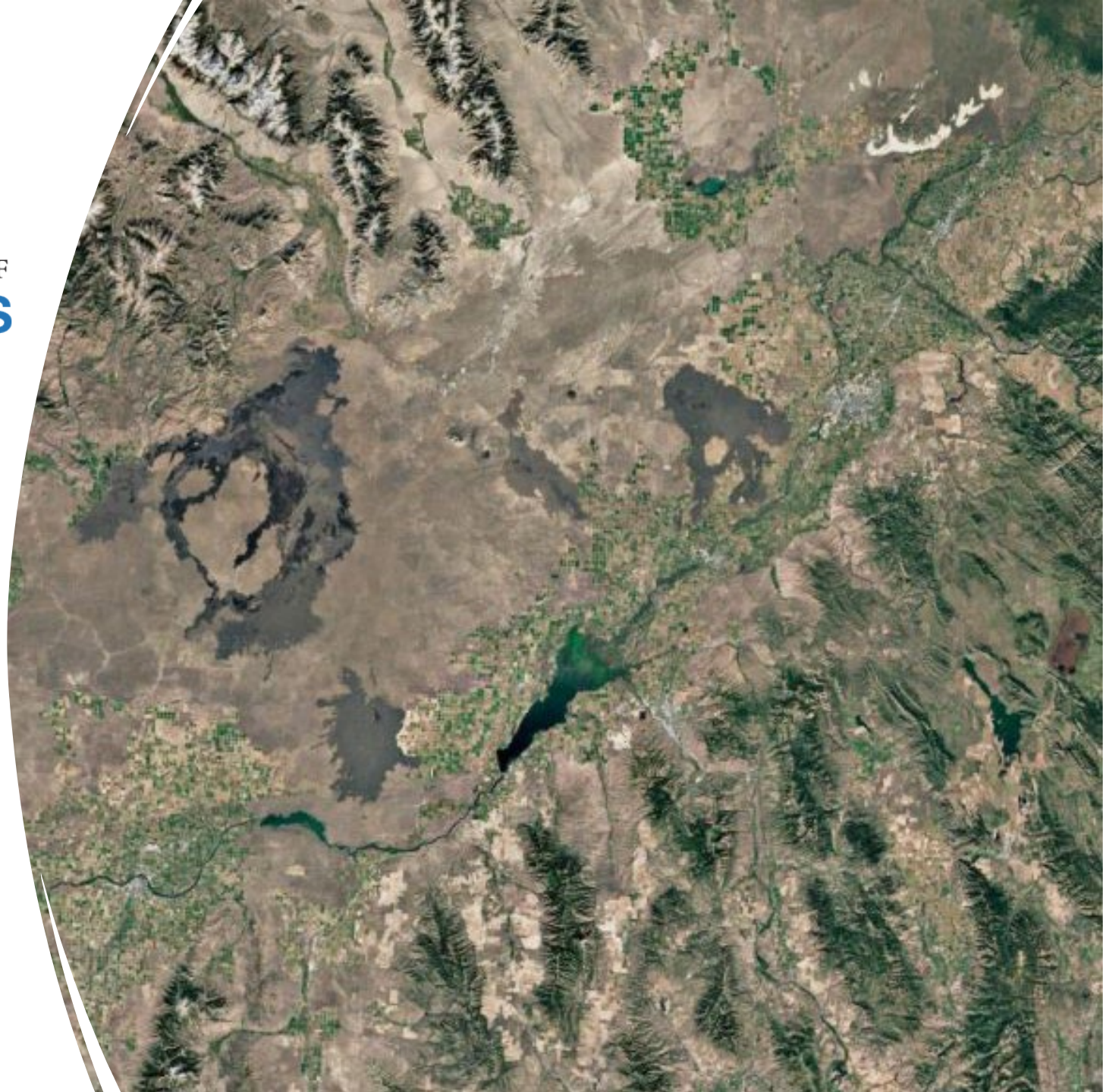
IDAHO DEPARTMENT OF
WATER RESOURCES

Hydrology of the Eastern Snake Plain & Its Tributaries

Presented by: Matt Anders
March 24-26, 2025



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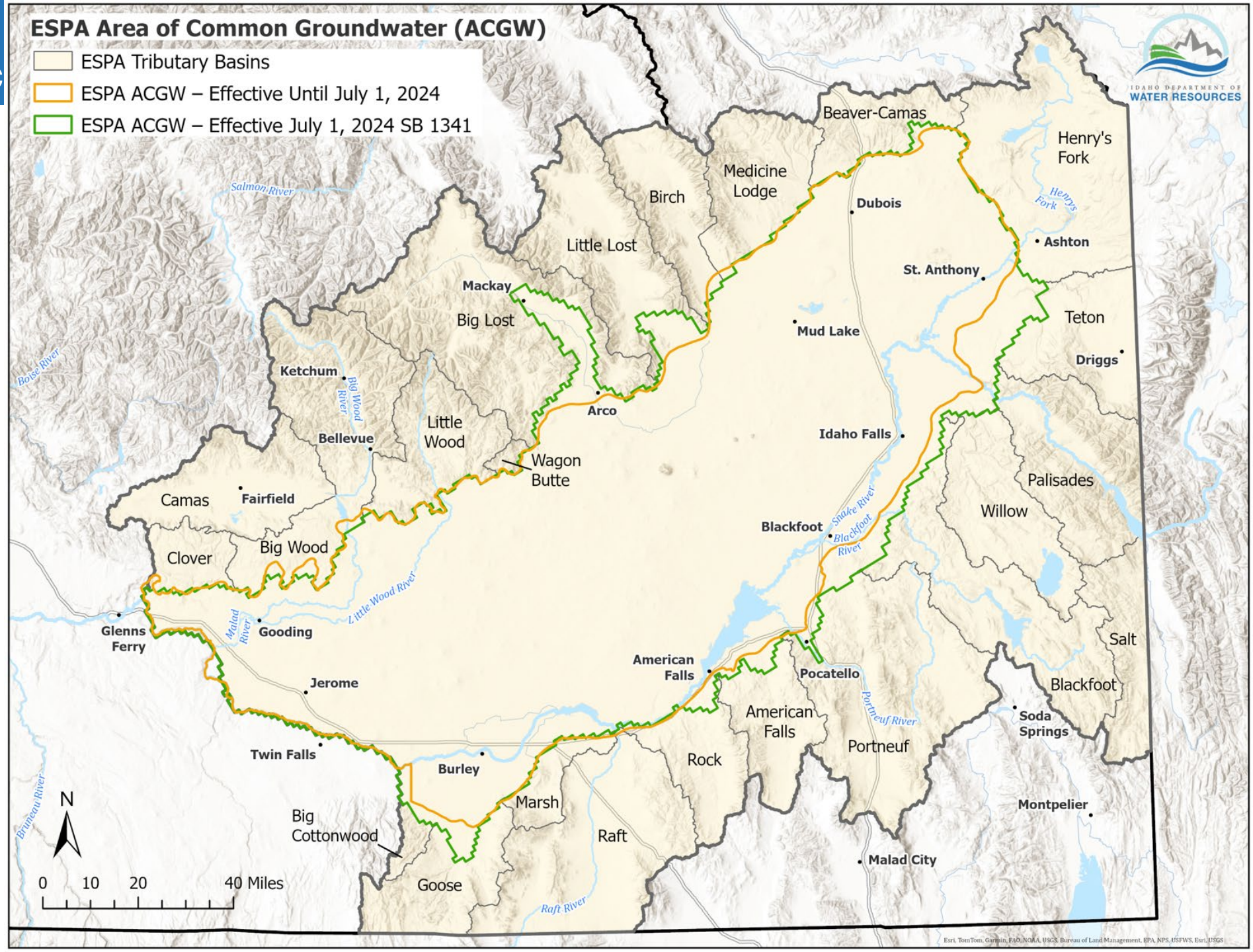
Eastern Snake Plain Aquifer (ESPA) & Tributary Basins

Area of Common Groundwater

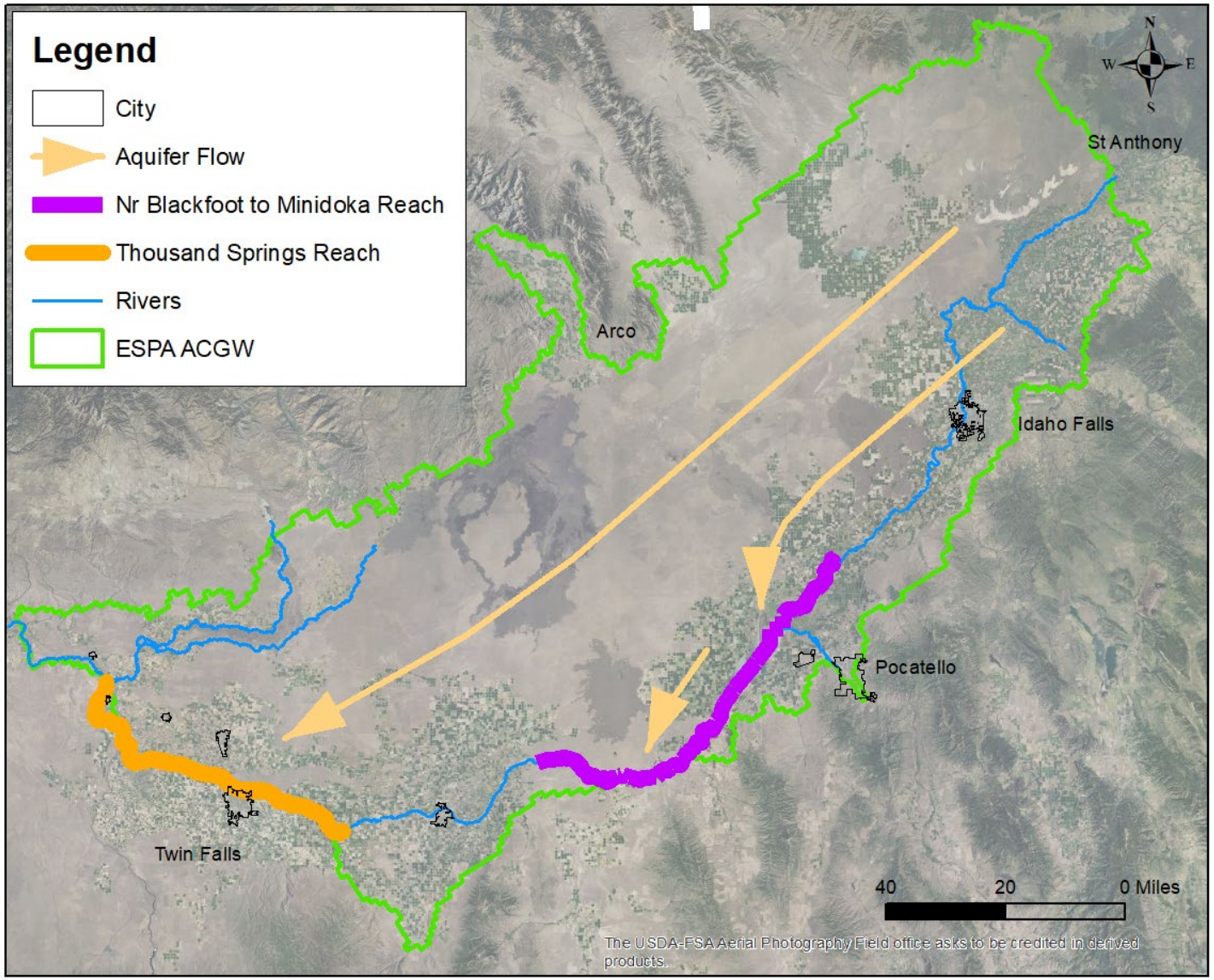
vs.

Tributary Basin



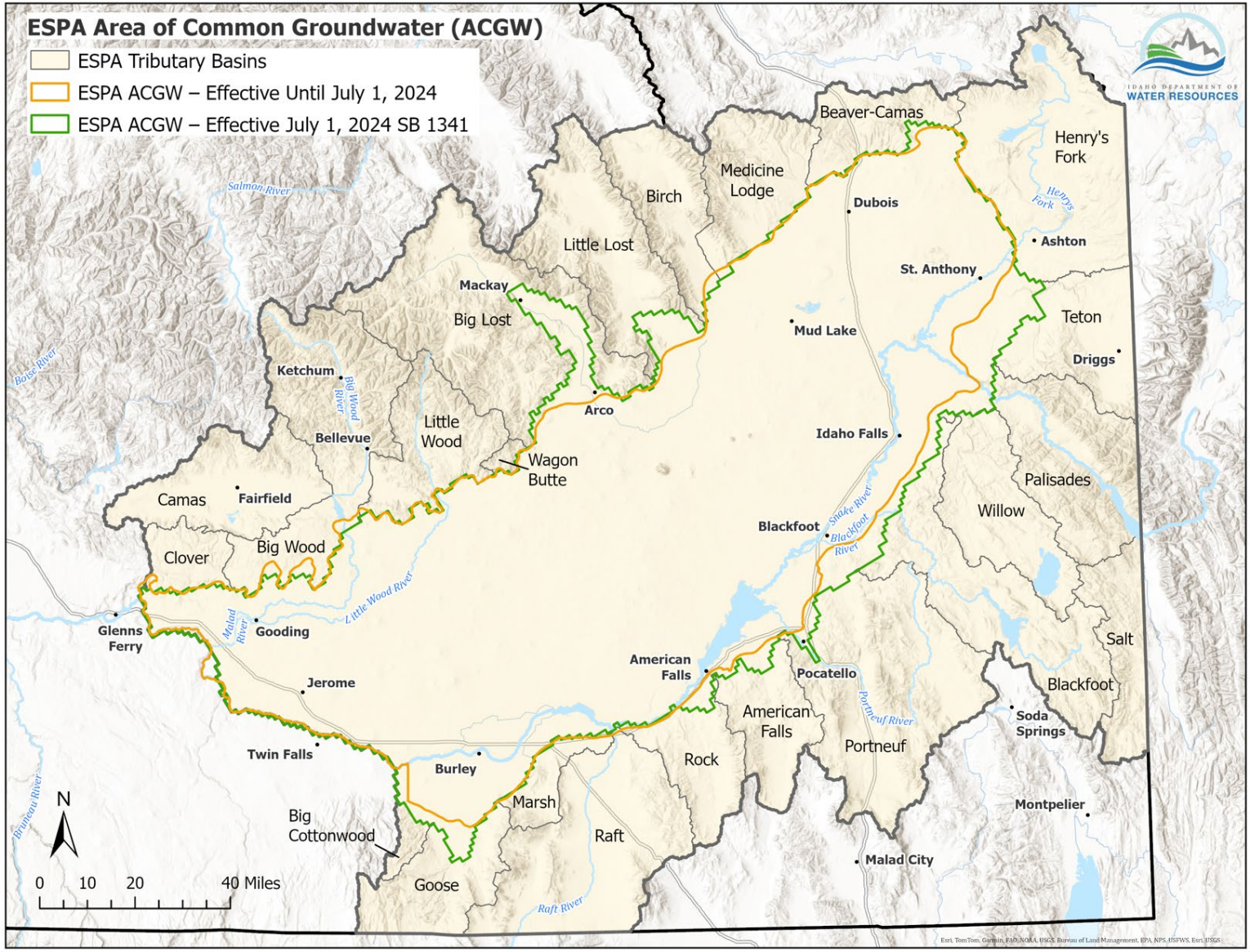
ESPA Surface & Groundwater Connection

- Groundwater flow is NE → SW
- ESPA discharges to Snake River
  - 1,000 Springs Reach
  - Near Blackfoot to Minidoka Reach
    - The natural flow water supply for the SWC.

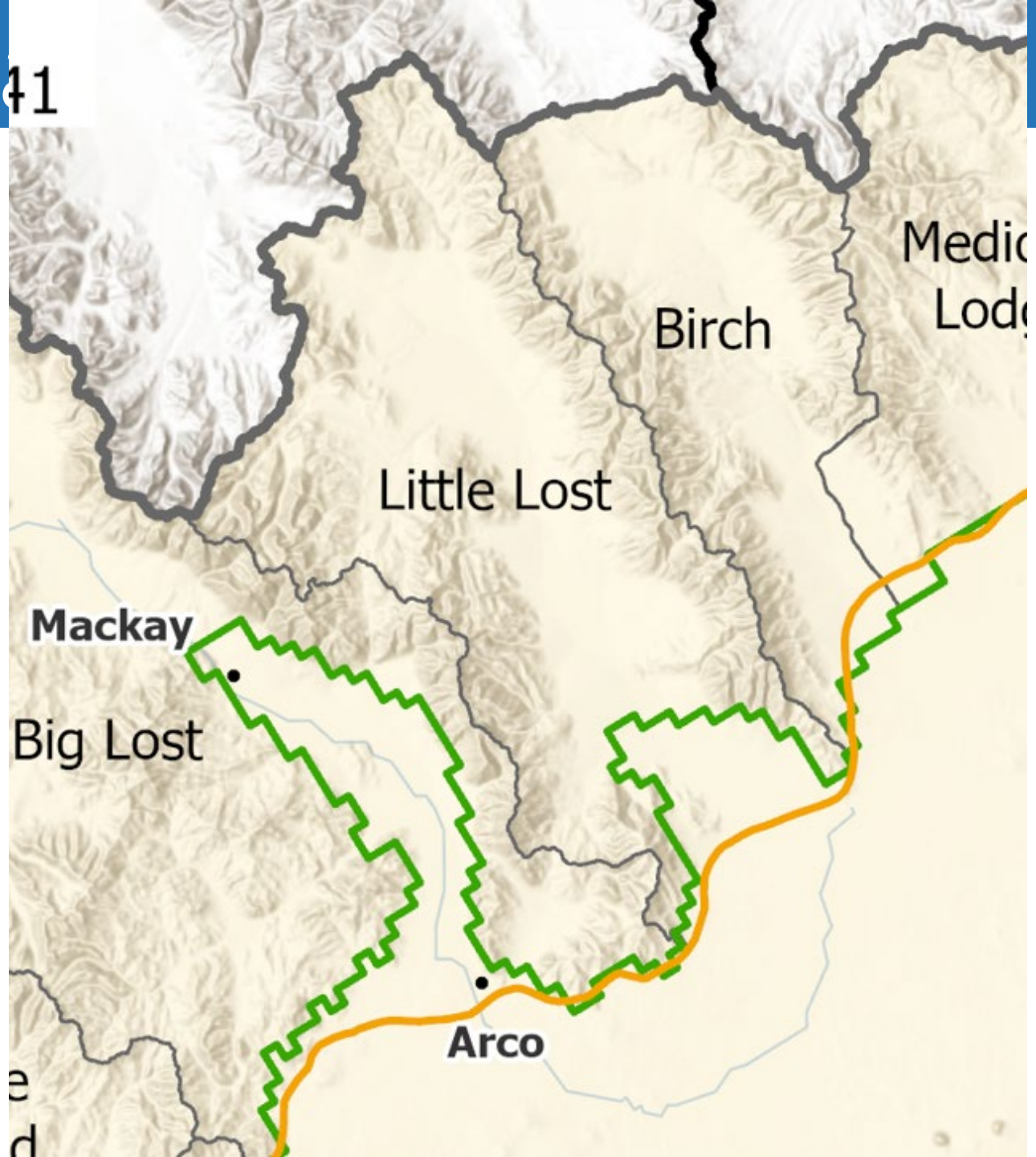


Tributary Basin Connection to ESPA

- U.S. Geological Survey mapped surface water drainage basins in the 1970s.
- Groundwater basin boundaries generally coincide with surface water basin boundaries.
- Groundwater divides in valley bottoms can be challenging
  - Bancroft-Lund GW divide
  - Arbon Valley GW divide



Birch
Little Lost
Mackay
Big Lost
etchum
Big Wood River
Bellevue
Little Wood
Arco
Wagon Butte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Little Lost
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American
Falls
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Portneuf Rive
American
Falls
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Portneuf River
American
Falls
Portneuf
Soda
Sprin
Montp
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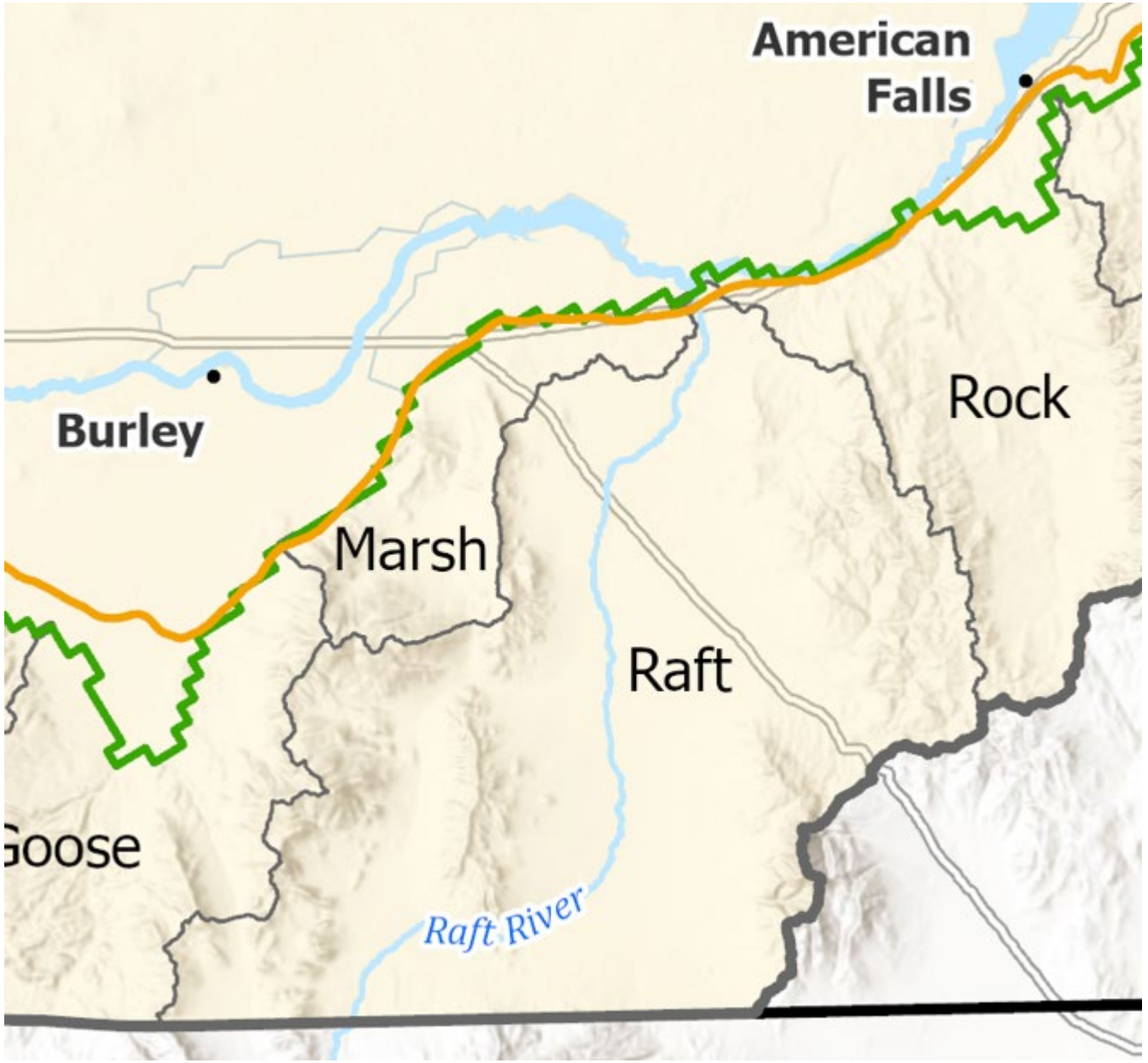
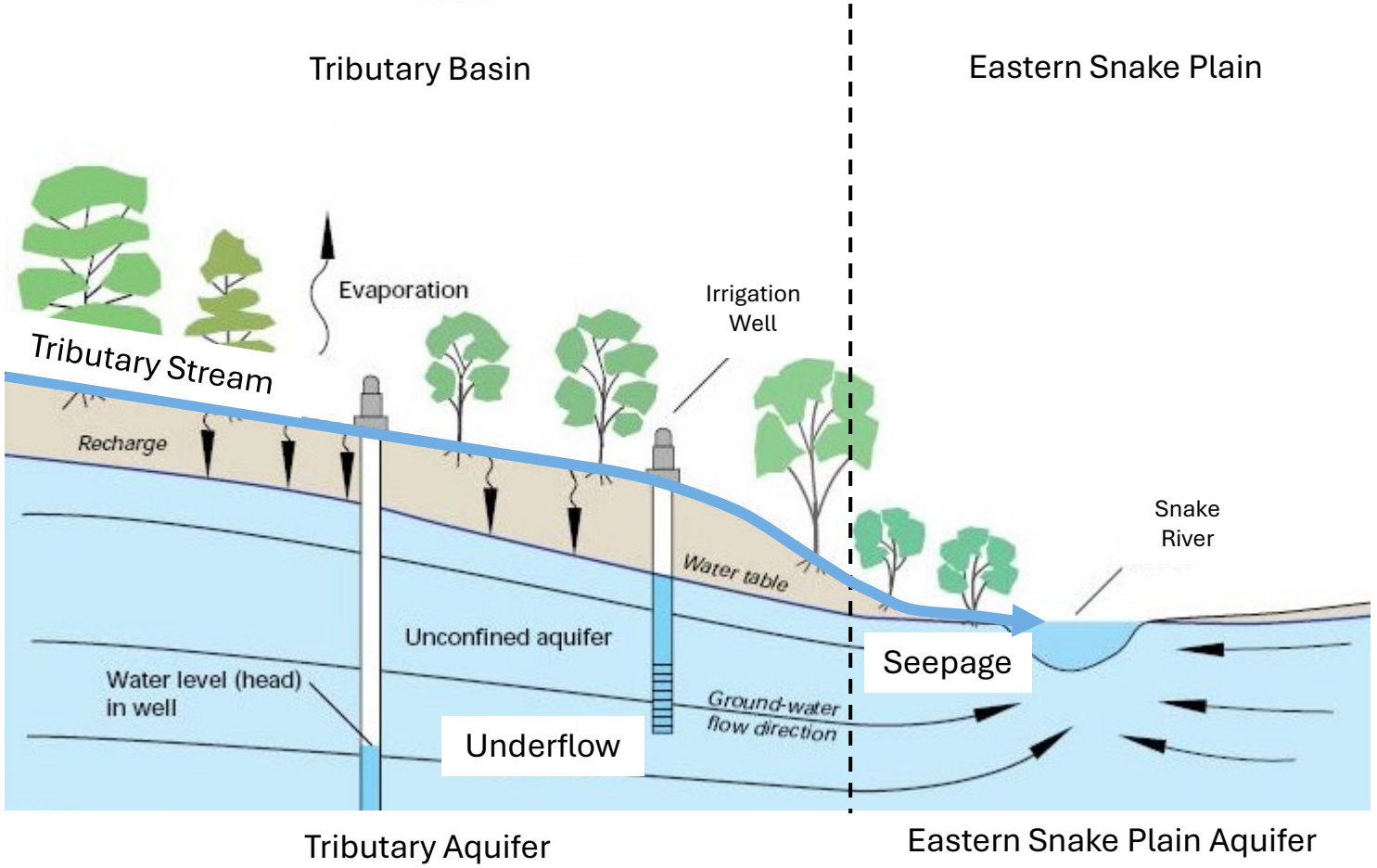
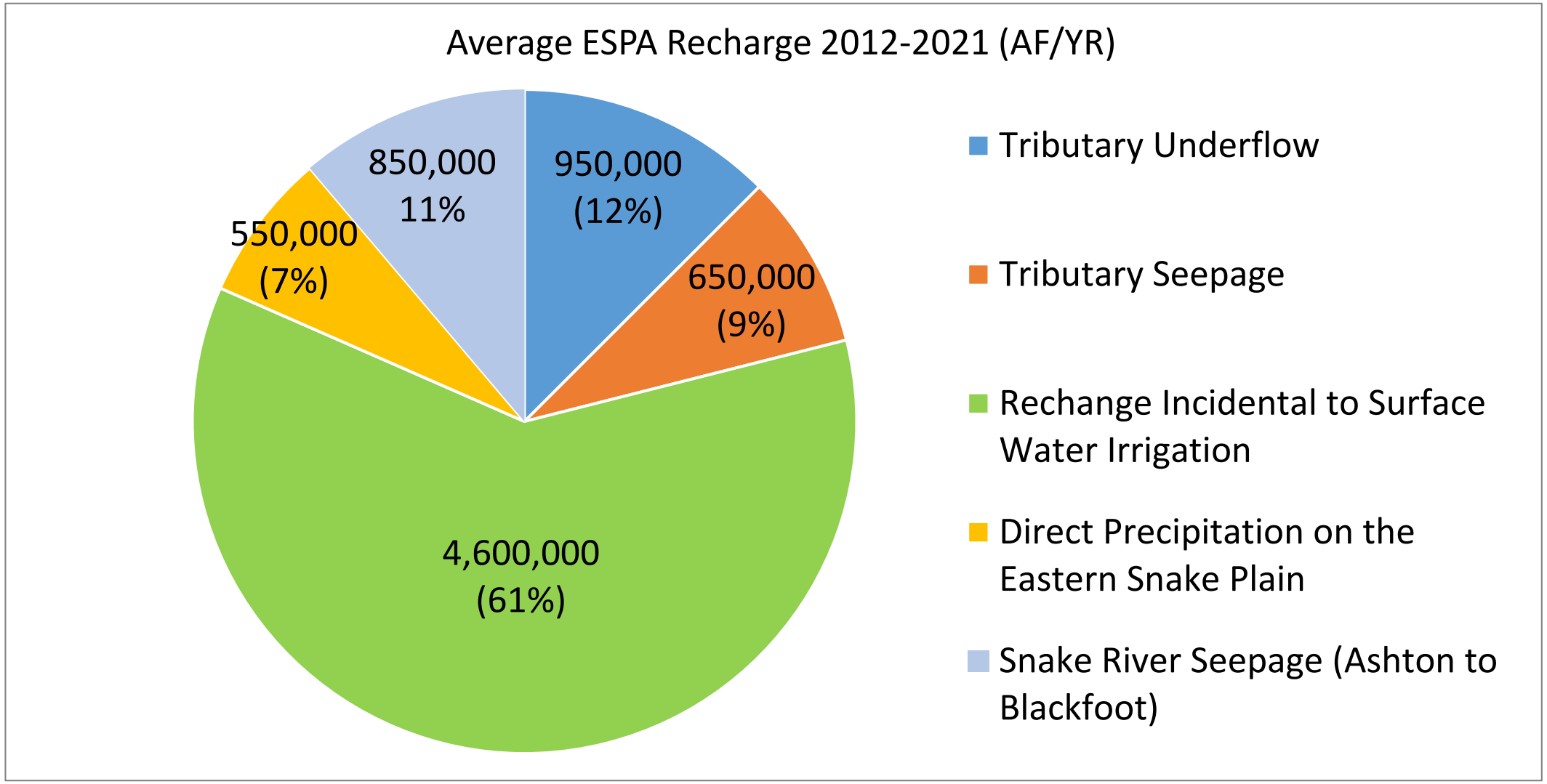

American
Falls
Burley
Rock
Marsh
Raft
Goose
Raft River

Tributary Basin Connection to ESPA

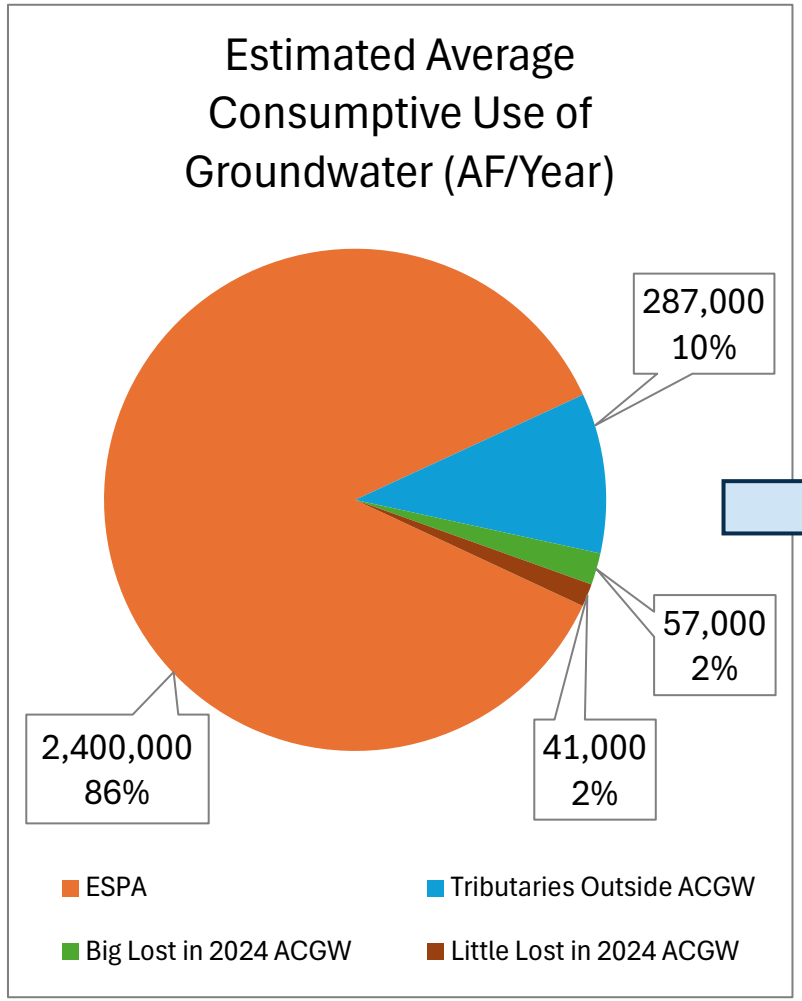
- Surface Connection
  - Tributary stream to Snake River
- Underground Connection
  - Seepage = tributary stream to ESPA
  - Underflow = tributary aquifer to ESPA
- Tributary basins contribute large, small, or intermittent quantities of water to the ESPA.

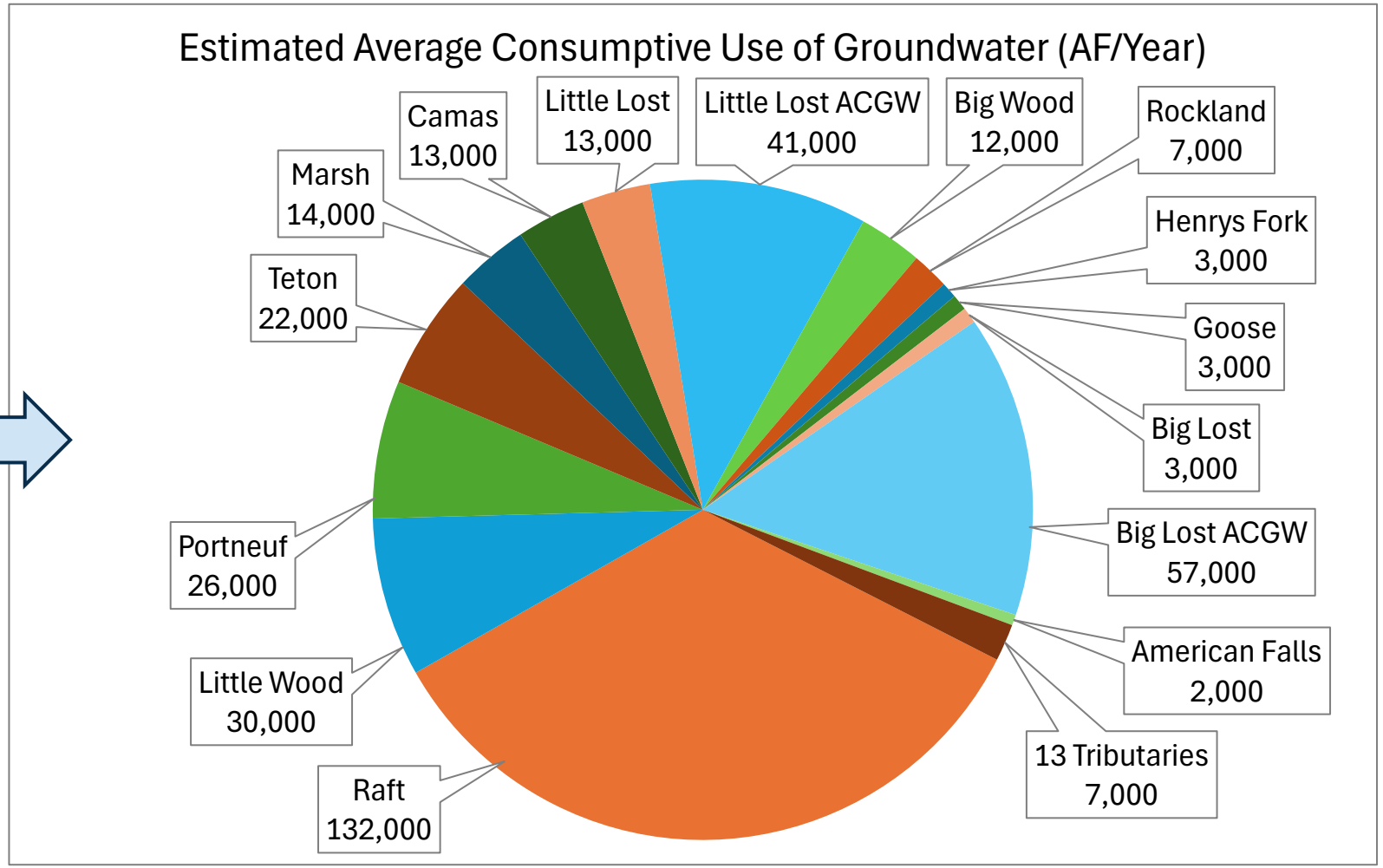


Tributary Basin Connection to ESPA



Tributary Basin Connection to ESPA





- Handout

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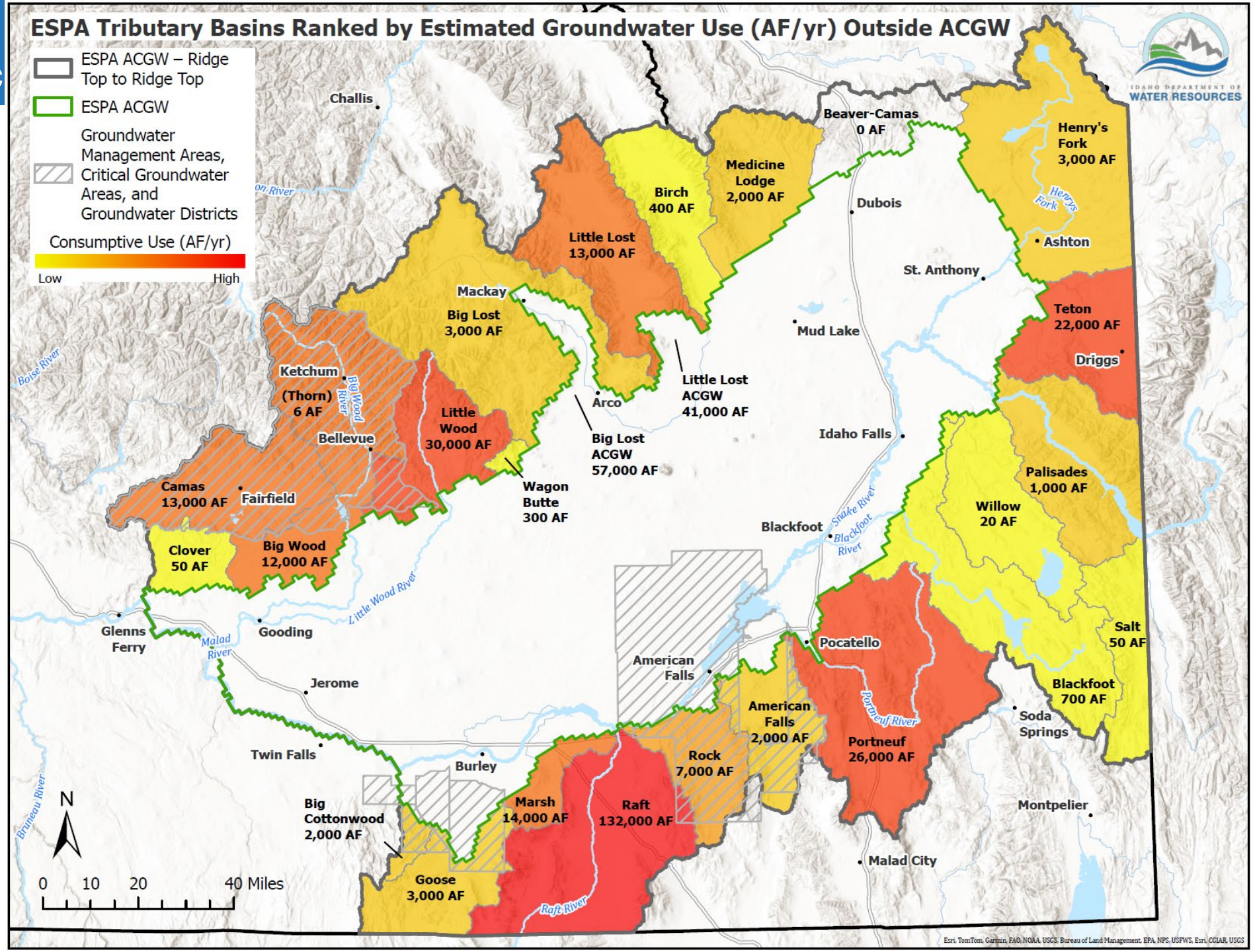
Tributary Basin Connection to ESPA

- Handout



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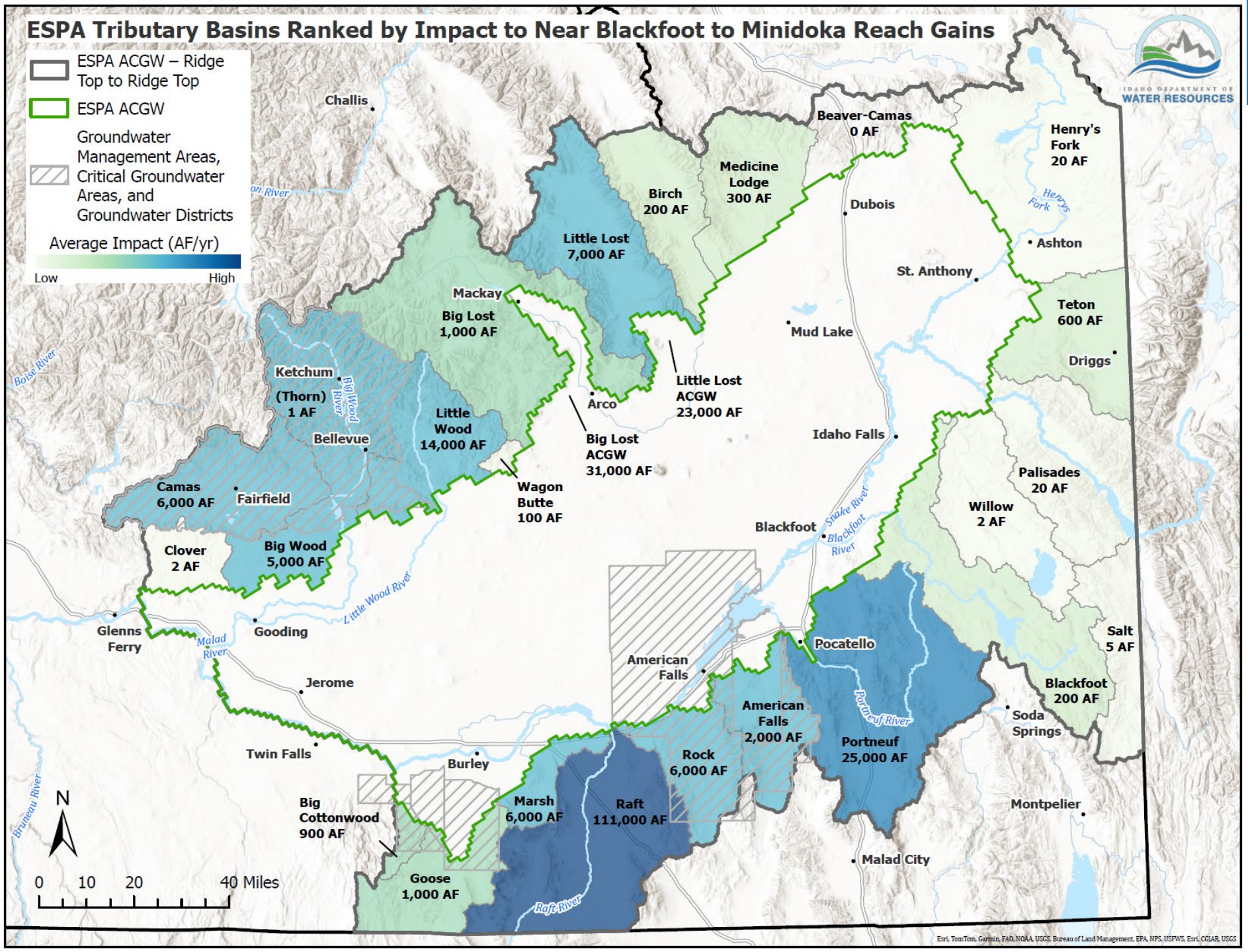
Tributary Basin Connection to ESPA

- Consumptive groundwater use in tributaries reduces water inputs to ESPA.
- Estimated reduction in discharge to the Near Blackfoot to Minidoka Reach due to consumptive groundwater use.
- Handout



Questions?

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WATER RESOURCES

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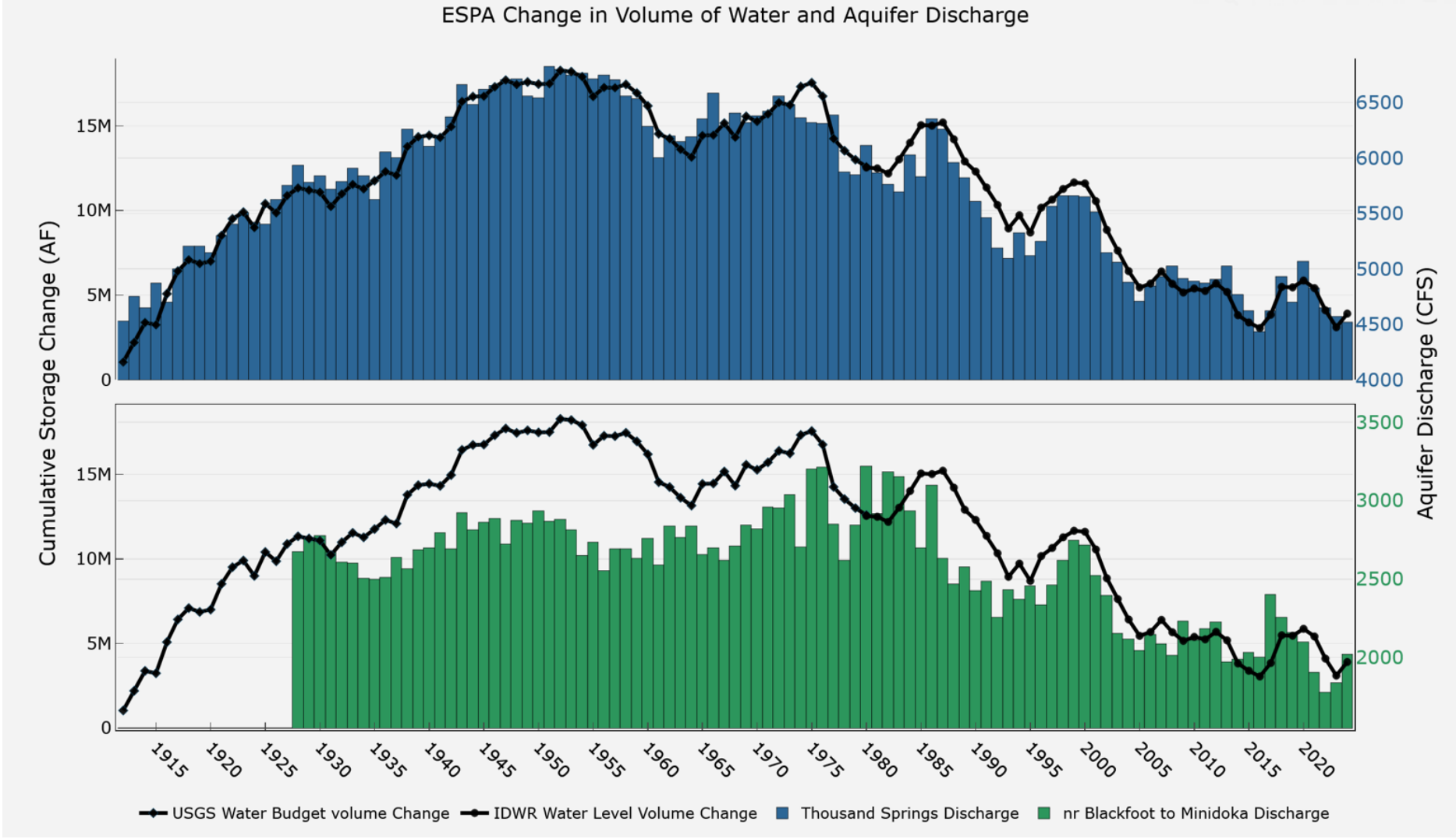
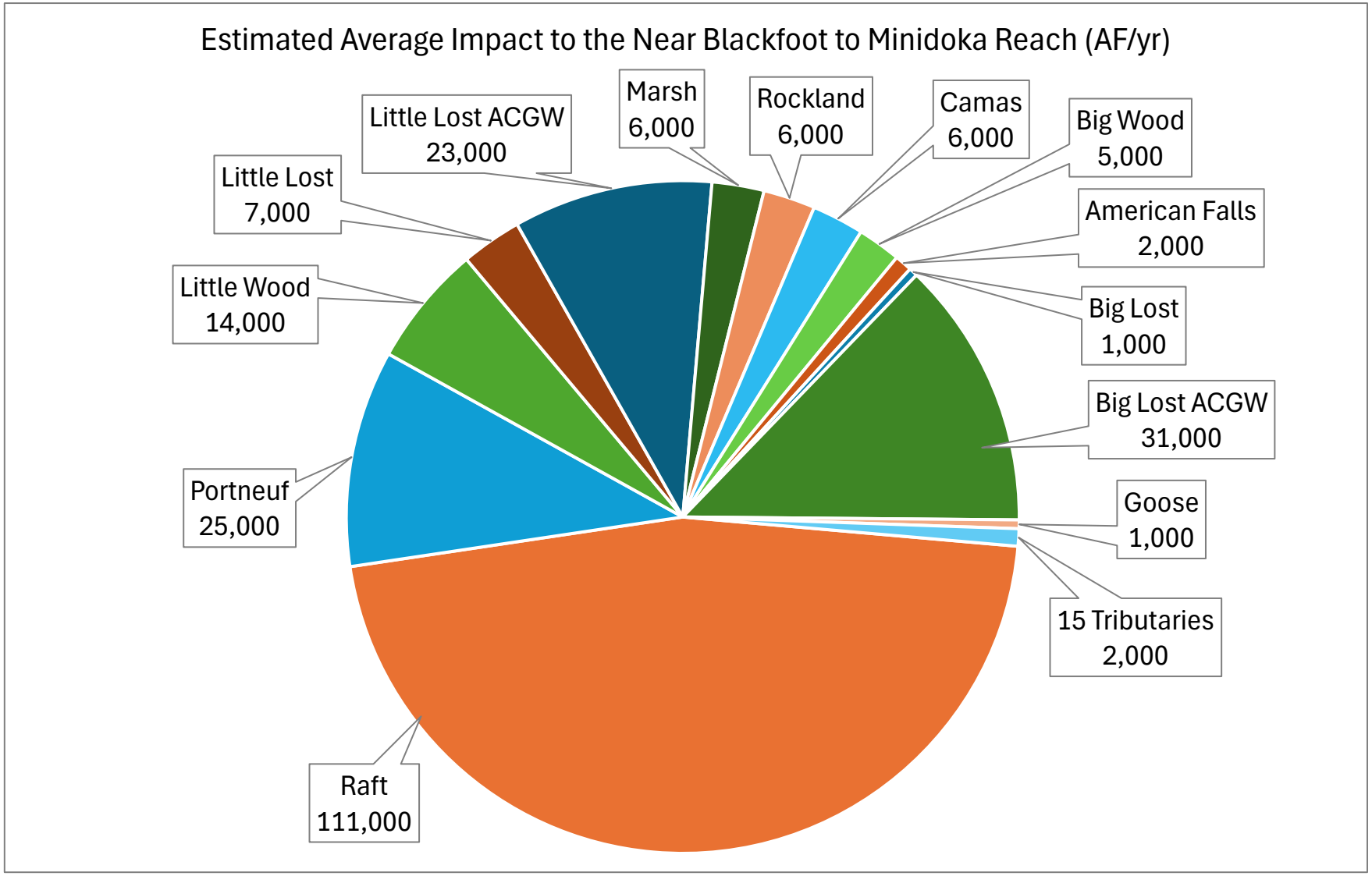
ESPA Surface & Groundwater Connection

- Black line is the change in storage in the ESPA.
- Blue bars are the ESPA discharge to Thousand Springs.
- Green bars are the ESPA discharge to the Near Blackfoot to Minidoka reach.
    - Natural flow water supply for the SWC is declining.

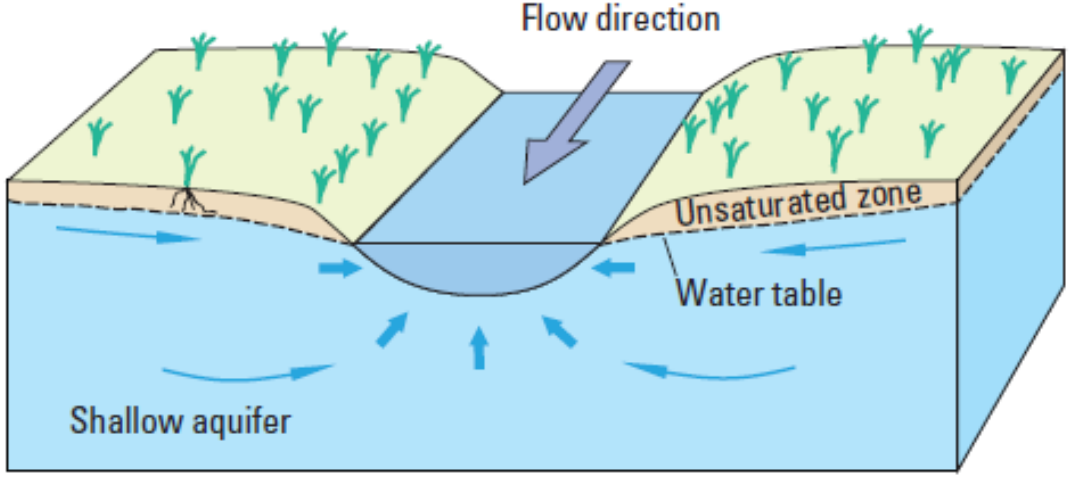


Tributary Basin Connection to ESPA

- Estimated reduction in discharge to the Near Blackfoot to Minidoka Reach due to consumptive groundwater use in tributary basins.

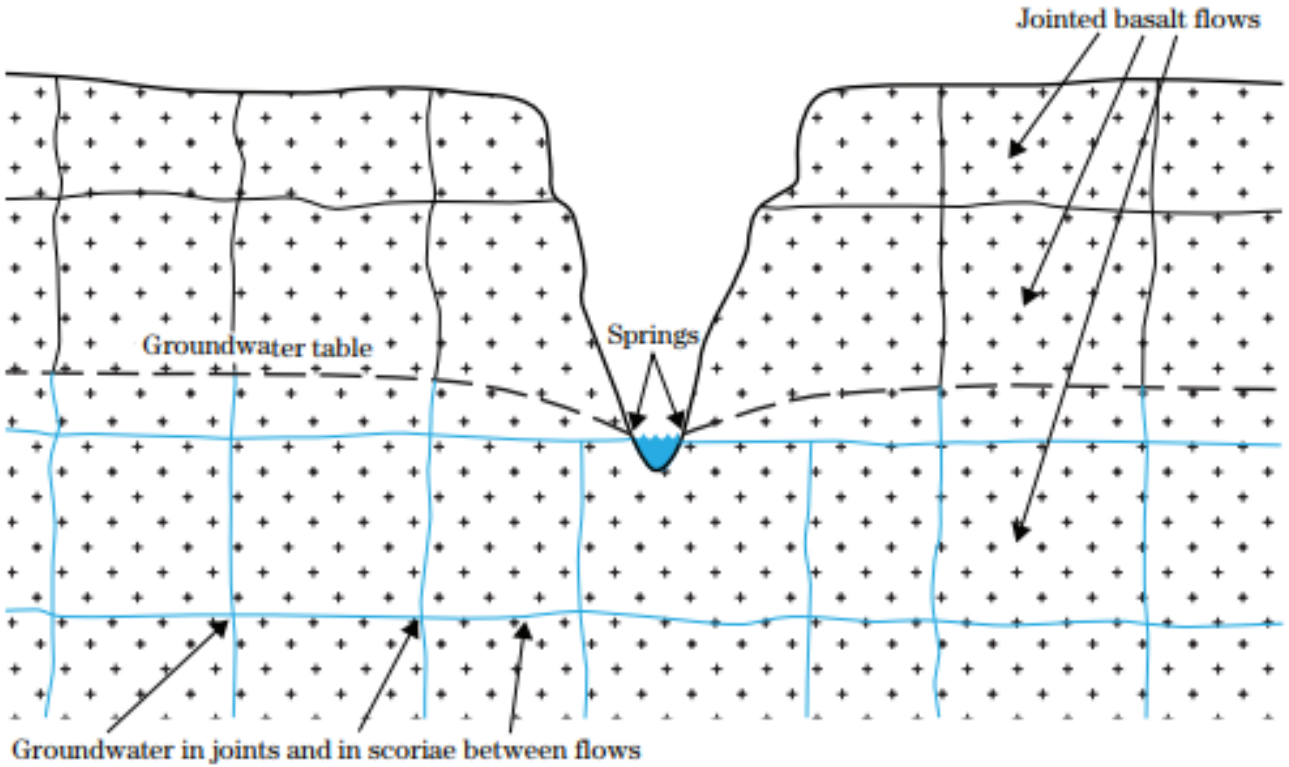


ESPA Surface & Groundwater Connection



From USGS Circular 1376

- Springs occur when the groundwater table intersects the land surface or canyon wall.
- Discharge from springs is controlled by the water level in the ESPA.
- Higher water levels in the aquifer increase discharge at springs, and vice versa.



Tributary Basin Connection to ESPA

Tributary	Estimated Seepage (AF/yr)*	Estimated Underflow (AF/yr)*
American Falls	---	21,000
Big Lost	138,000	80,000
Little Lost	25,000	275,000
Portneuf	---	22,000
Raft	---	30,000

* Estimated using ESPAM 2.2