoka

# Surface Water Coalition Settlement
# Long Term Practices - 2016 and Beyond

- Consumptive Use Reduction of groundwater by 240 KAF
  - Irrigation season reduction: April 1 – October 31
- Annual Storage Water Delivery of 50,000 AF
- Mandatory Measurement Devices by 2018
- Support state sponsored recharge program of 250 KAF avg/yr
- Additional support for:
  - NRCS conservation programs;
  - New conversion projects;
  - Management of Trust Water Rights;
  - Participation in review and possible recommendations of changes to IDWR administrative processes on the ESPA.

# ESPA Managed Recharge

- **ESPA Background**
- **ESPA Managed Recharge**
- **Aquifer Response**

# State 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
- ✓ **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

Recharge in the Egin Lakes area

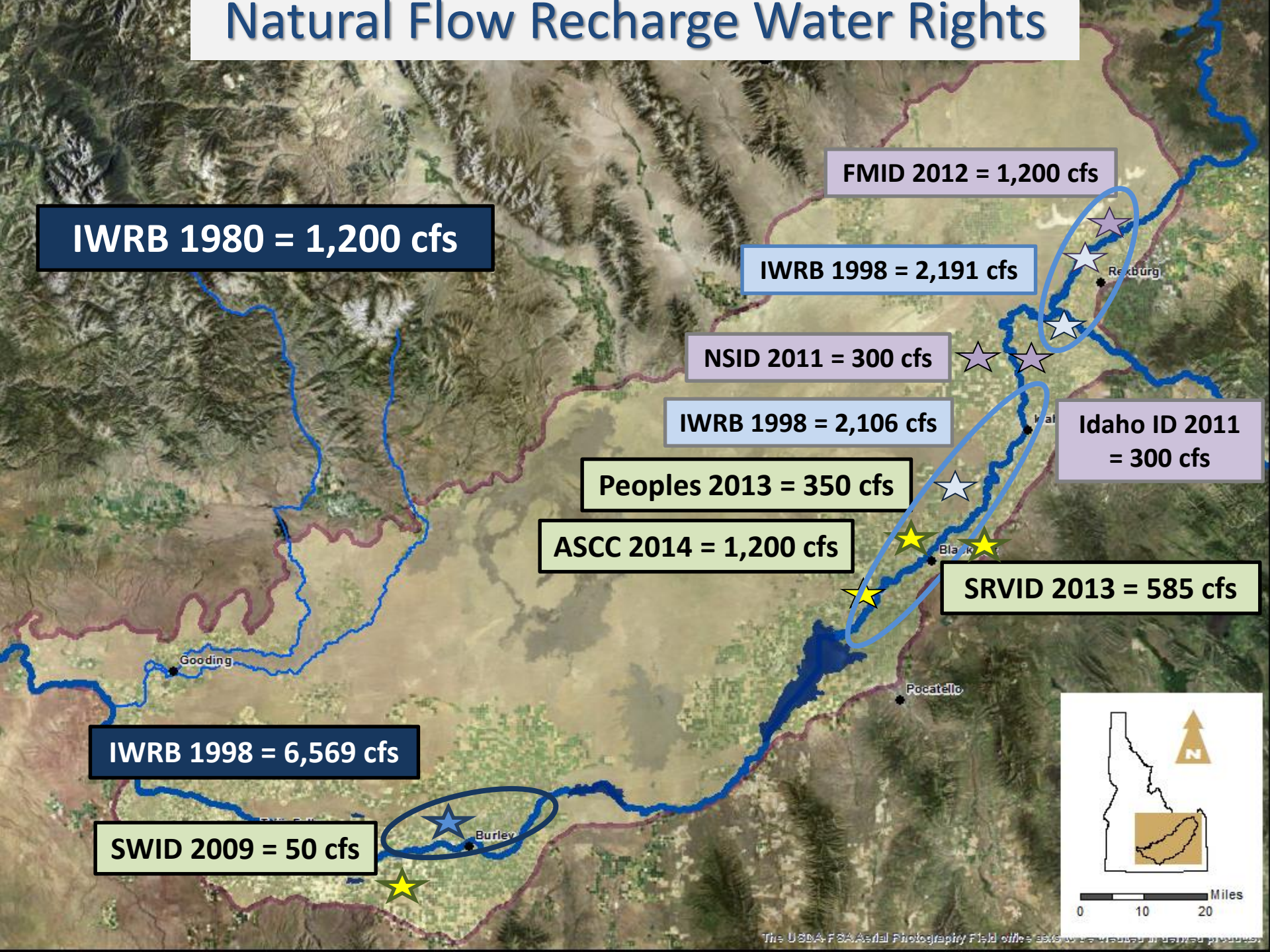
# State Managed Recharge Program

## HOW IT WORKS

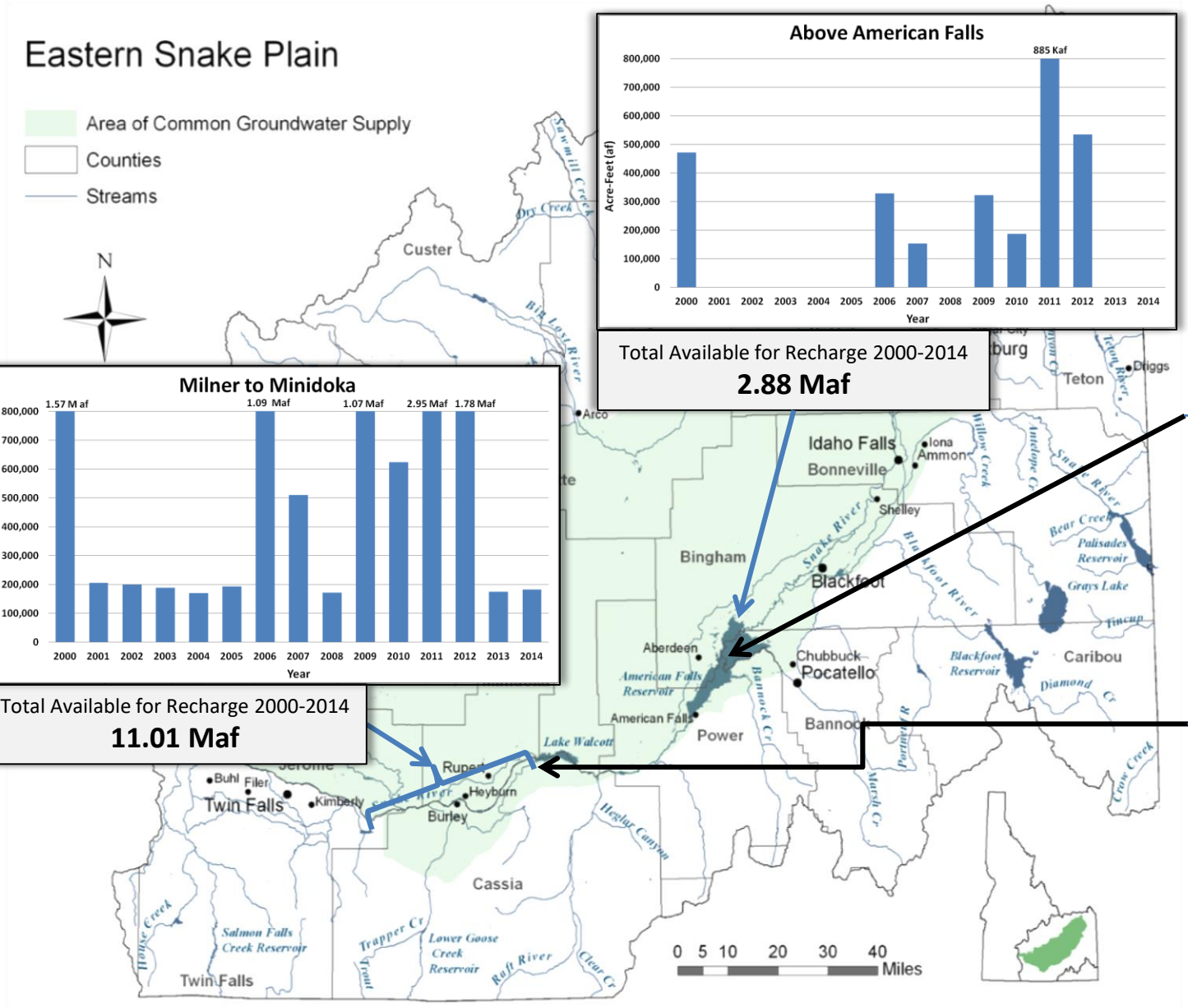
- Use existing irrigation delivery facilities to the extent possible to deliver recharge water. Recharge in canal and in off-canal spreading basins
- Target winter recharge to avoid interference with irrigation deliveries
- Idaho Water Resource Board has adopted incentivized payment schedule for canals and has committed to pay for infrastructure to "winterize" delivery systems
- Make state recharge a <u>partnership</u>
- Winter 2014-2015 recharge went from "pilot scale" to "full scale" operation; recharged 75,234 acre-feet (300 kaf past Milner, was available for recharge under the IWRB's water rights)

*Recharge at MP31 recharge basin/Milner-Gooding Canal – Jan 16, 2015*

# Natural Flow Recharge Water Rights



# Water Available for Recharge in the ESPA







Total Available for Recharge 2000-2014
**2.88 Maf**



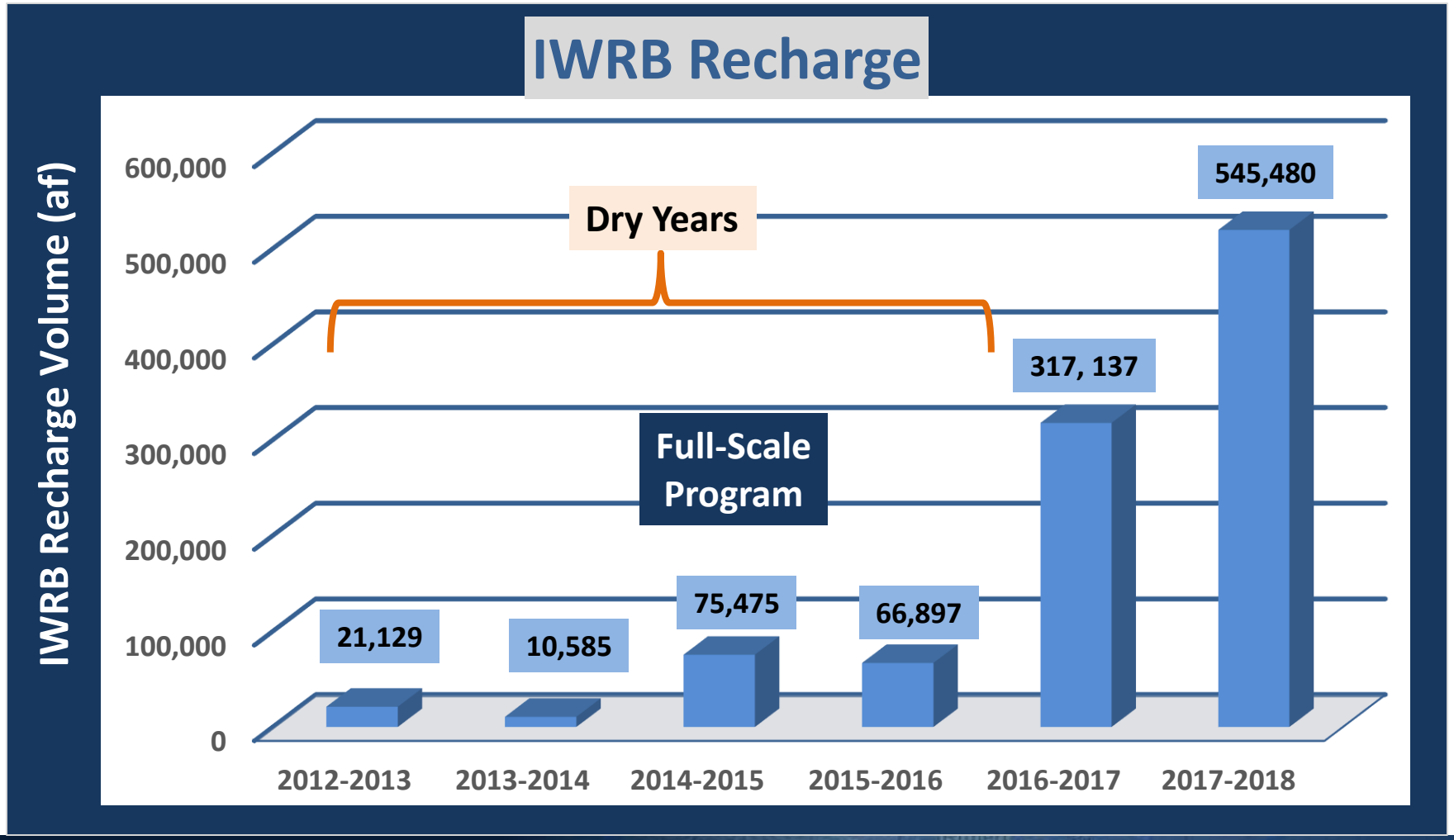

Total Available for Recharge 2000-2014
**11.01 Maf**

**IWRB Recharge Water Rights – 1980 & 1998 priority**

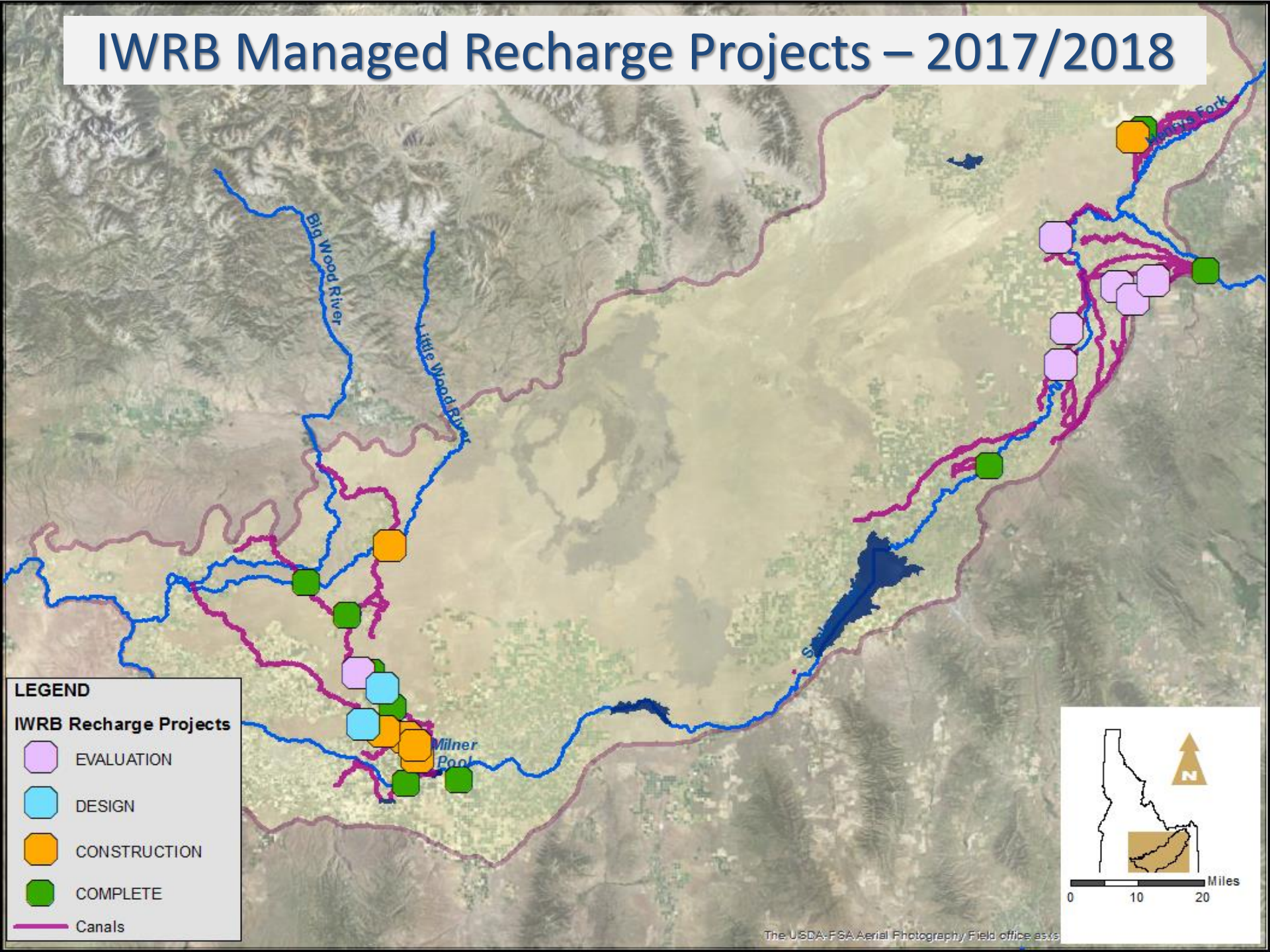
American Falls Reservoir:
1.6 million AF
<u>1921 priority</u>

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

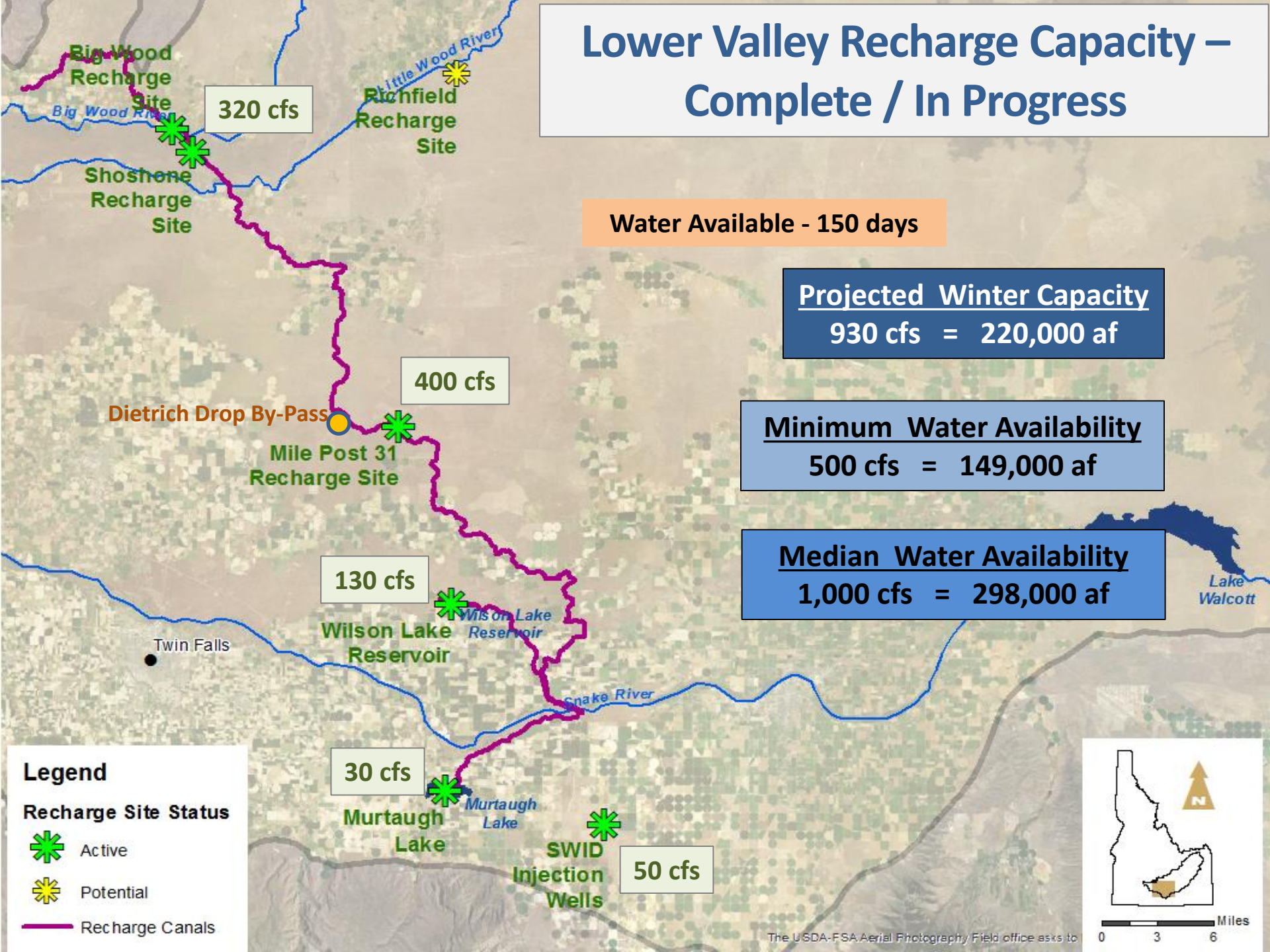
# IWRB Recharge – 2012 to 2018



# IWRB Managed Recharge Projects – 2017/2018



# Lower Valley Recharge Capacity – Complete / In Progress



# Milner-Gooding – Shoshone Canal Rehabilitation

Allow delivery of winter flows to Shoshone Recharge Site once Dietrich Drop Hydro Plant bypass is done.

Milner-Gooding Canal – rehabilitating concrete channel near Shoshone
November 11, 2015

Milner-Gooding Canal – Concrete flume rehabilitation complete
March 10, 2016

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# Milner-Gooding Canal - MP 28 Hydro Plant By-Pass

Allows cold-weather flow to safely by-pass the Mile 28 Hydro Plant on its way to the MP31

Milner-Gooding Canal – Mile 28 hydro plant bypass under construction
November 9, 2015 (above)

New Mile28 Hydro Plant bypass upstream side (above) and downstream side (below) (Nov. 30, 2015)

# Milner-Gooding Canal - MP 28 Hydro Plant Tailbay

**Milner-Gooding Canal**
**(2017/2018)**

- **Minor Infrastructure Improvements** — **Oct 2017**
- **Survey** — **Oct 2017**
- **Delivery Option/ Cost Estimates:** — **Spring 2018**

# Milner-Gooding Canal – Mile 31 Expansion

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



# Recharge during Construction

New Turn-out and Check Structure 500 cfs

Current Turnout 200 cfs

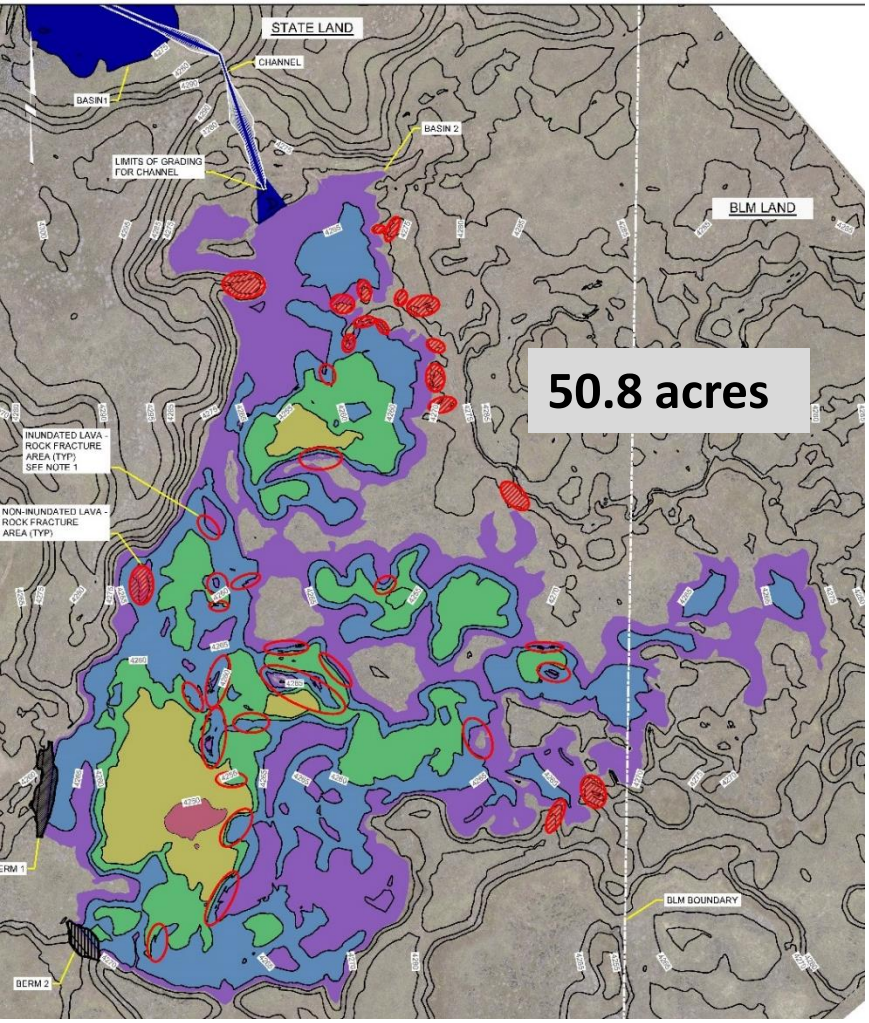
LEGEND

- Recharge Extent - 2014/2015
- MP31 BLM Lease Area
- Milner Gooding Canal

# MP 31 Recharge Site

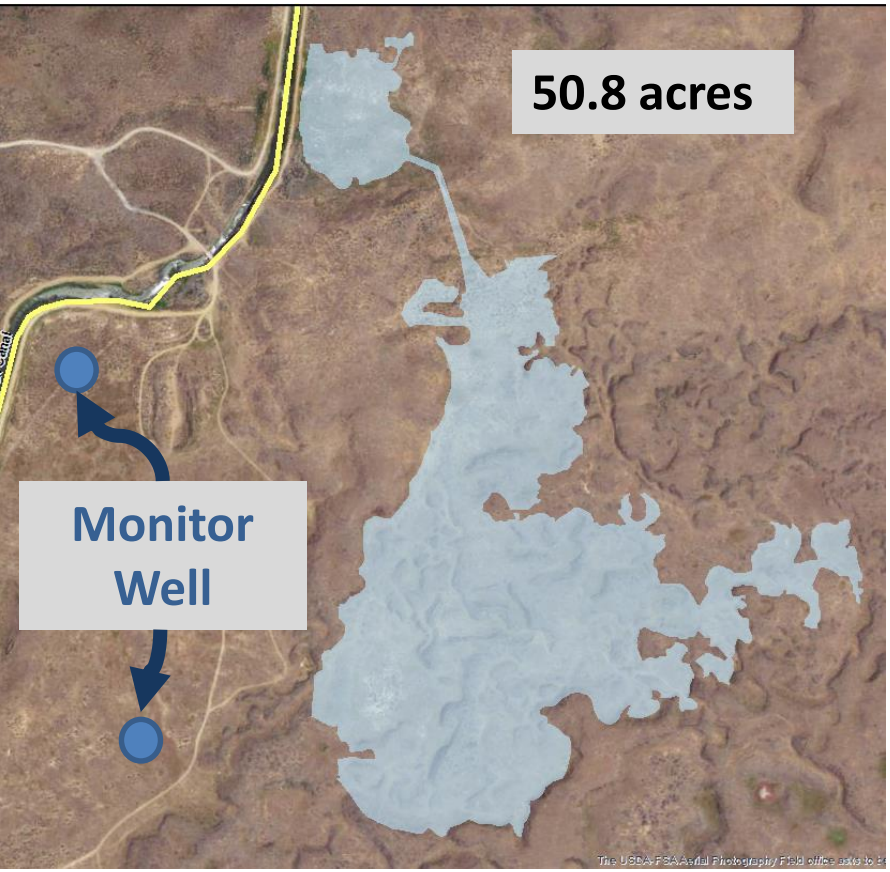
# Shoshone Recharge Site

# Richfield Site – Dietrich Canal




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

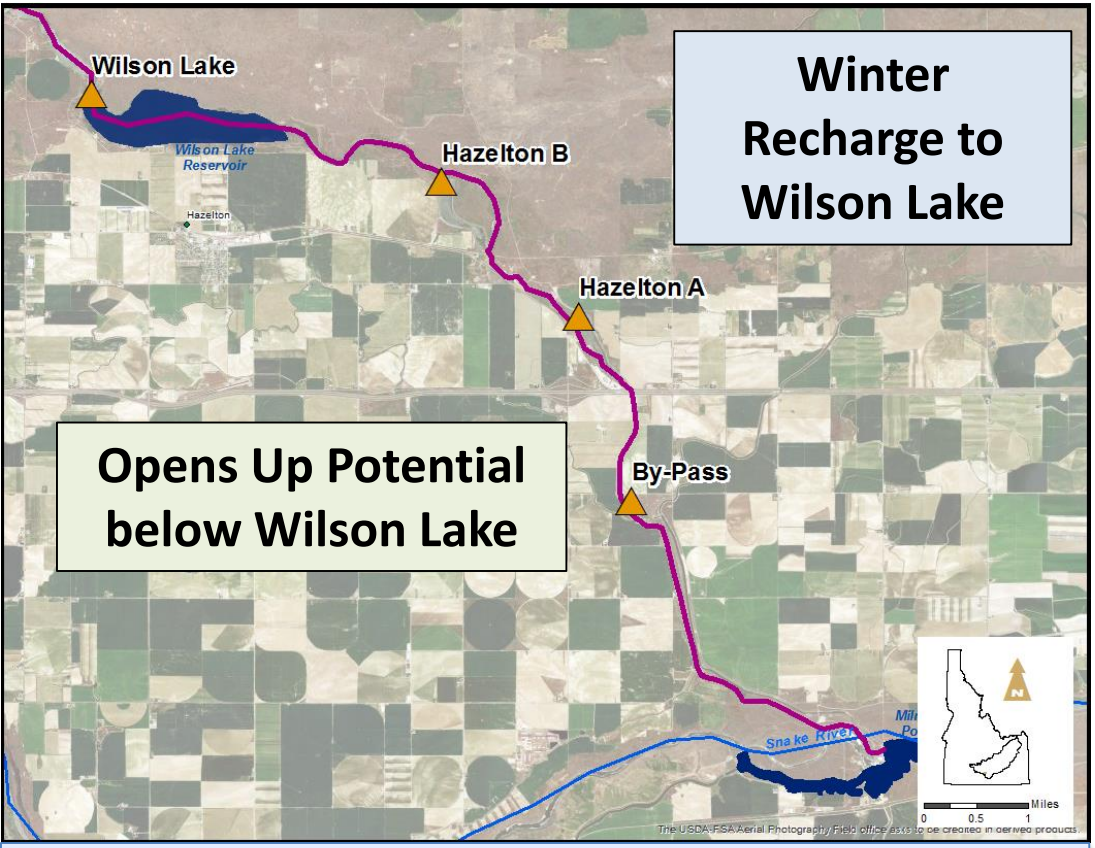
# Richfield Site – Dietrich Canal




**Potential Recharge Capacity**
**100 cfs - Big/Little Wood Rivers**
**(Spring 2017/2018)**

| | |
|---|---|
| • Design | Winter 2018 |
| • Construction | March 2018 |
| • Monitoring Plan | Dec 2017 |
| • Monitor Wells | May 2018 |
| • Cost | $150,000 |

# North Side Canal Hydro-Bypass Projects




**Winter Recharge to Wilson Lake**

**Opens Up Potential below Wilson Lake**

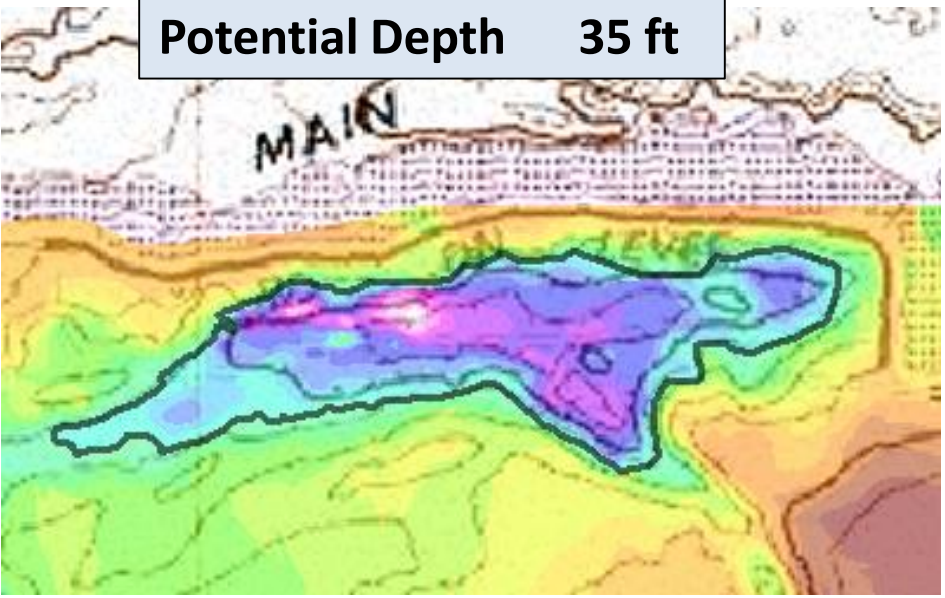
**Recharge Capacity**
**130 cfs (2017/2018)**

Wilson Lake Recharge, Mar 17, 2017

- **Design completed** **Jan 2018**
- **FERC Approval** **Apr 2018**
- **Work to be completed** **Feb 2018**
- **Construction Complete** **Dec 2018**
- **Cost** **$3,800,000**

# North Side Canal Wilson Canyon Site

| | |
|---|---|
| Size | 19 ac |
| Potential Depth | 35 ft |



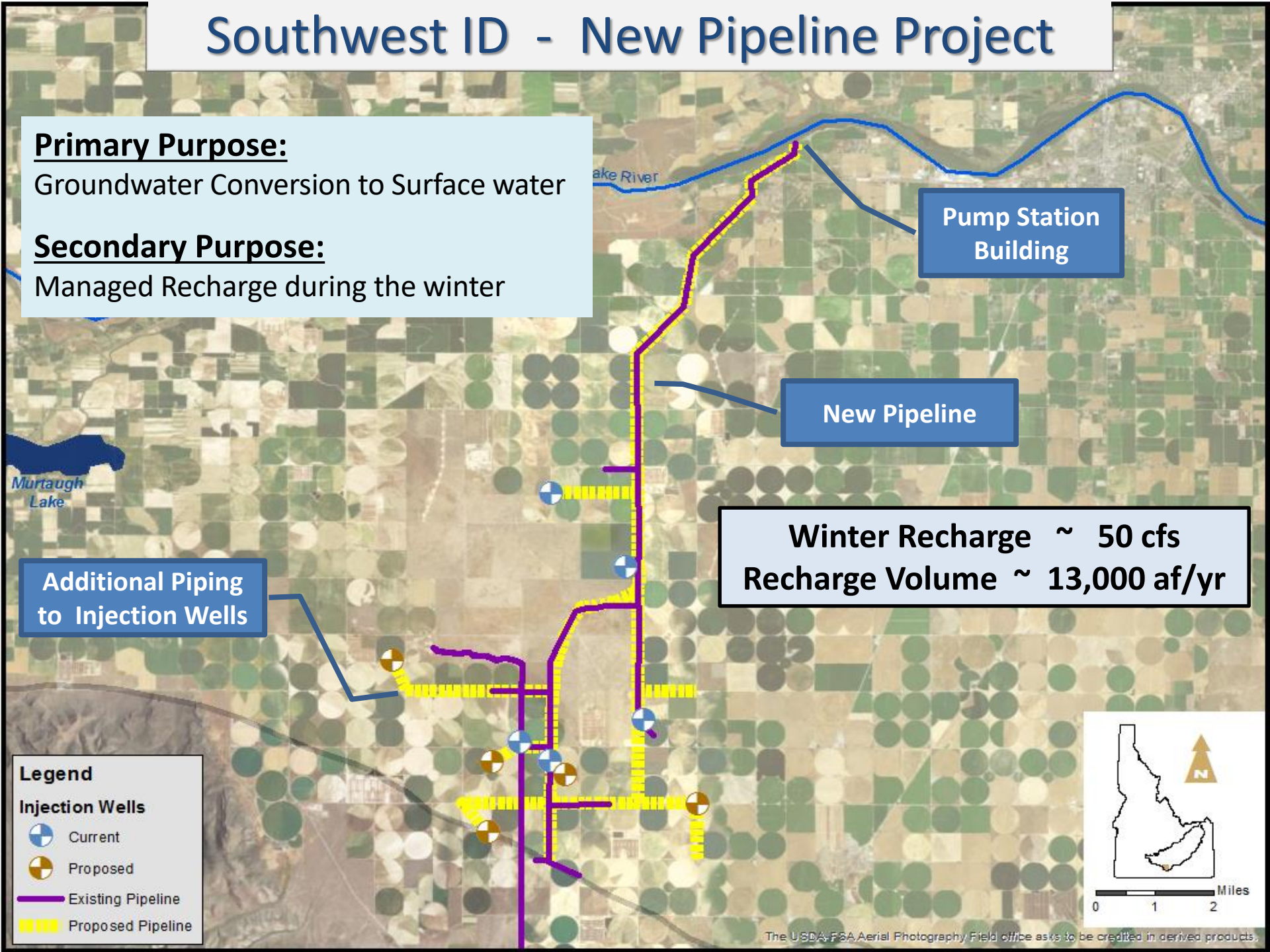

**Recharge Capacity** **50 - 200 cfs**
**(Fall 2018)**

- **Areal Survey** **Oct 2017**
- **Delivery Option/ Cost Estimates:** **Jan 2018**
- **Design/Construction:** **2018**

# Southwest ID - New Pipeline Project

**Primary Purpose:**
Groundwater Conversion to Surface water

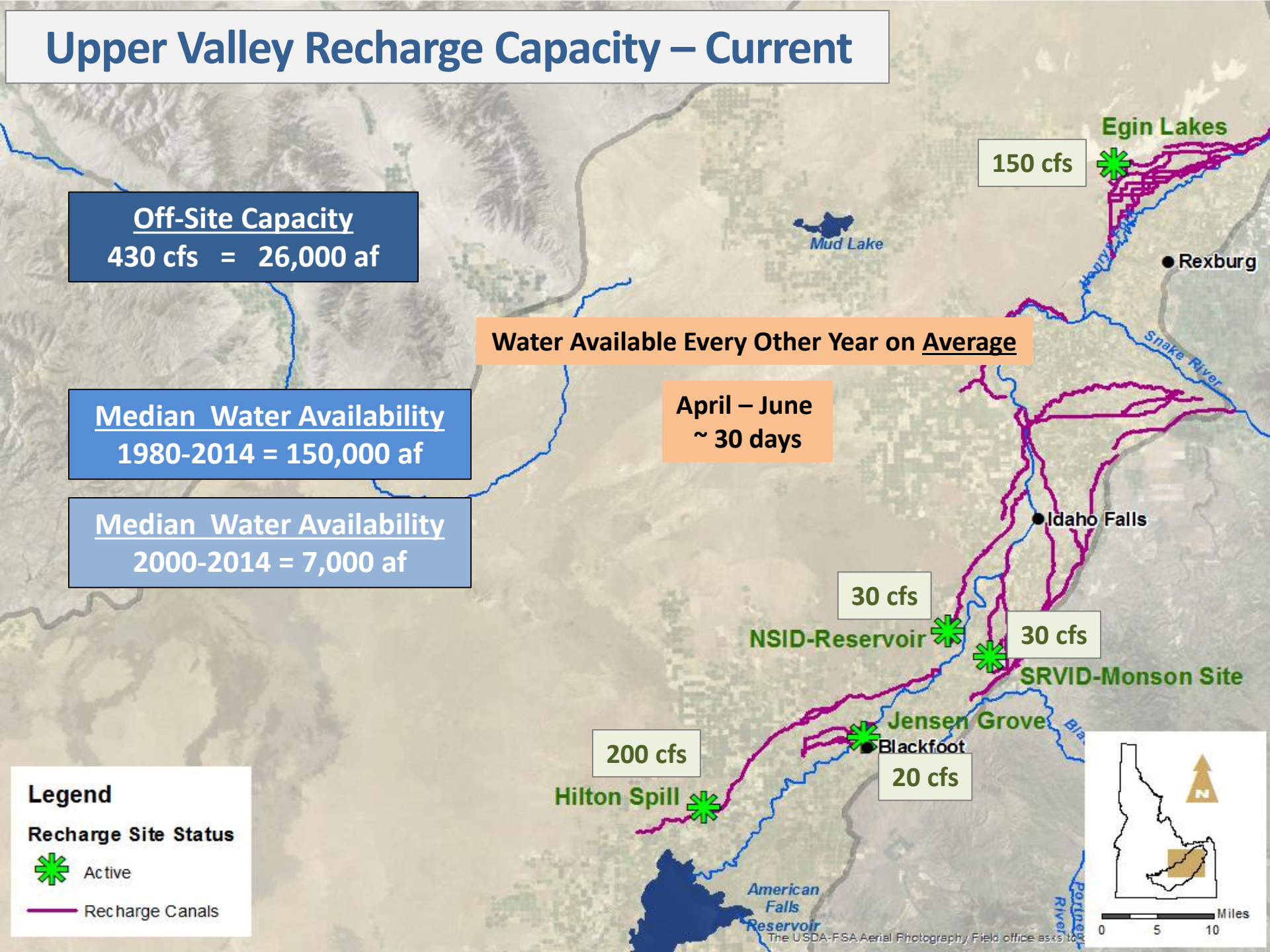
**Secondary Purpose:**
Managed Recharge during the winter



# SWID – New Pipeline (Complete)

**Adding infrastructure to allow diversion for irrigation/conversion projects and winter-time recharge – 50 cfs ~$15M, IWRB = $600K**

# Upper Valley Recharge Capacity – Current




**Off-Site Capacity**
430 cfs = 26,000 af

**Median Water Availability**
1980-2014 = 150,000 af

**Median Water Availability**
2000-2014 = 7,000 af

**Water Available Every Other Year on Average**

**April – June**
**~ 30 days**

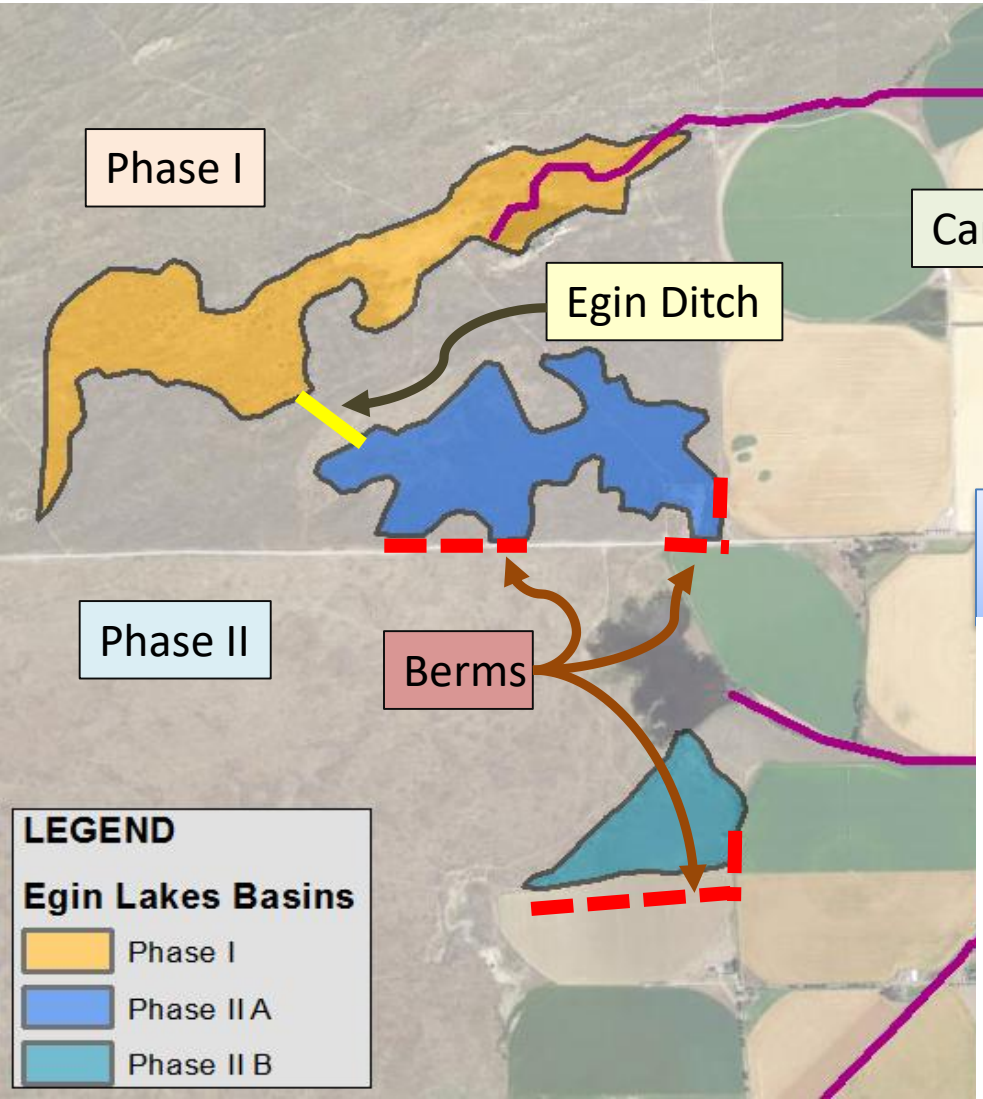
# Egin Lakes Expansion Phase I


New canal under construction, Nov 2015

New Recharge Canal - 50 cfs to 150 cfs
Egin Recharge Site near St. Anthony

Completed Recharge Canal, Mar 2016

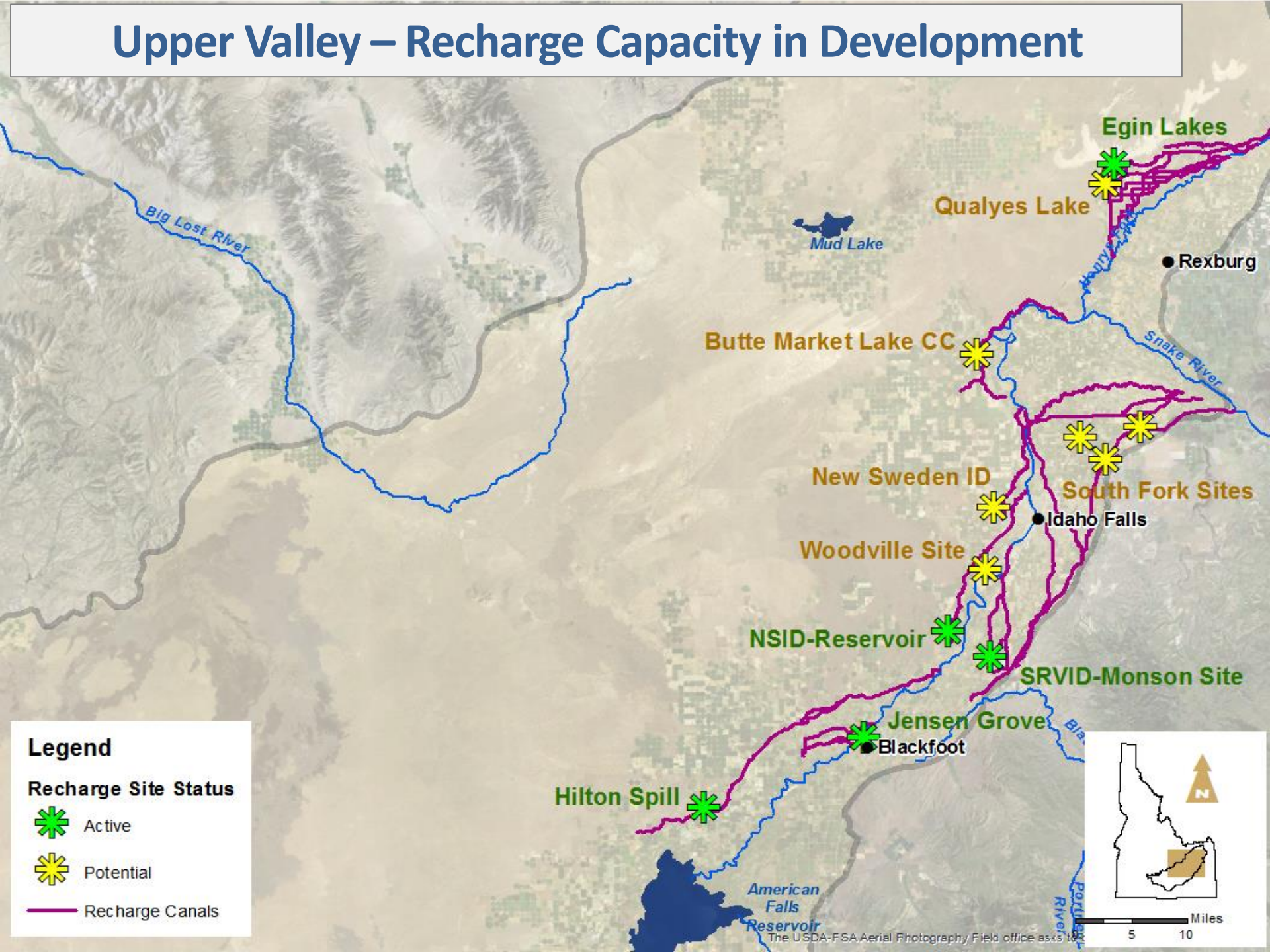
# Egin Lakes Phase II

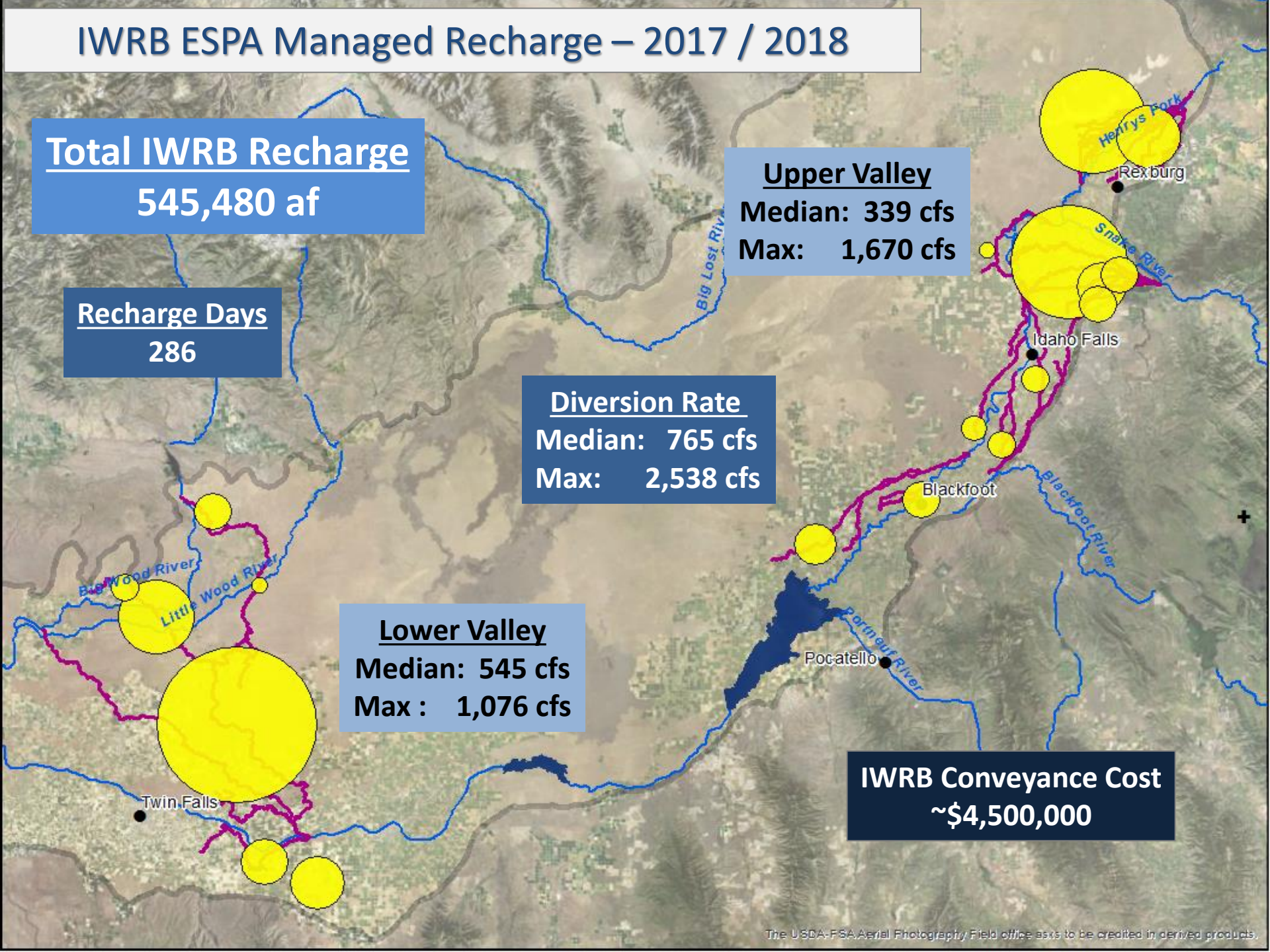

**Potential Recharge Capacity 150 cfs**
**(Fall 2017/Spring 2018)**

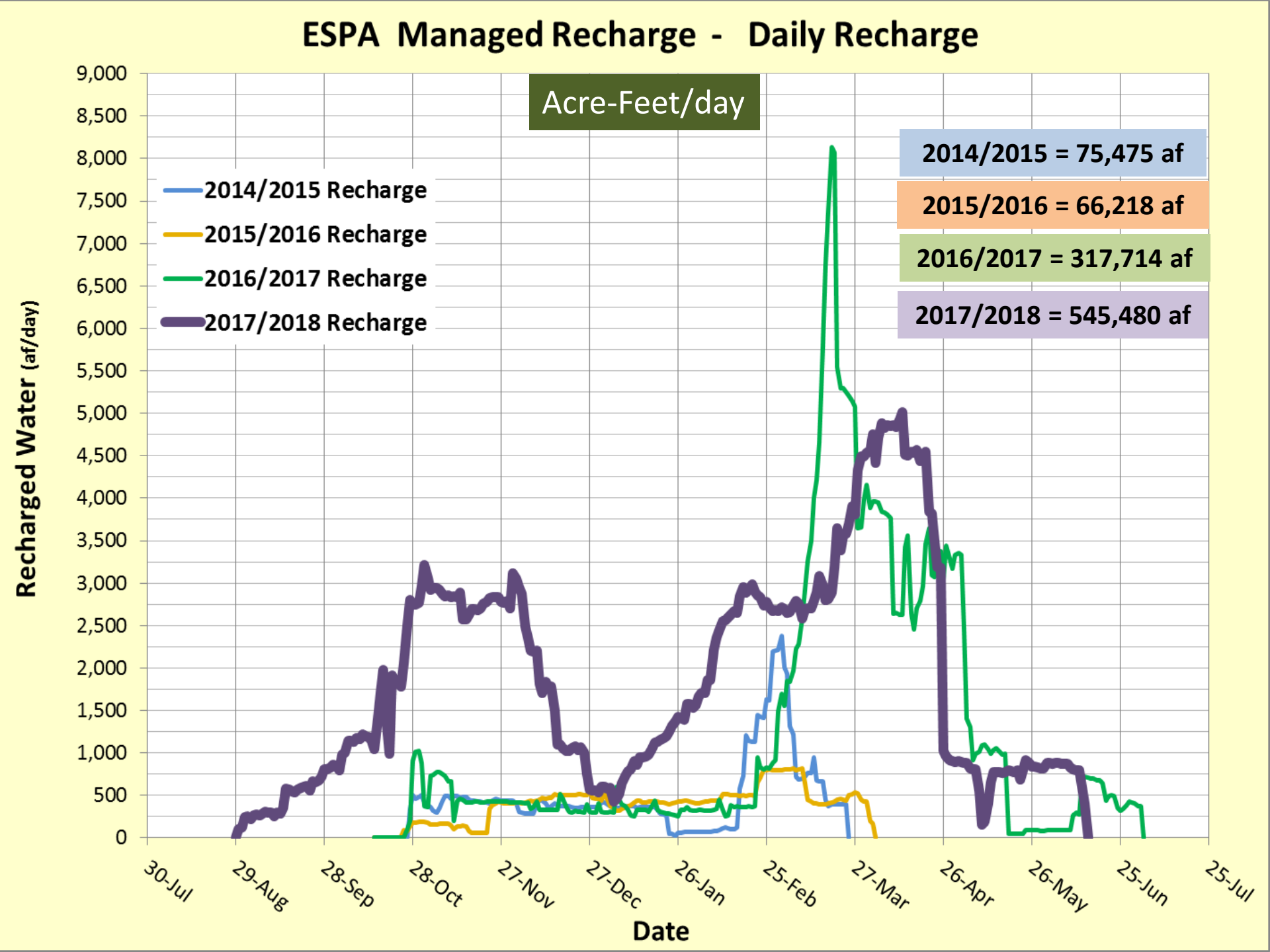
| | |
|---|---|
| **EA BLM Approval** | **Oct 2017** |
| **Construction:** | |
| • **Canal Drop Structure** | **Winter 2018** |
| • **Egin Ditch** | **Summer 2018** |
| • **Berms** | **Summer 2018** |
| **Cost** | **$580,000** |

# Upper Valley – Recharge Capacity in Development



# IWRB ESPA Managed Recharge – 2017 / 2018

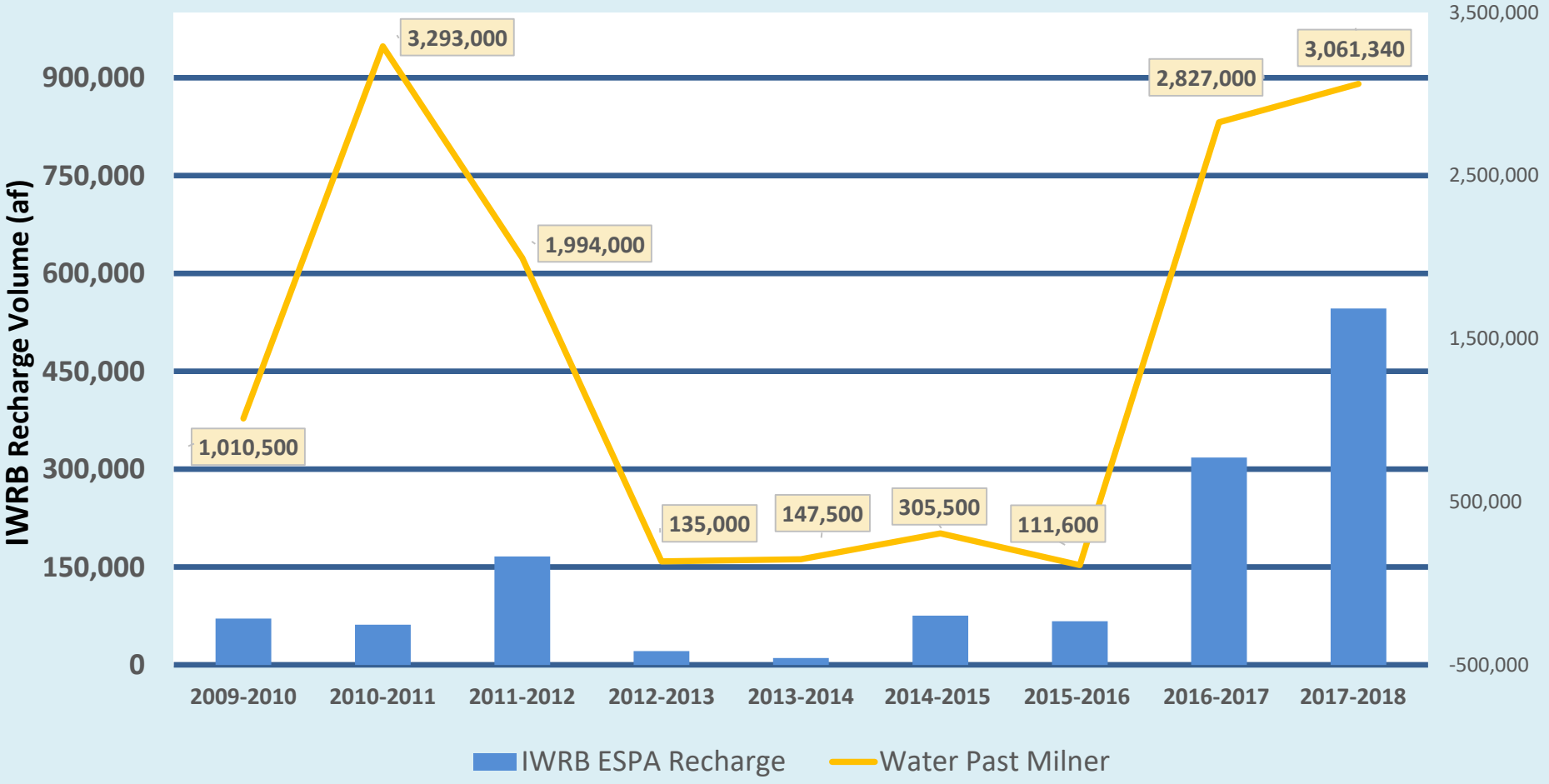



ESPA Managed Recharge - Daily Recharge
Acre-Feet/day
2014/2015 = 75,475 af
2015/2016 = 66,218 af
2016/2017 = 317,714 af
2017/2018 = 545,480 af
2014/2015 Recharge
2015/2016 Recharge
2016/2017 Recharge
2017/2018 Recharge
Recharged Water (af/day)
9,000
8,500
8,000
7,500
7,000
6,500
6,000
5,500
5,000
4,500
4,000
3,500
3,000
2,500
2,000
1,500
1,000
500
0
30-Jul
29-Aug
28-Sep
28-Oct
27-Nov
27-Dec
26-Jan
25-Feb
27-Mar
26-Apr
26-May
25-Jun
25-Jul
Date

IDAHO Water Resource Board

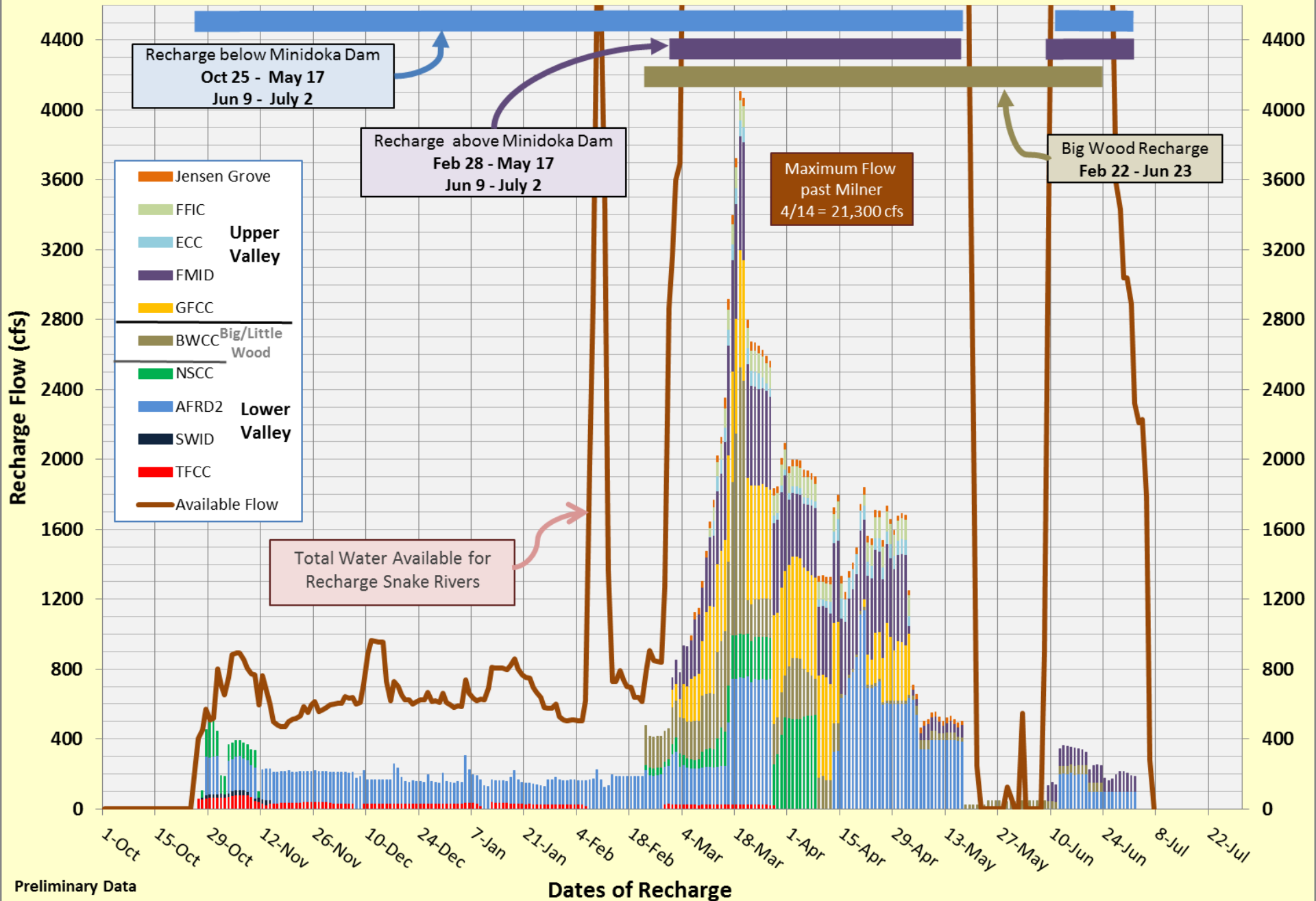
# IWRB Recharge vs. Water Past Milner

## 2009-2018



# Total IWRB Managed Recharge Rates During 2016 - 2017 Season

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



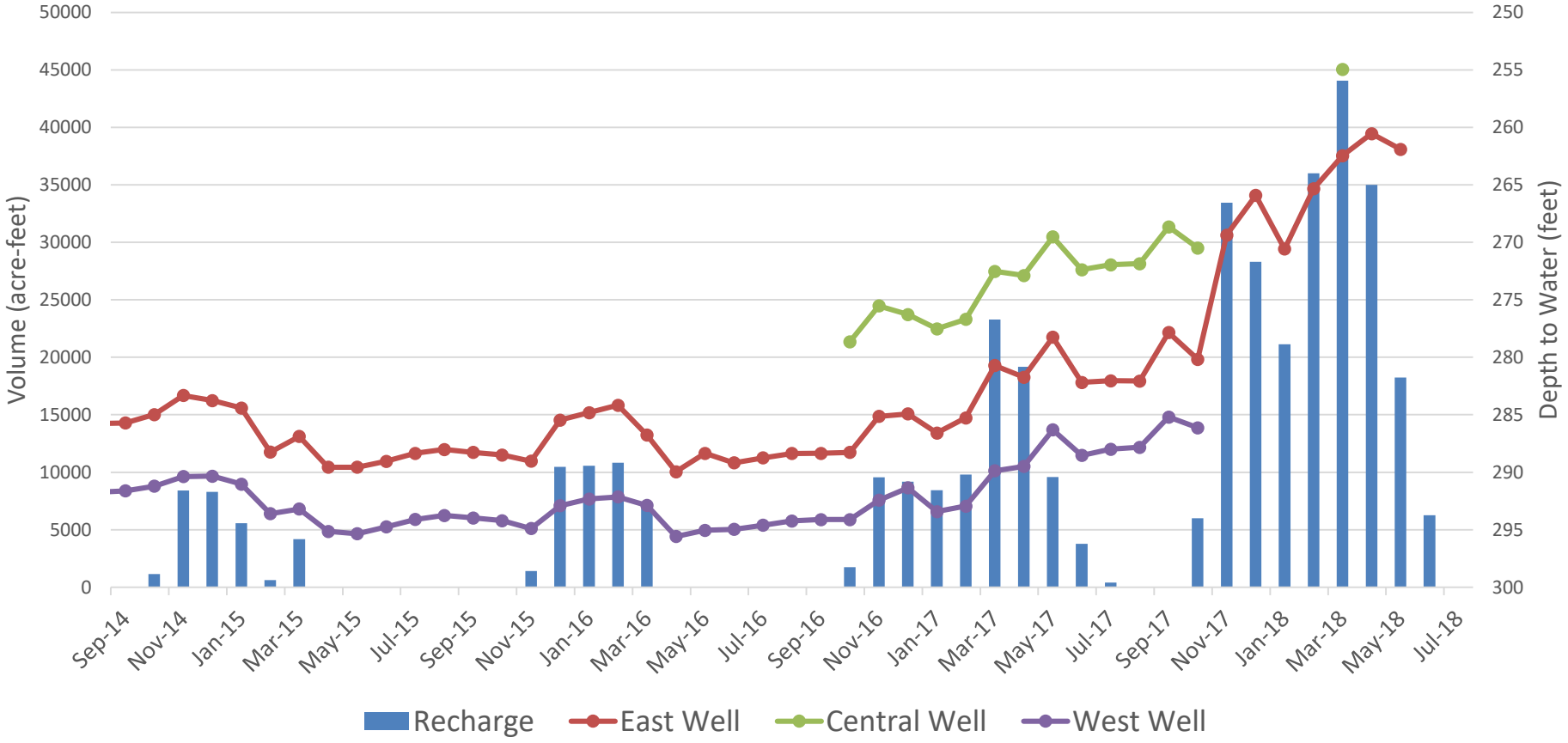

Preliminary Data

# ESPA Managed Recharge

- **ESPA Background**
- **ESPA Managed Recharge**
- **Aquifer Response**

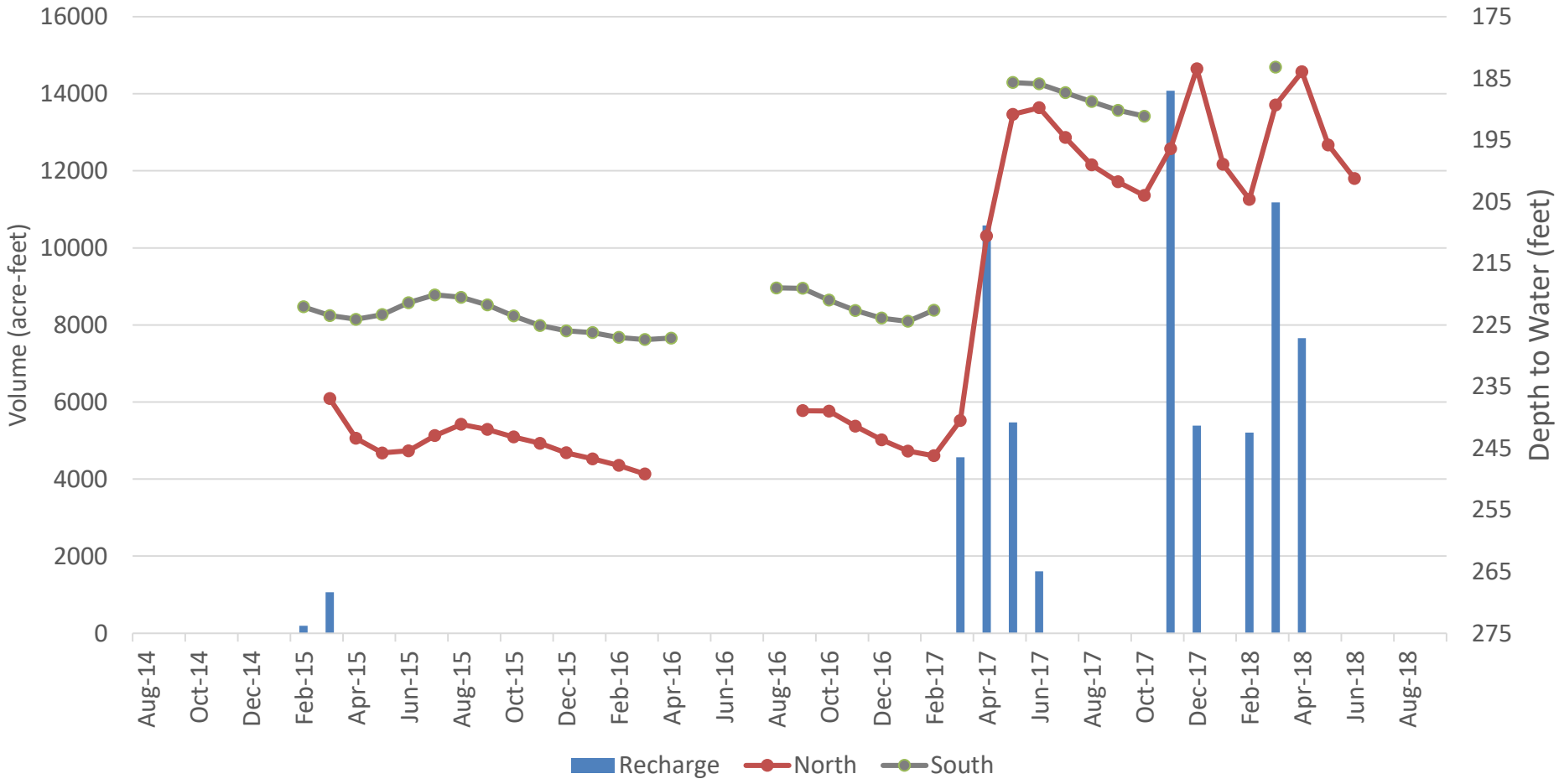
# Mile Post 31

## Volume & Water Levels

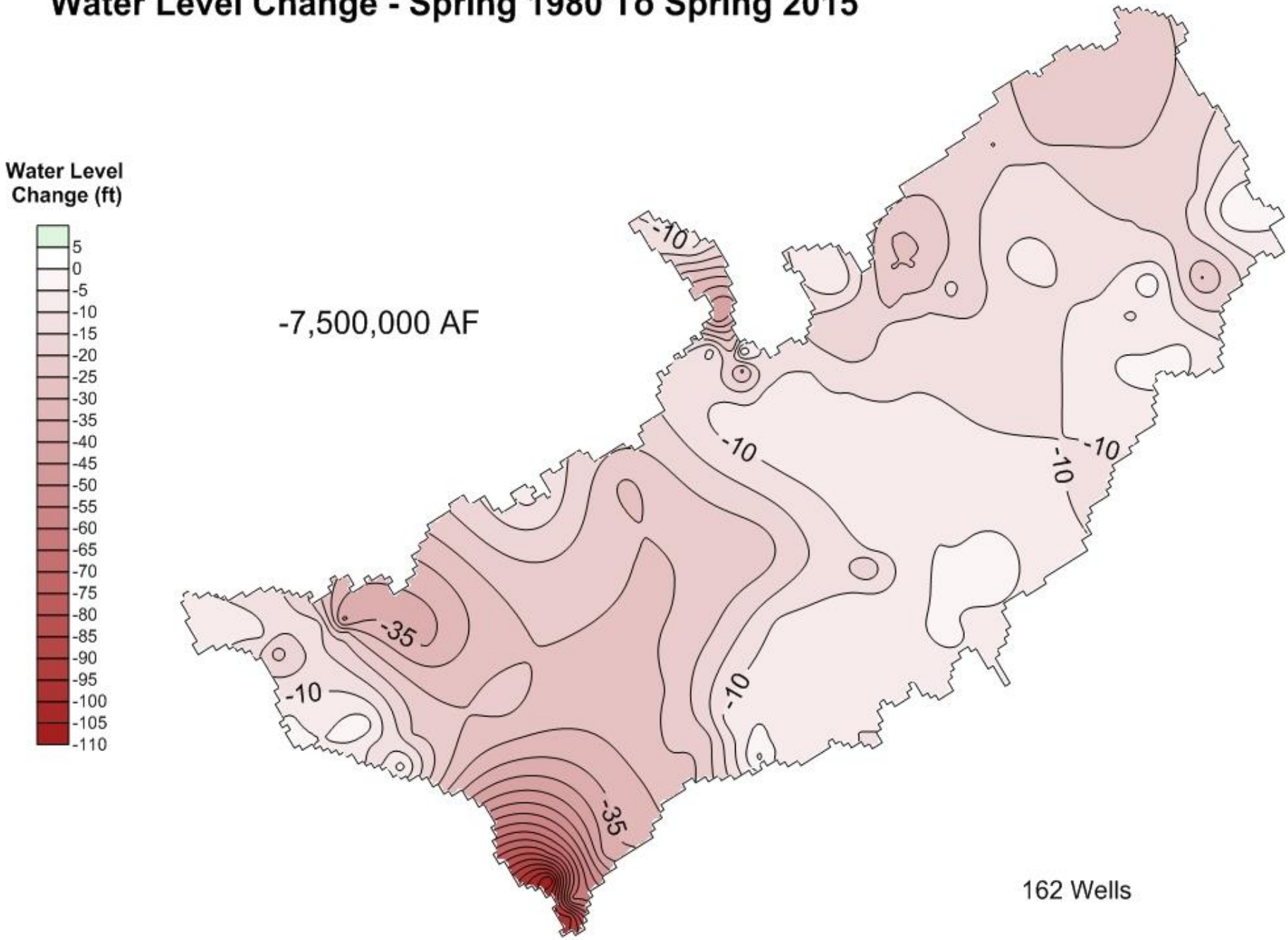


# Shoshone Site

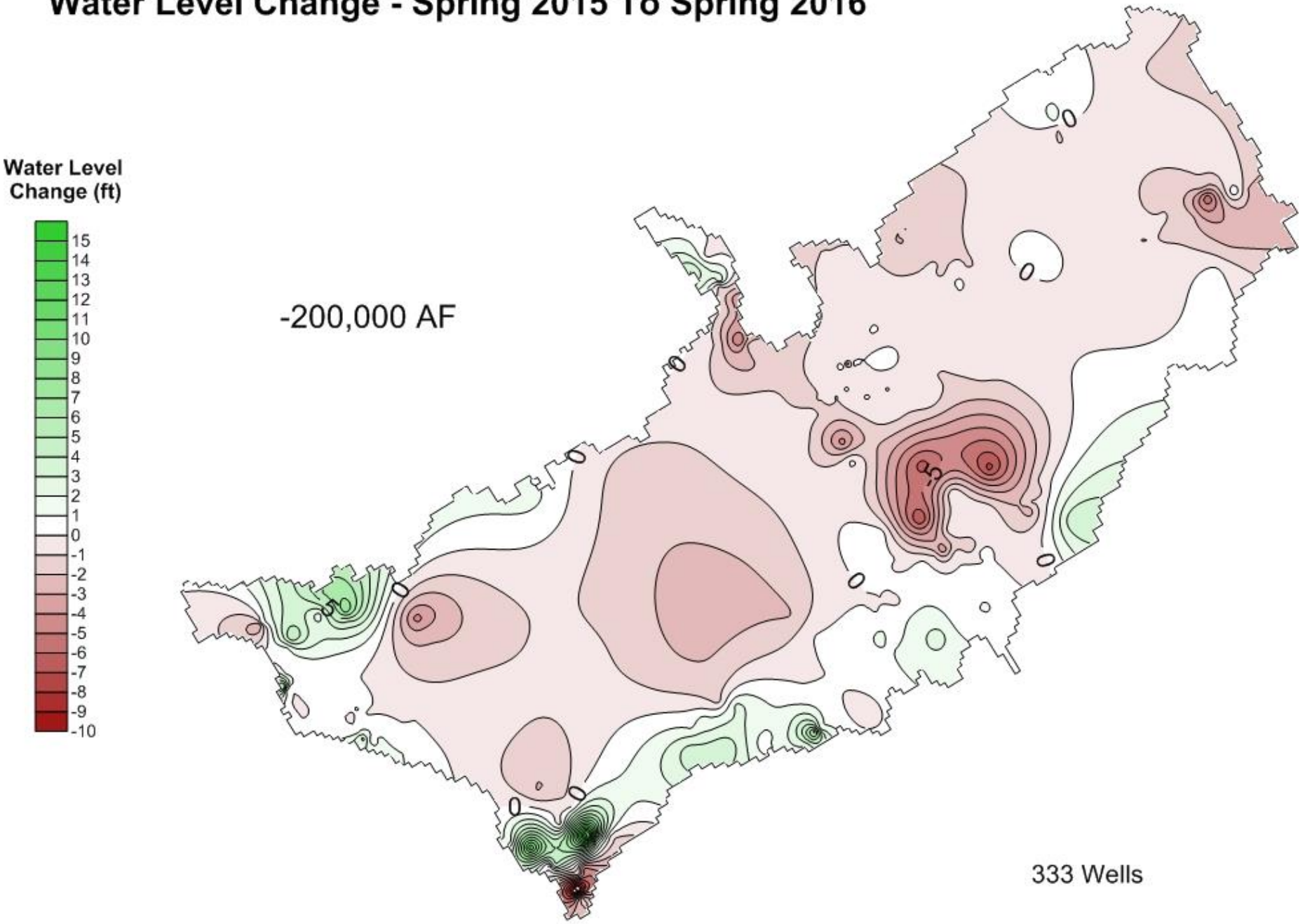
## Volumes & Water Levels



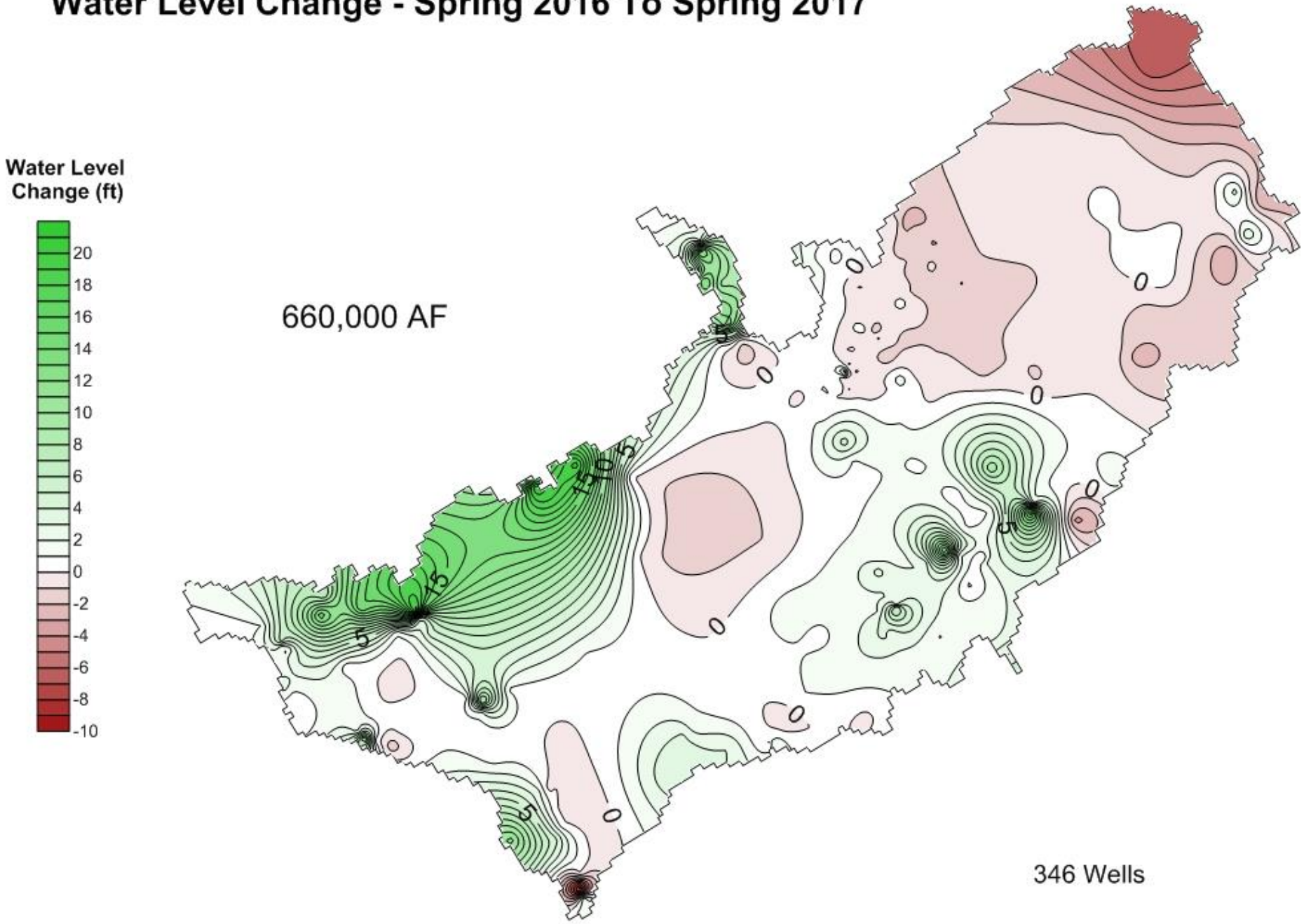
# Water Level Change - Spring 1980 To Spring 2015

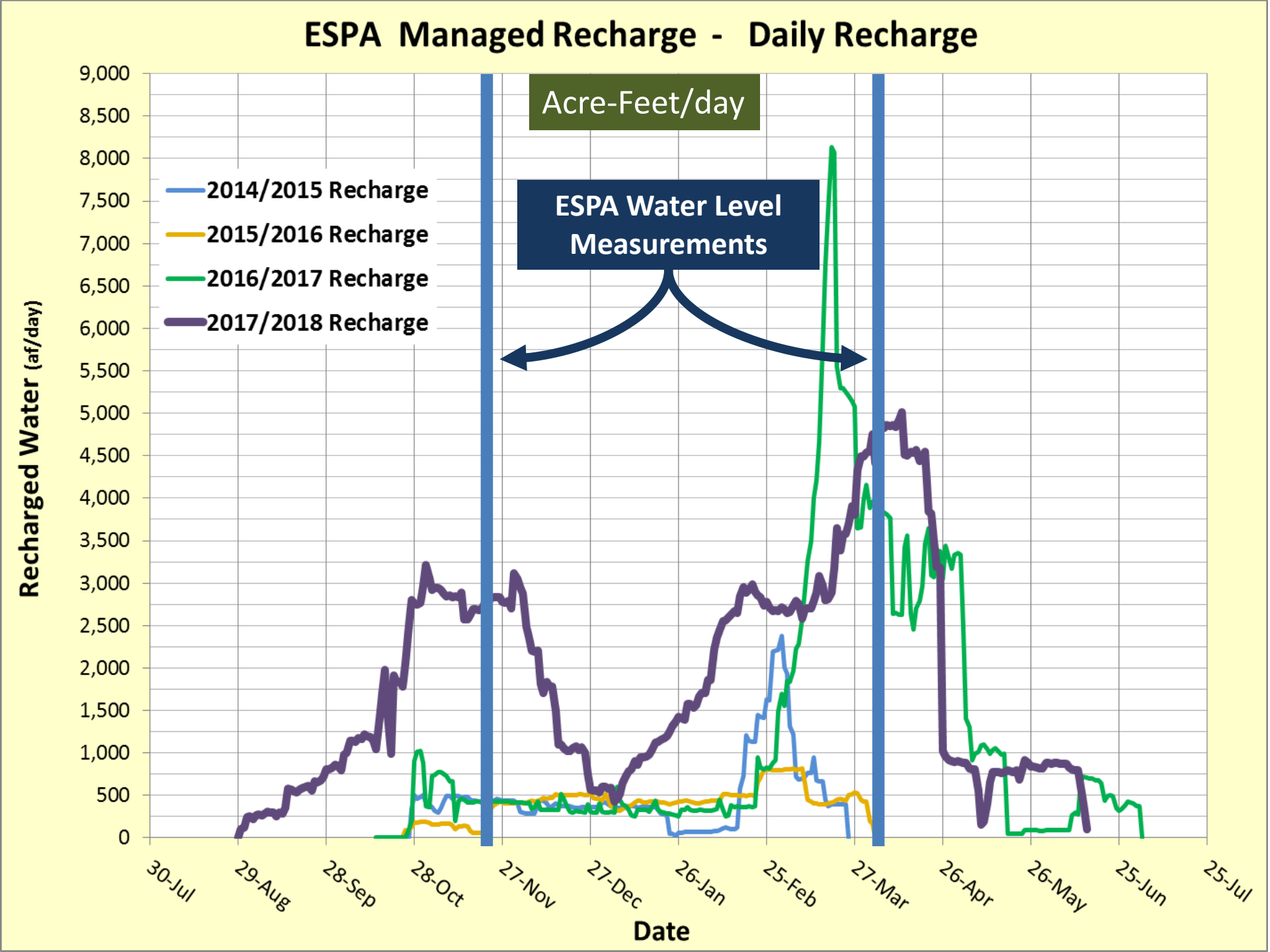


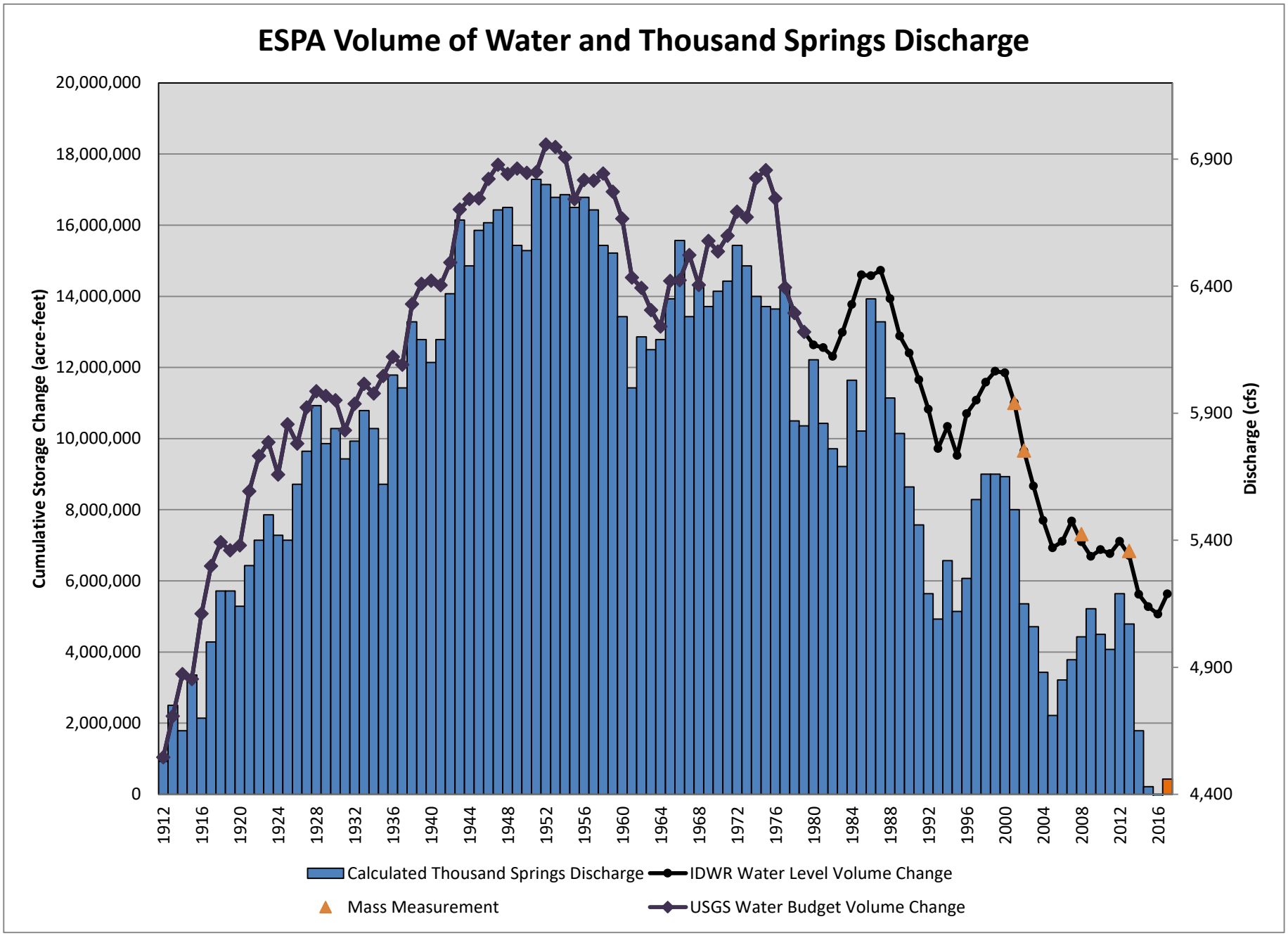
# Water Level Change - Spring 2015 To Spring 2016

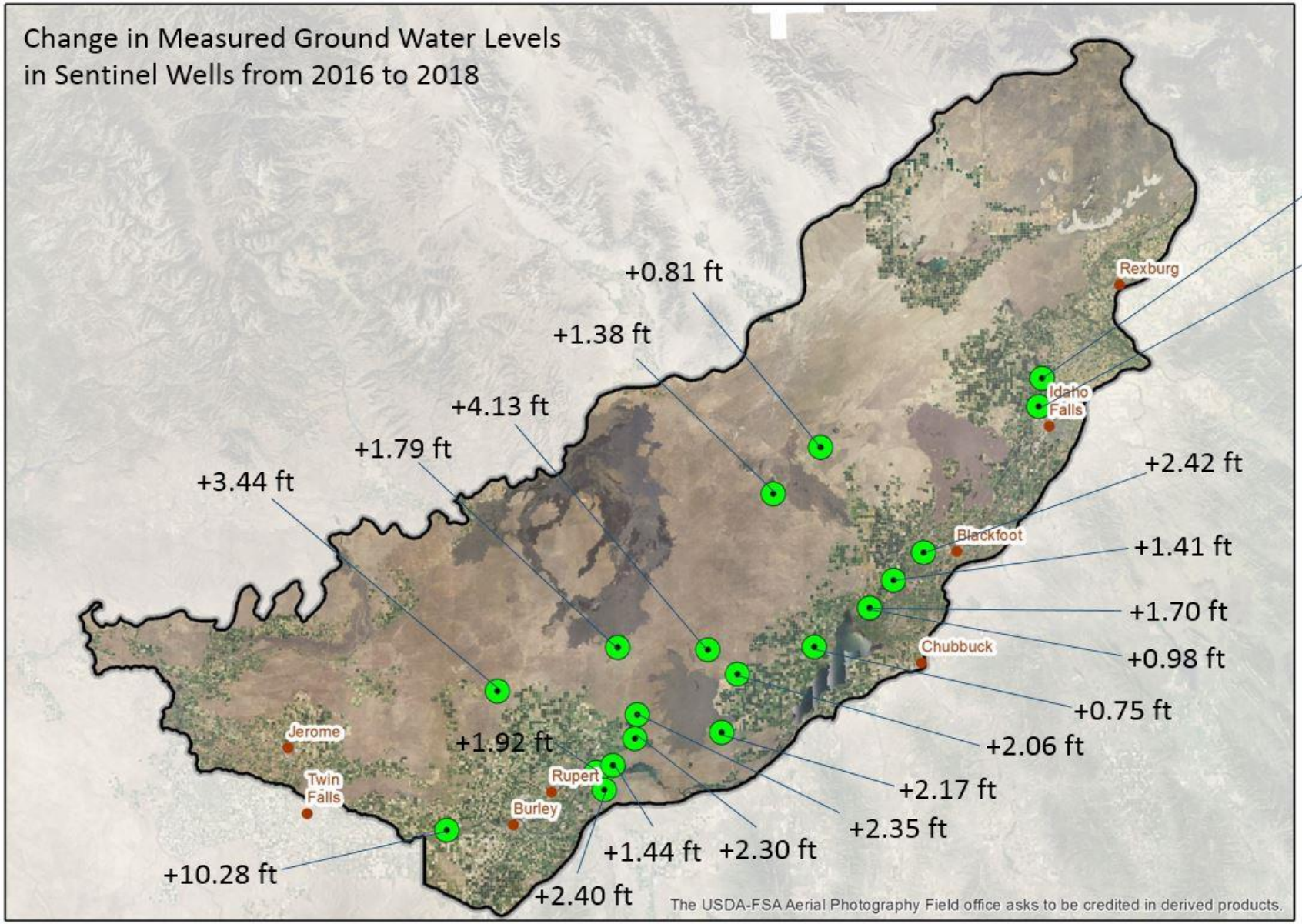


# Water Level Change - Spring 2016 To Spring 2017




ESPA Managed Recharge - Daily Recharge
Acre-Feet/day
ESPA Water Level Measurements
2014/2015 Recharge
2015/2016 Recharge
2016/2017 Recharge
2017/2018 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
30-Jul
29-Aug
28-Sep
28-Oct
27-Nov
27-Dec
26-Jan
25-Feb
27-Mar
26-Apr
26-May
25-Jun
25-Jul
Date


ESPA 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
Discharge (cfs)
6,900
6,400
5,900
5,400
4,900
4,400
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
Calculated Thousand Springs Discharge
IDWR Water Level Volume Change
Mass Measurement
USGS Water Budget Volume Change


Change in Measured Ground Water Levels
in Sentinel Wells from 2016 to 2018
+1.99 ft
+1.74 ft
+0.81 ft
Rexburg
+1.38 ft
Idaho Falls
+4.13 ft
+1.79 ft
+2.42 ft
+3.44 ft
Blackfoot
+1.41 ft
+1.70 ft
Chubbuck
+0.98 ft
+0.75 ft
Jerome
+1.92 ft
+2.06 ft
Rupert
+2.17 ft
Twin Falls
Burley
+2.35 ft
+1.44 ft
+2.30 ft
+10.28 ft
+2.40 ft
The USDA-FSA Aerial Photography Field office asks to be credited in derived products.

# Recharge Challenges

- On-going funding ($2.5-3.0 million/year in conveyance fees alone)
- Additional infrastructure required to recharge all available water
- Competition between state funded and private manage recharge
  - Settlement agreement: 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 do not)
- Tracking volume recharged challenging – adequate monitoring devices not in place on all canals
- Coordination with water users, Water District 1, USBR, etc.
- Understanding the effects on aquifer from recharge – water depth measurements is important, but determining direct effects of recharge (events and long-term) still a challenge