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Eastern Snake Plain Managed Aquifer Recharge Program

Henrys Fork Basin Study Working Group

Brian Patton, Idaho Department of Water Resources

Recharge Basics

- **Natural Recharge**
  - precipitation infiltrating into ground water aquifers

- **Artificial or Managed Recharge**
  - artificial placement of water from a different source into a ground water aquifer

- **Incidental Aquifer Recharge**
  -unintentional placement of water into an aquifer resulting from normal water deliveries for irrigation or other uses (i.e. canal losses)

- **Aquifer Storage and Recovery (ASR)**
  - currently no ASR in Idaho
  - ASR usually treats underground water storage the same as surface water storage: 1-for 1 input and withdrawal
  - in states that have ASR, a closed ground water system is required (which the ESPA is not)

- **Managed Recharge Applications**
  - replenishment of depleted aquifers
  - water supply mitigation
  - low cost storage of large volumes that may otherwise flow out of the basin

Eastern Snake Plain Aquifer

- fractured basalt, approximately 11,000 square miles (~ 200 mi. long by ~ 60 mi. wide)
- total storage in the upper 500 ft. estimated at 200-300 maf
- well yields above 3,000 gpm are common and transmissivity is high
- primary discharges are in the Thousand Springs area and in the American Falls/Fort Hall area.
- Interconnected with Snake River (gaining from or losing to along entire reach)

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Eastern Snake Plain

- Eastern Snake Plain is roughly the same area as the Upper Snake Basin (Snake and tributaries from Milner Dam to headwaters)

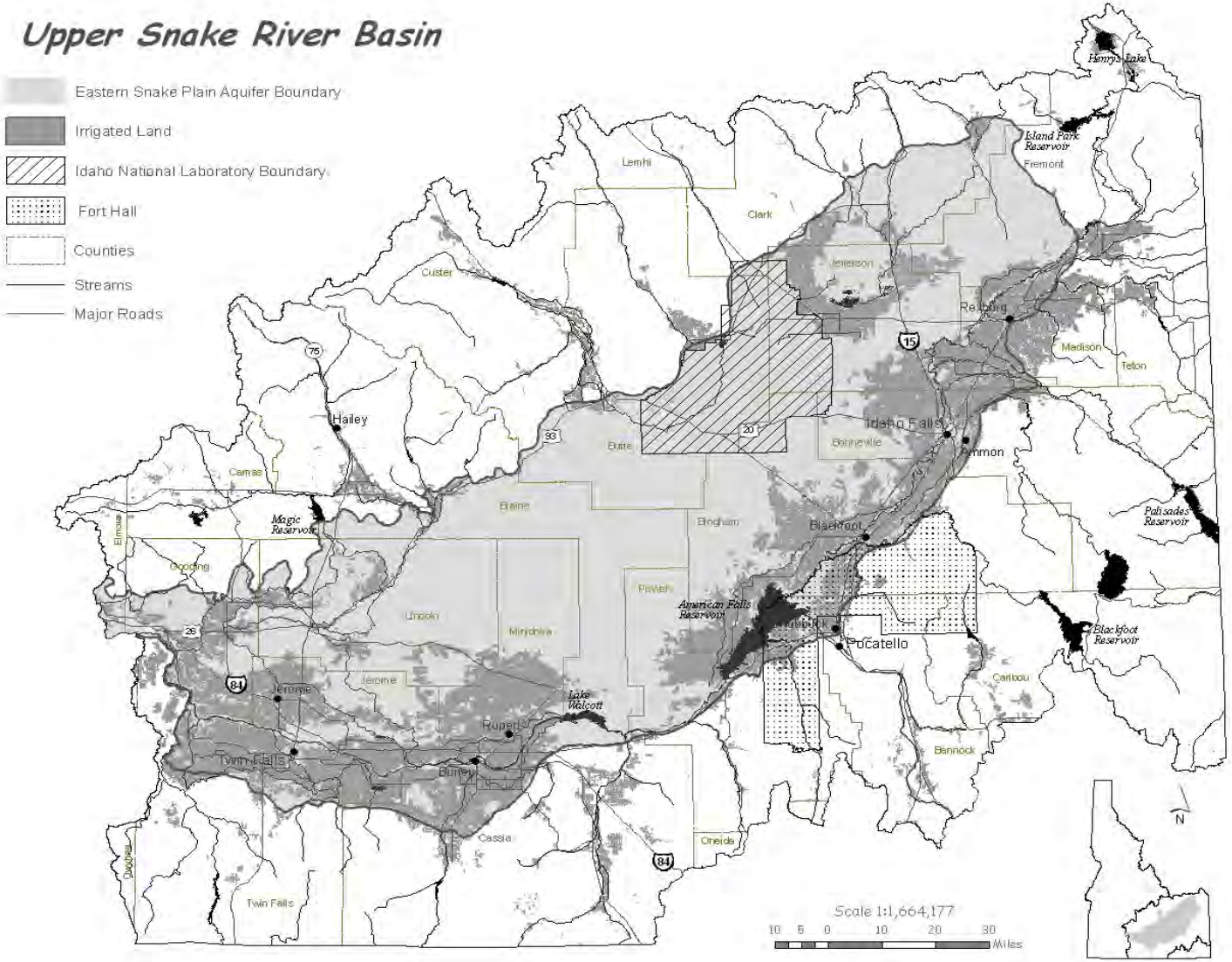
- ~ 2 million irrigated acres ~ half surface and half ground water

- canals constructed between 1890 and 1935

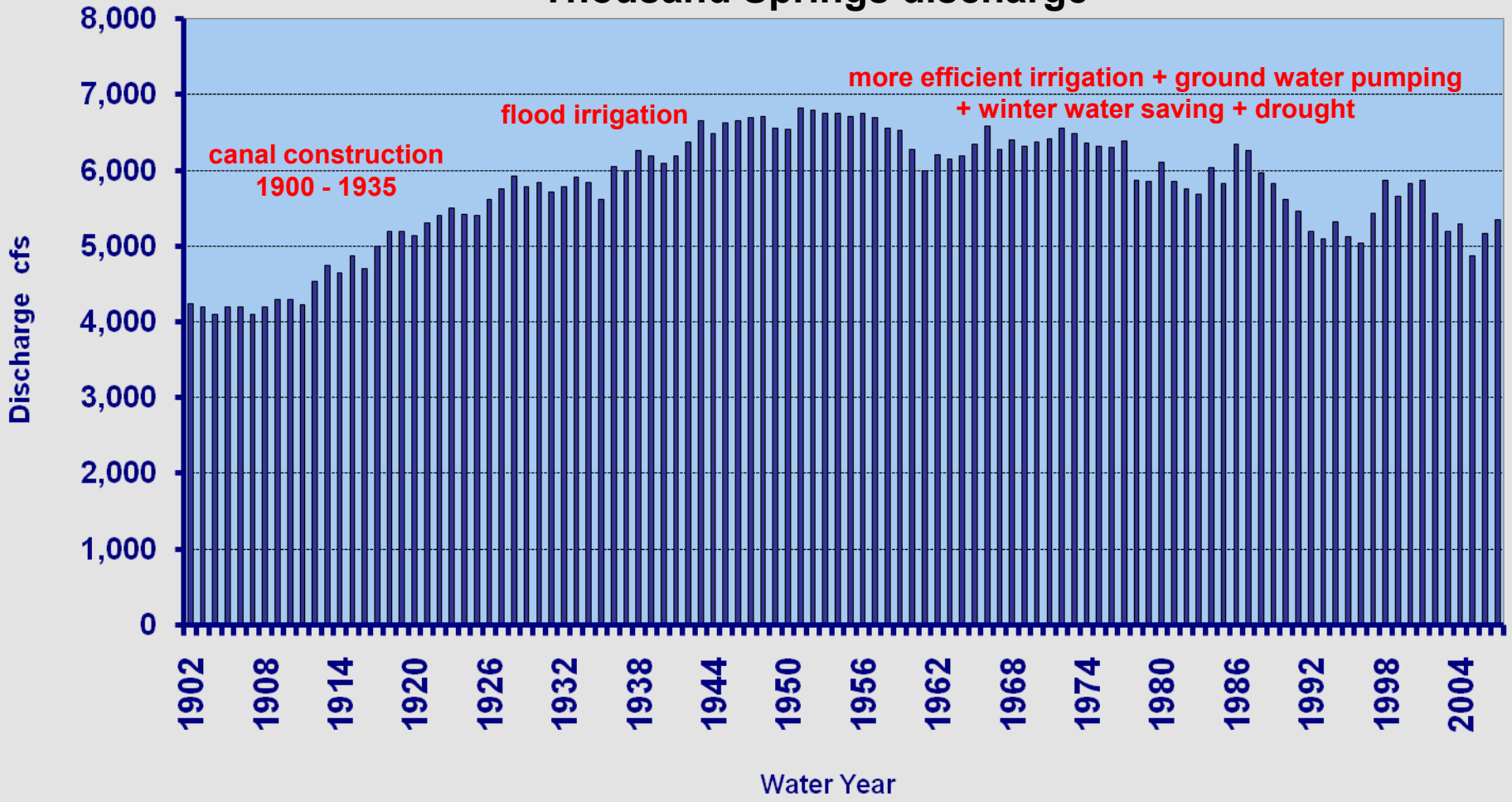
- most canals are unlined and leak ~ 30 %

- 1980-2002 average canal leakage (incidental recharge) ~ 3.4 million acre-feet annually

- Region accounts for approximately 25% of Idaho's economic output

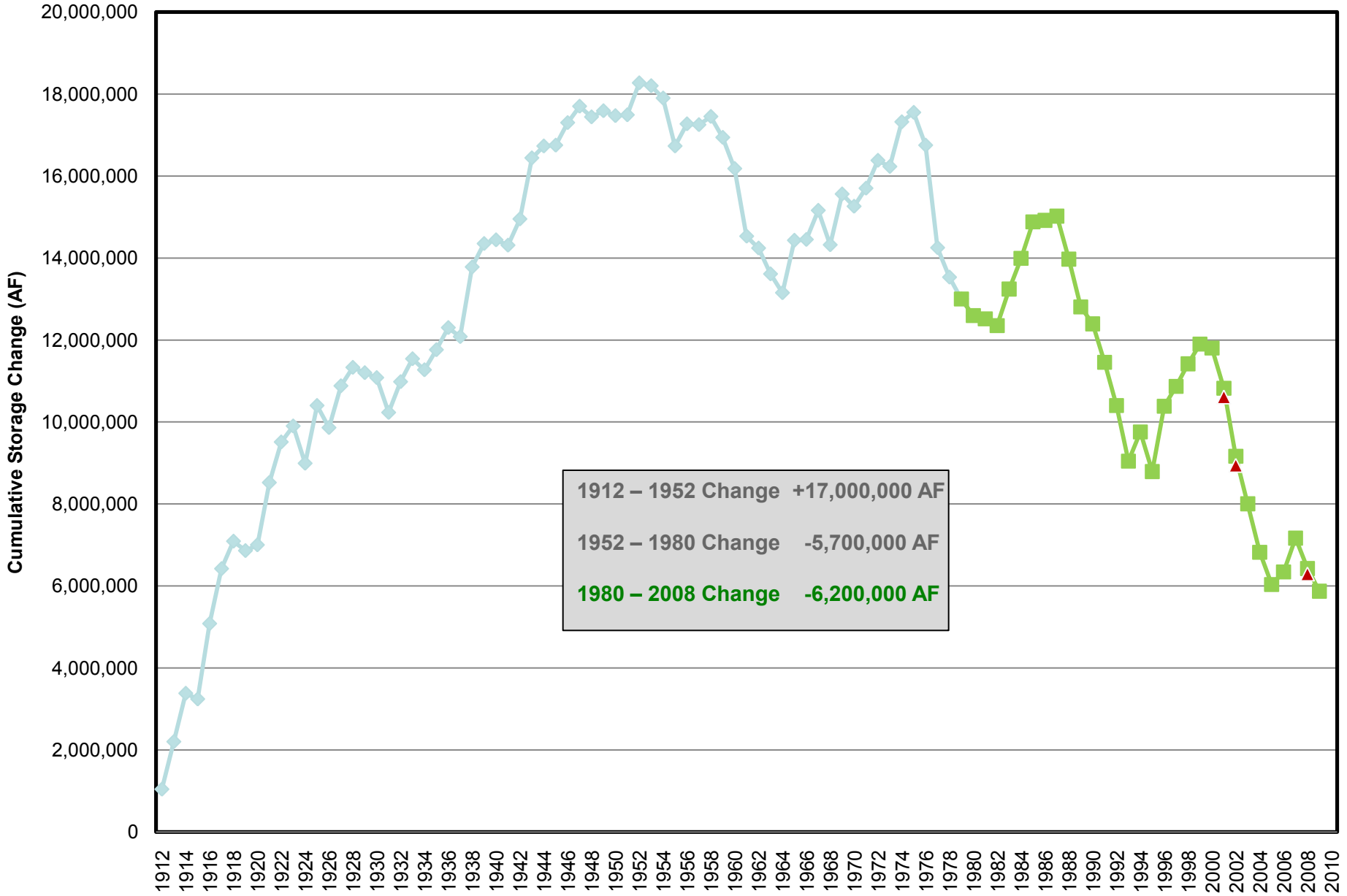

Upper Snake River Basin
Eastern Snake Plain Aquifer Boundary
Irrigated Land
Idaho National Laboratory Boundary
Fort Hall
Counties
Streams
Major Roads
Henrys Lake
Island Park Reservoir
Fremont
Lemhi
Clark
Custer
Jefferson
Madison
Teton
Blaine
Camas
Gooding
Lincoln
Minidoka
Jerome
Twin Falls
Cassia
Oneida
Power
Bingham
Bonneville
Butte
Hailey
Idaho Falls
Ammon
Blackfoot
Pocatello
Caribou
Bannock
Magic Reservoir
American Falls Reservoir
Lake Walcott
Palisades Reservoir
Blackfoot Reservoir
Rupert
Burley
Scale 1:1,664,177
10 5 0 10 20 30
Miles
N

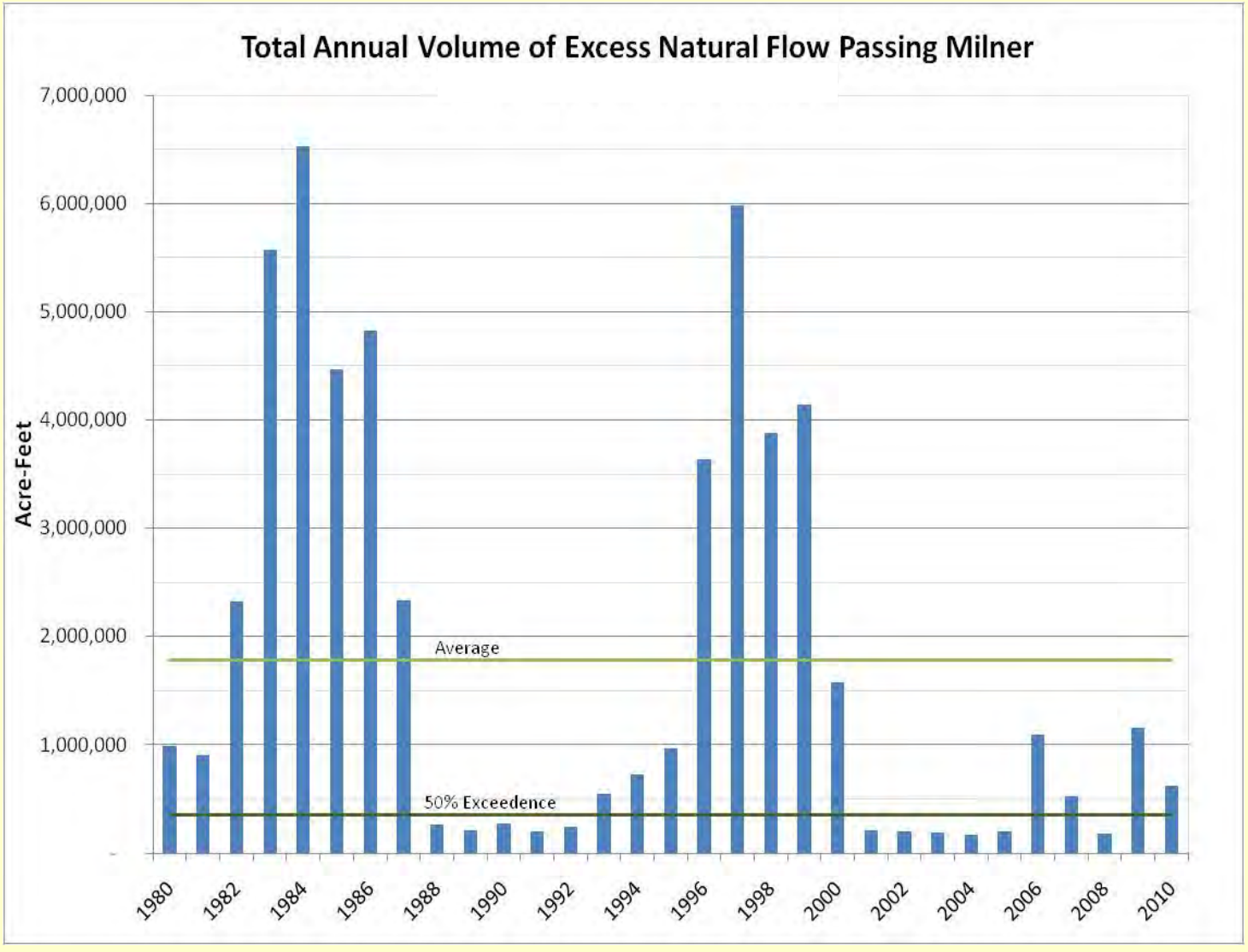
Thousand Springs discharge



1902 discharge ~ 4,200 cfs (3 maf/yr)
1950 peak discharge ~ 6,800 cfs (4.9 maf/yr)
2007 discharge ~ 5,350 cfs (3.9 maf/yr)

ESPA - Cumulative Change in Aquifer Storage




Total Annual Volume of Excess Natural Flow Passing Milner
Acre-Feet
7,000,000
6,000,000
5,000,000
4,000,000
3,000,000
2,000,000
1,000,000
-
Average
50% Exceedence
1980
1982
1984
1986
1988
1990
1992
1994
1996
1998
2000
2002
2004
2006
2008
2010

Eastern Snake Plain Managed Recharge

- Studies of ESPA managed recharge by the Idaho Water Resource Board (IWRB) and Bureau of Reclamation and others date back to 1962.

- Legislature directed IWRB to undertake ESPA managed recharge program in 2005 (HB372, HB392, and HCR28)

- In 2008, IDWR Director clarified the relative priority of the Water Board's recharge water right vs. hydropower generation water rights at Milner Dam, removing a major hurdle to implementing a sustainable recharge program.

Managed Recharge and CAMP

- A series of water use conflicts that had to potential to severely disrupt the economy of the Eastern Snake Plain region led to the ESPA Comprehensive Aquifer Management Plan (CAMP) which was approved as a component of the State Water Plan by the 2009 Legislature through HB 264.

- The CAMP recognized an annual water budget deficit in the ESPA of 600,000 acre-feet, which could be rectified over a 30-year term at a cost of $600 million.

- Due to this high cost and long time frame, CAMP implementation was divided into two phases.

- Phase 1 is estimated to take 10 years and achieve a 200,000-to-300,000 acre-foot annual water budget adjustment to the ESPA, of which 100,000 acre-feet annually would be provided through recharge. The balance would come from cloud seeding, GW-SW conversion projects, and demand reduction.

- Phase 2 would provide the remainder of the water budget adjustment (300,000-to-600,000 acre-feet) and would include additional recharge, additional demand reduction, and possibly new surface water storage (Minidoka Enlargement, Henrys Fork/Teton storage).

Managed Recharge and the Swan Falls Reaffirmation Agreement

•The State and the Idaho Power Company entered into the Swan Falls Reaffirmation Agreement in 2009.

•The Reaffirmation Agreement attempts to balance the need to address the water budget shortfall in the ESPA with the need to maintain flows in the Snake River from Milner Dam through Hells Canyon to maintain an adequate hydropower generation base.

•The Agreement recognizes the Phase 1 CAMP goal of an average of 100,000 acre-feet of recharge annually, but if the IWRB proposes to increase this amount prior to 2019, legislative approval must be obtained.

•After 2019, the annual average recharge amount can increase to 250,000 acre-feet.

•In addition, the IWRB must approve recharge projects by others that propose the diversion of natural flow for recharge in excess of 10,000 acre-feet.

•The provisions of this agreement were included in statute through several pieces of legislation passed in 2009.

Eastern Snake Plain Managed Recharge

- Large volume, low cost, passive process: 186,044 ac-ft (2009-2010)
  $3.00/a-f

- Undertaken by the IWRB under contract with canal companies/irrigation districts

- Canal companies/irrigation districts deliver the IWRB's water to aquifer recharge mostly through canal leakage before and after the irrigation season.

- A few dedicated recharge sites, including Egin Lakes, are used to increase recharge capacity. These are useful if the Board's recharge right stays in priority after the irrigation season starts.

- IWRB pays cash payment to encourage canal companies to participate and deliver the IWRB's water available under its water rights.

Sources of Recharge Water

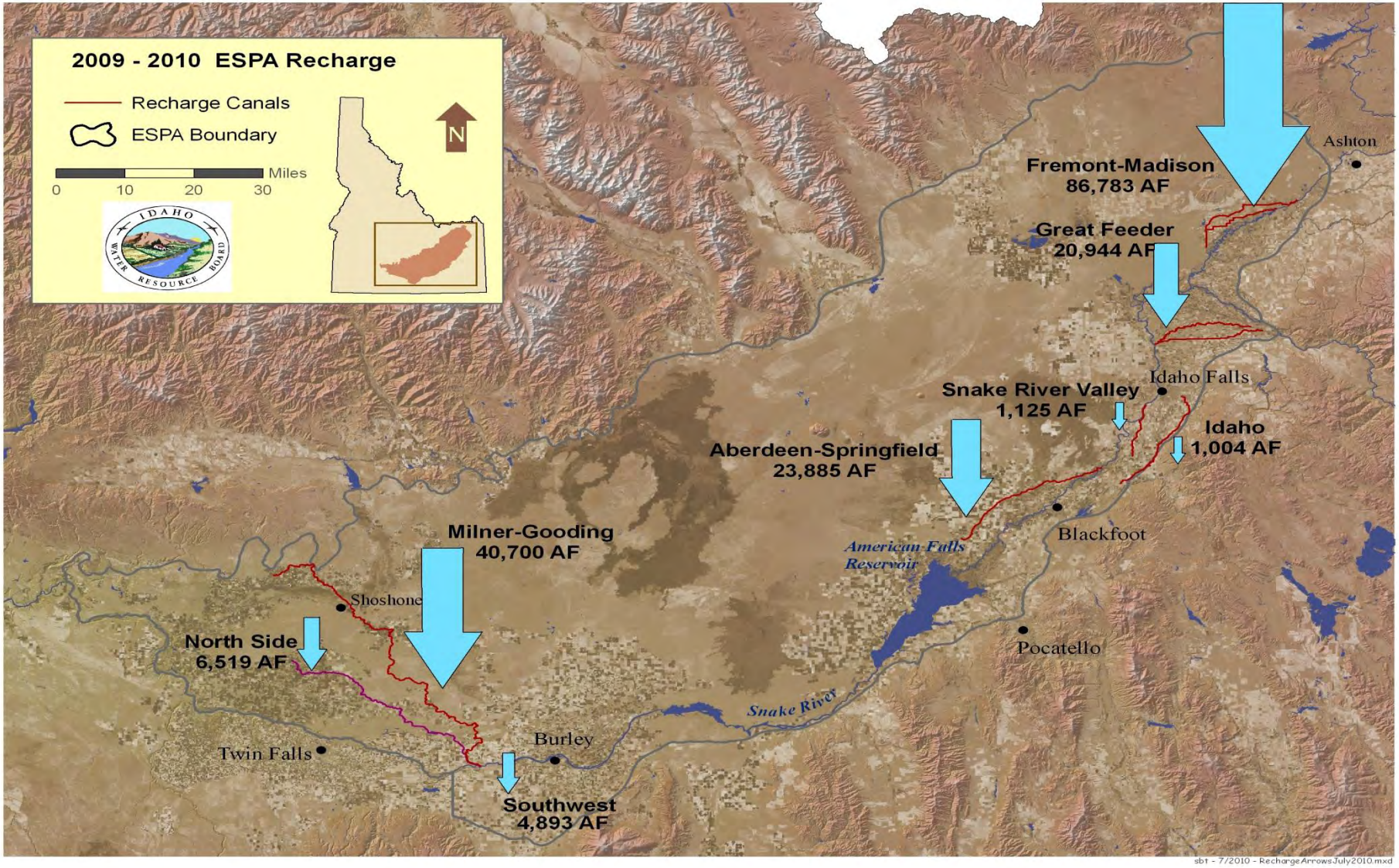
- Idaho Water Resource Board recharge rights
  - -1980 priority, 1,200 cfs diversion from the Snake River
  - -1980 priority, 800 cfs diversion from the Big/Little Wood Rivers

- IWRB's Recharge rights generally in priority before and after irrigation season

- Losses that occur during irrigation, "incidental losses", are considered normal operating losses and are not counted as managed recharge

Contracting, Reporting, Verification & Payment

- two party annual, renewable contracts between the IWRB and canal companies, essentially available to all
- measurements made by canal personnel, subject to verification by IDWR and WD01.
- reports submitted to IWRB
- upon approval of recharge reports, payment made to canal company by IWRB


2009 - 2010 ESPA Recharge
Recharge Canals
ESPA Boundary
Miles
0 10 20 30
N
Fremont-Madison
86,783 AF
Great Feeder
20,944 AF
Ashton
Idaho Falls
Snake River Valley
1,125 AF
Idaho
1,004 AF
Aberdeen-Springfield
23,885 AF
Blackfoot
American Falls
Reservoir
Milner-Gooding
40,700 AF
Shoshone
North Side
6,519 AF
Pocatello
Snake River
Burley
Twin Falls
Southwest
4,893 AF
sbt - 7/2010 - RechargeArrowsJuly2010.mxd

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ESPA RECHARGE 2009 - 2010

Fall 2010
2,300 a-f

Spring 2010
59,208 a-f

Total Recharge
2009-2010
186,044 a-f

Fall 2009
20,686 a-f

Two-year annual average of 93,022 AF

Spring 2009
103,850 a-f

Recharge Volume

72% above American Falls
28% below American Falls

2009

2010

Acre Feet

200,000
180,000
160,000
140,000
120,000
100,000
80,000
60,000
40,000
20,000
0

1/1/09 2/1/09 3/1/09 4/1/09 5/1/09 6/1/09 7/1/09 8/1/09 9/1/09 10/1/09 11/1/09 12/1/09 1/1/10 2/1/10 3/1/10 4/1/10 5/1/10 6/1/10 7/1/10 8/1/10 9/1/10 10/1/10 11/1/10 12/1/10 1/1/11

Date

Managed recharge at Egin Lakes site in 2008

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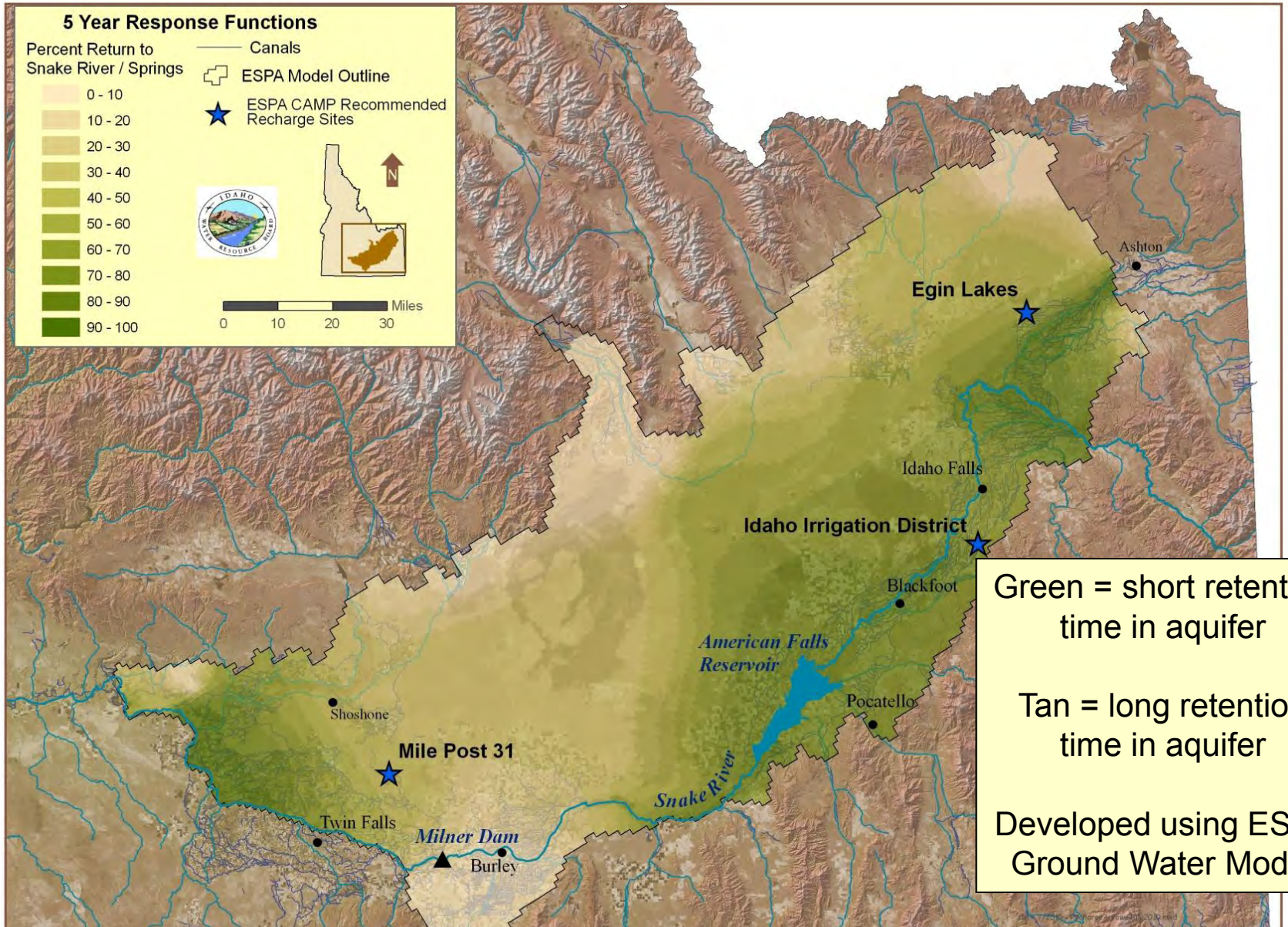
Managed recharge north of Shoshone from Milner-Gooding Canal
April 28, 2009. Flow is approximately 230 cfs.

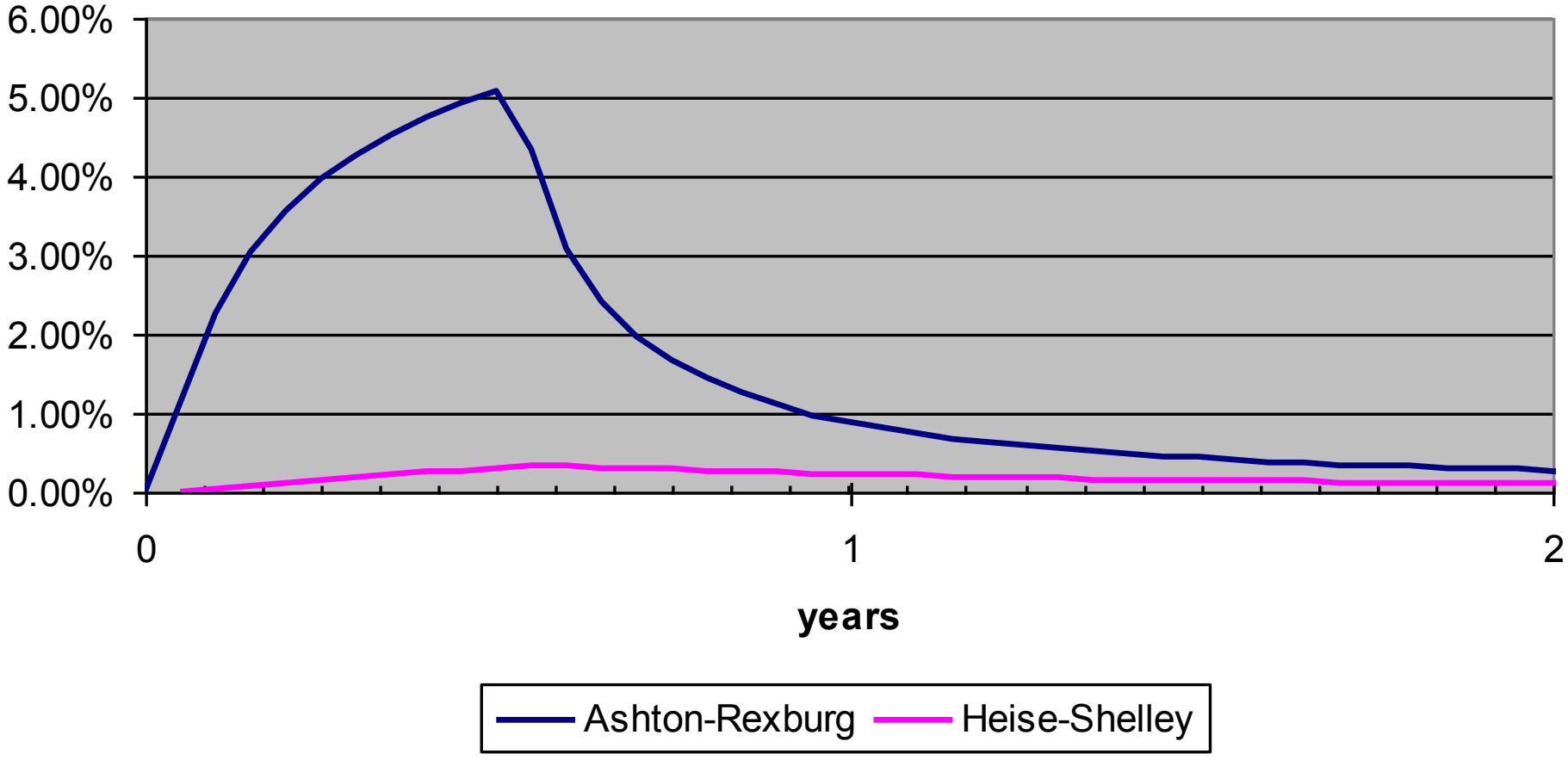


Green = short retention time in aquifer

Tan = long retention time in aquifer

Developed using ESPA Ground Water Model

Modeled Return Time to the Ashton-Rexburg and Heise-Shelley reaches of the river due to a one-time recharge event in FMID



Effects of Managed Recharge in ESPA

Above American Falls (Including Henrys Fork):

- In general short retention time, with most back to the Snake River within weeks to months.
- This can extend the availability of natural flow during the irrigation season, reducing storage use and resulting in more carry-over in reservoirs.
- Recharge in Henrys Fork may benefit Mud Lake area

Below American Falls Reservoir:

- In general long retention time and long-term storage of water in aquifer.
- Recharge above Thousand Springs has short retention time but augments spring flows.

All ESPA Recharge Since 2008

Total Recharged = 188,604 acre-feet

73.5 % Above American Falls (including Henrys Fork)

26.5% Below American Falls

All ESPA Recharge Retained Since 2008

Total Estimated Retention = 44,100 acre-feet

21.3 % Above American Falls (including Henrys Fork)

78.7% Below American Falls

Note: volume shown here differs slightly from volumes shown earlier in presentation because this analysis was done for IWRB while recharge was still occurring in fall of 2010 and includes 2009-2010 recharge plus 5,000 AF done in 2008.

Pending ESPA Managed Recharge Issues

- IWRB moving towards prioritizing location of recharge

- IWRB is concerned about continuing to pay the entire program cost
  - CAMP funding mechanism not yet in place to fund recharge
  - IWRB is concerned that water users on the Eastern Snake Plain are not contributing to program

- Additional constructed capacity is needed mostly below American Falls

Conclusions

•Managed recharge program already underway for ESPA including Henrys Fork.

•Swan Falls Reaffirmation Agreement limits managed recharge to 100,000 acre-feet annually though 2019, and existing program is almost at this point.

•Egin Lakes and canals in Henrys Fork area are already in use to accomplish recharge and Egin is under consideration for expansion.

•Modeling shows short retention time in aquifer for water recharged in Henrys Fork.

Questions and Discussion