

*Update on Hydrologic conditions of the  
eastern Snake River Plain aquifer, Idaho  
National Laboratory, Idaho*

Roy Bartholomay

USGS INL Project Office

Email: [rcbarth@usgs.gov](mailto:rcbarth@usgs.gov)

Phone: (208) 526-2157

Website:

[https://www.usgs.gov/centers  
/id-water/science/idaho-  
national-laboratory-  
project-office](https://www.usgs.gov/centers/id-water/science/idaho-national-laboratory-project-office)



# Presentation Overview

- Summarize water availability at INL following two wet years.
- Summarize water quality of constituents and trends of wells sampled at INL.
- Summarize information on recharge and water quality studies in the Magic Valley.



DOE/ID-22242

Prepared in cooperation with the U.S. Department of Energy

**An Update of Hydrologic Conditions and Distribution of Selected Constituents in Water, Eastern Snake River Plain Aquifer and Perched Groundwater Zones, Idaho National Laboratory, Idaho, Emphasis 2012–15**



Scientific Investigations Report 2017–5021

U.S. Department of the Interior  
U.S. Geological Survey

DOE/ID-22180

**TRITIUM IN FLOW FROM SELECTED SPRINGS THAT DISCHARGE TO THE SNAKE RIVER, TWIN FALLS - HAGERMAN AREA, IDAHO, 1994-99**

U.S. GEOLOGICAL SURVEY  
OPEN-FILE Report 02-185

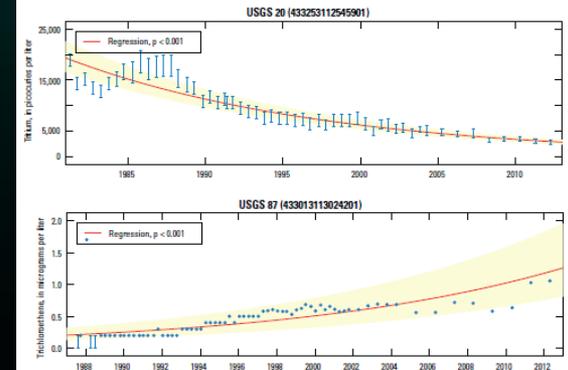


Prepared in cooperation with the U.S. DEPARTMENT OF ENERGY

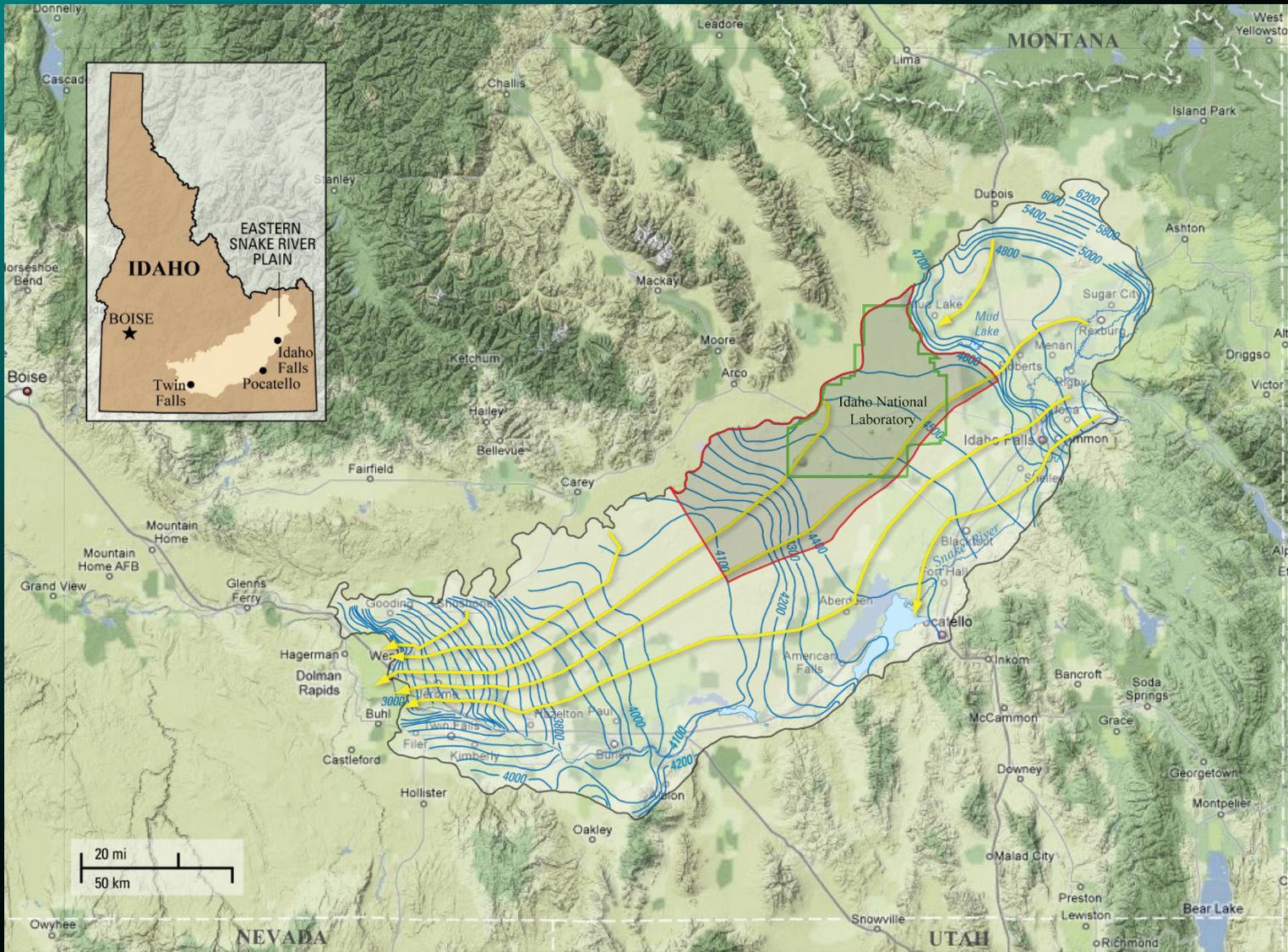
DOE/ID-22233

Prepared in cooperation with the U.S. Department of Energy

**Water-Quality Characteristics and Trends for Selected Wells Possibly Influenced by Wastewater Disposal at the Idaho National Laboratory, Idaho, 1981–2012**



Scientific Investigations Report 2015–5003

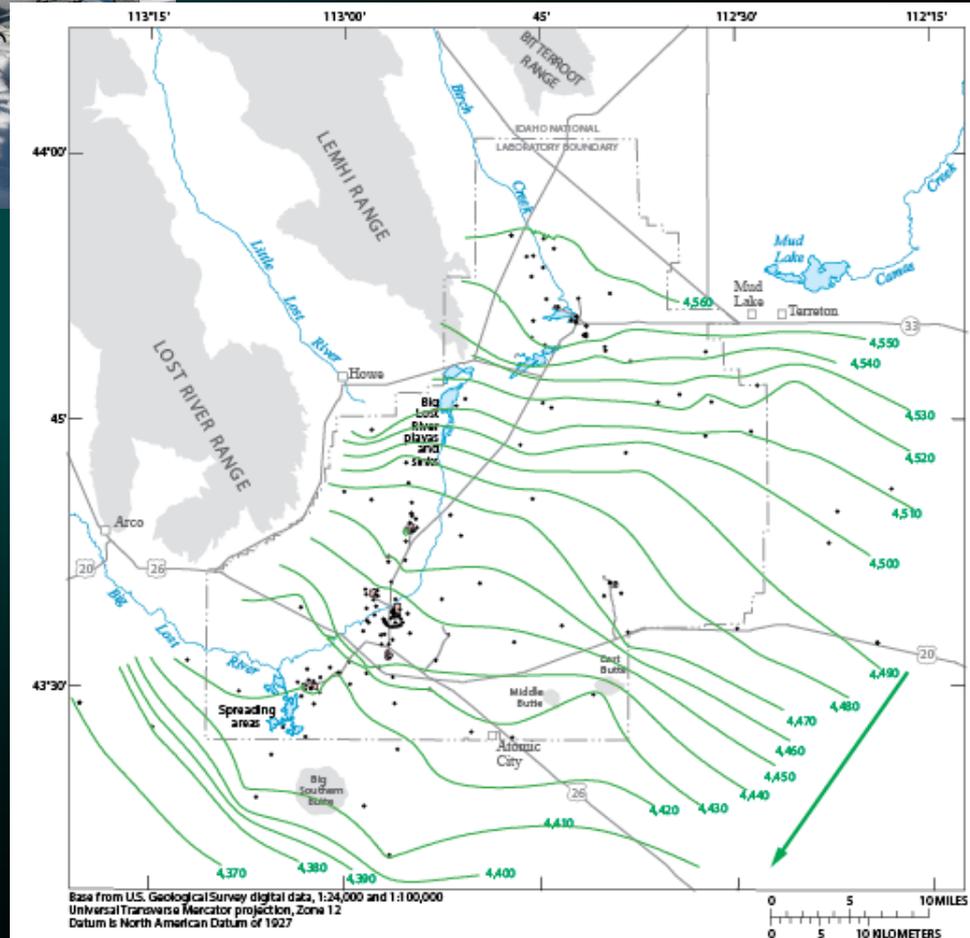


# Water-level Monitoring



Water levels – monthly to annually at 210 wells (8 continuous recorders-2 real-time)

Measurements needed for water availability and model re-calibration

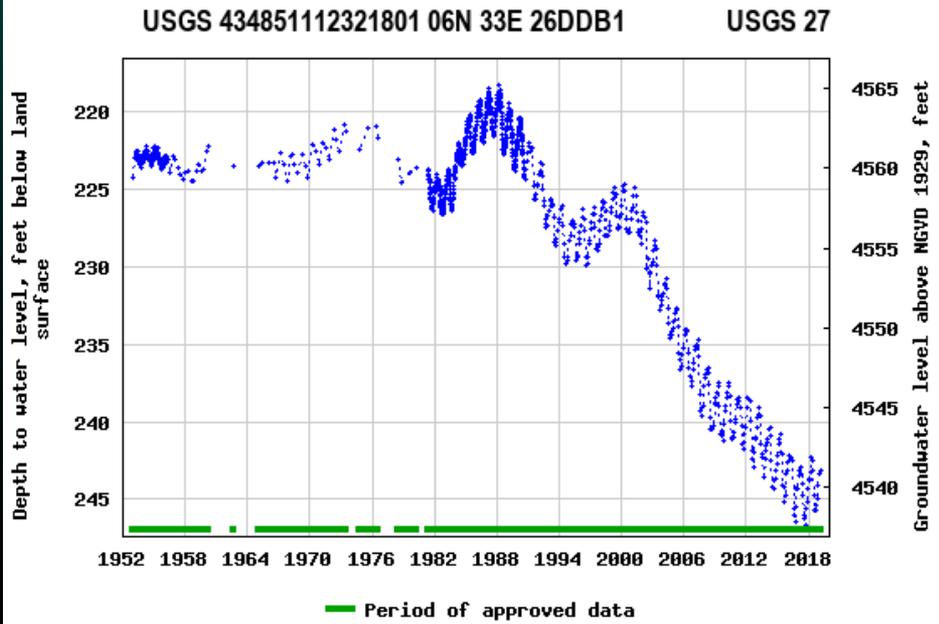
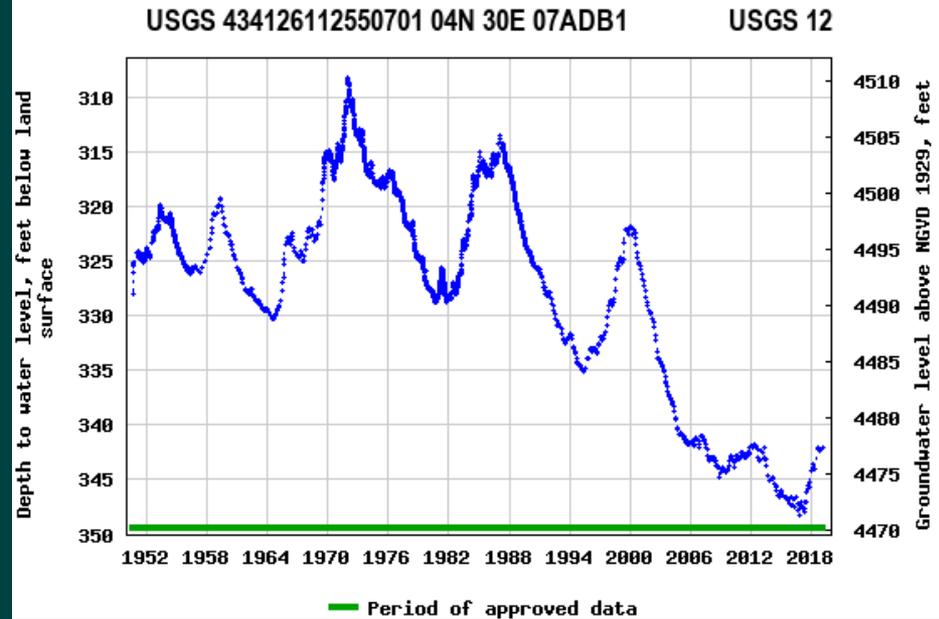


## EXPLANATION

- Water-table contour—Shows altitude of the water table, March–May 2015. Contour intervals are 10 feet. Datum is National Geodetic Vertical Datum of 1929. Contours approximately located.
- General direction of groundwater flow
- Well in the USGS water-level monitoring network at which water level was measured

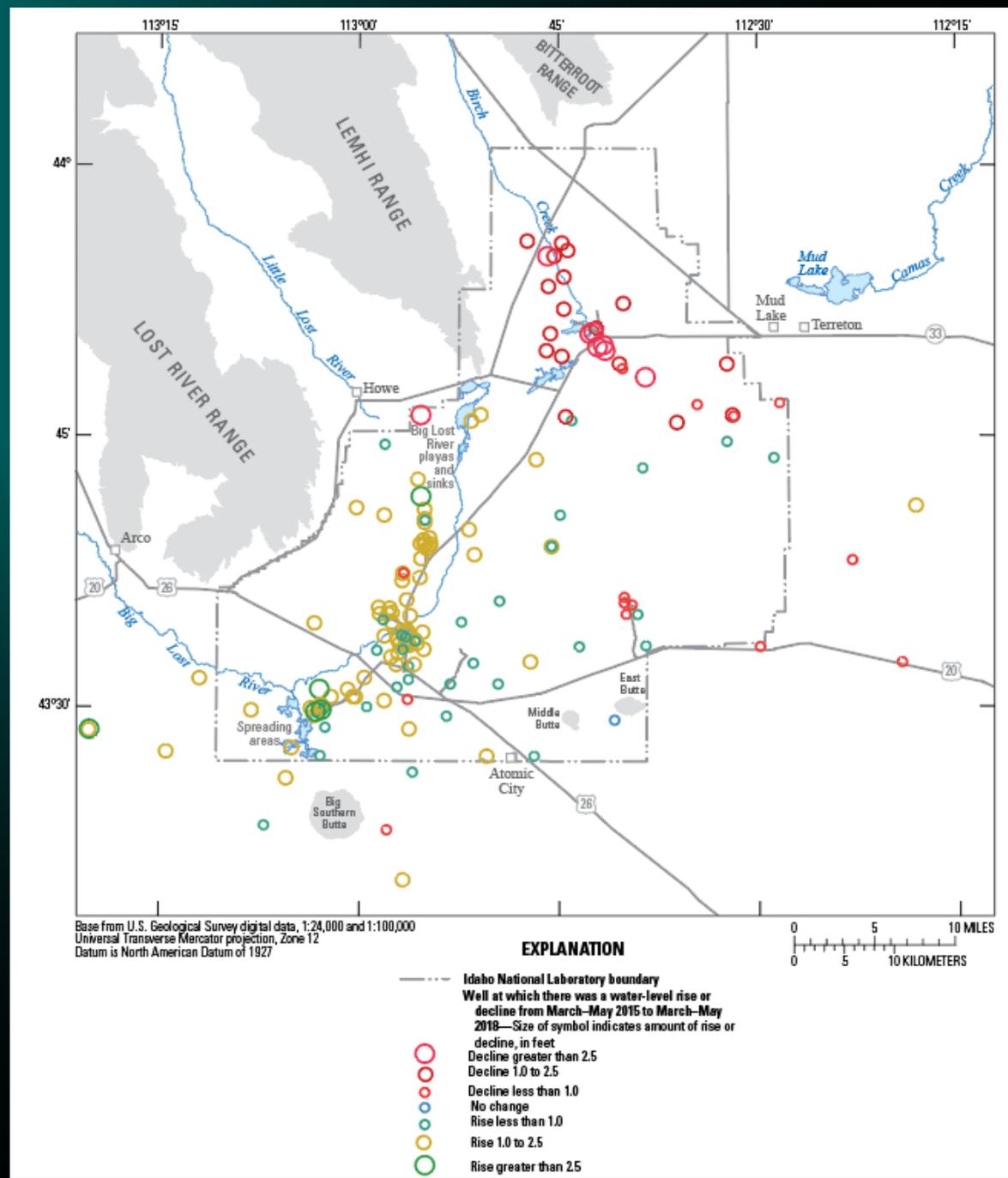
# *Cyclical nature of the Aquifer*

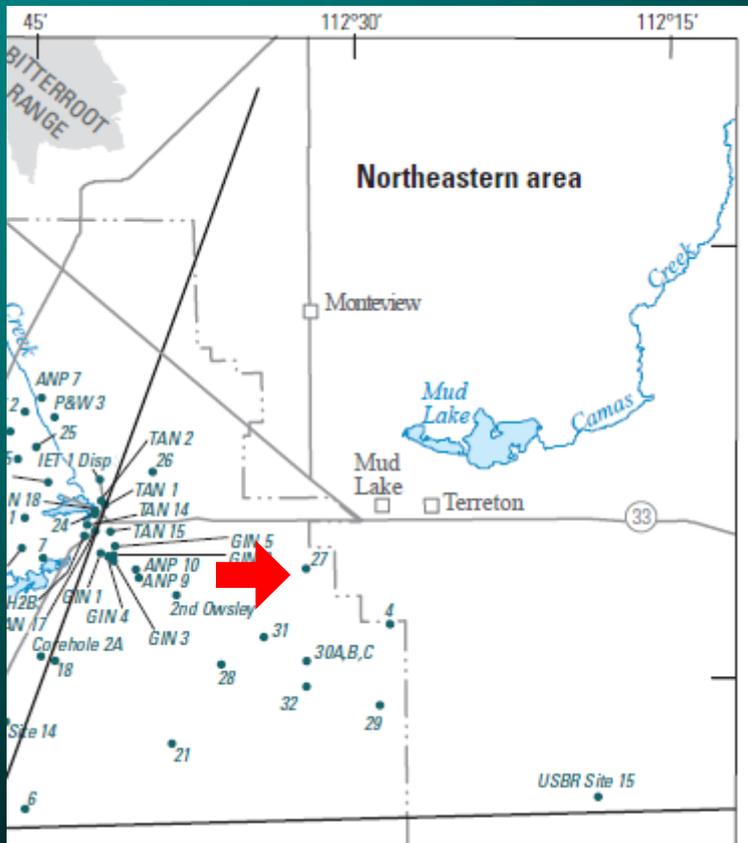
- Eastern Snake River Plain aquifer goes through cycles of increasing and decreasing water levels related to wet and dry cycles.
- After record lows in 2016, water levels in most wells have been increasing



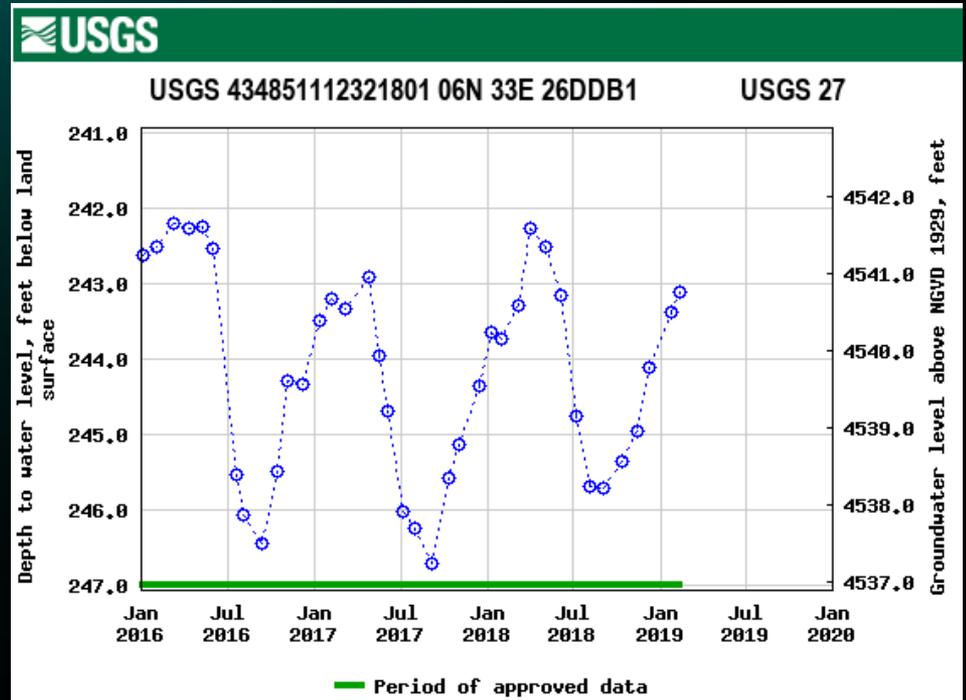
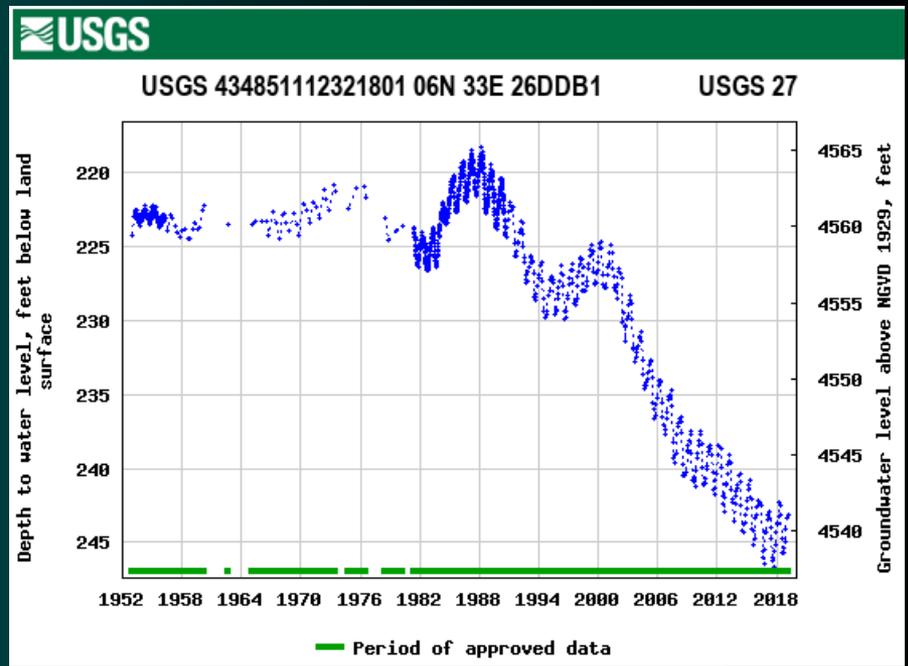
# Water level change from 2015 to 2018

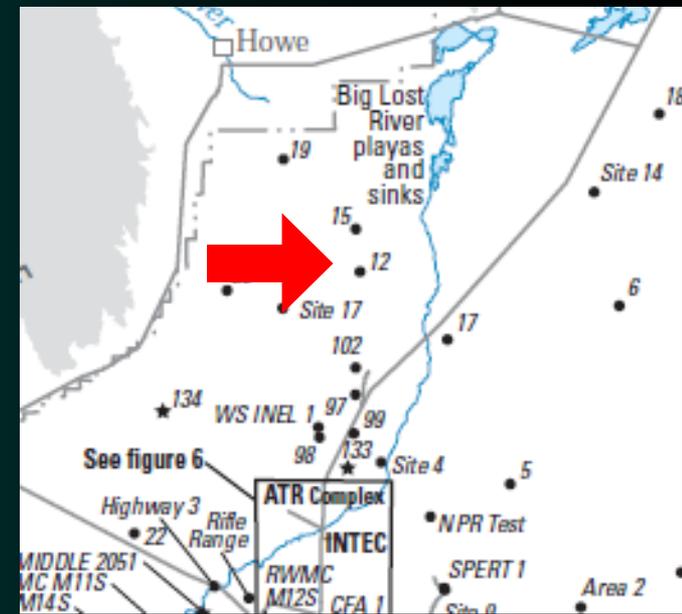
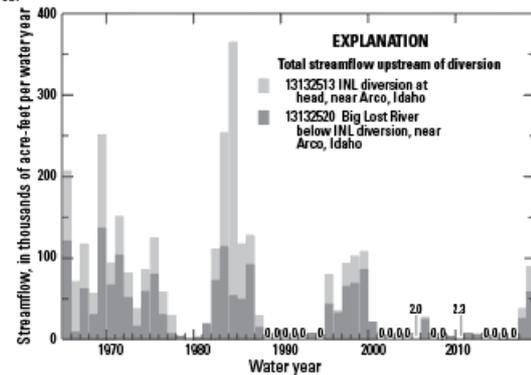
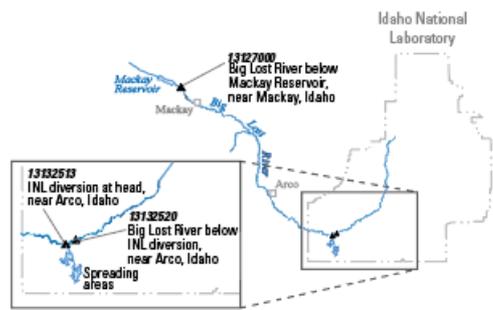
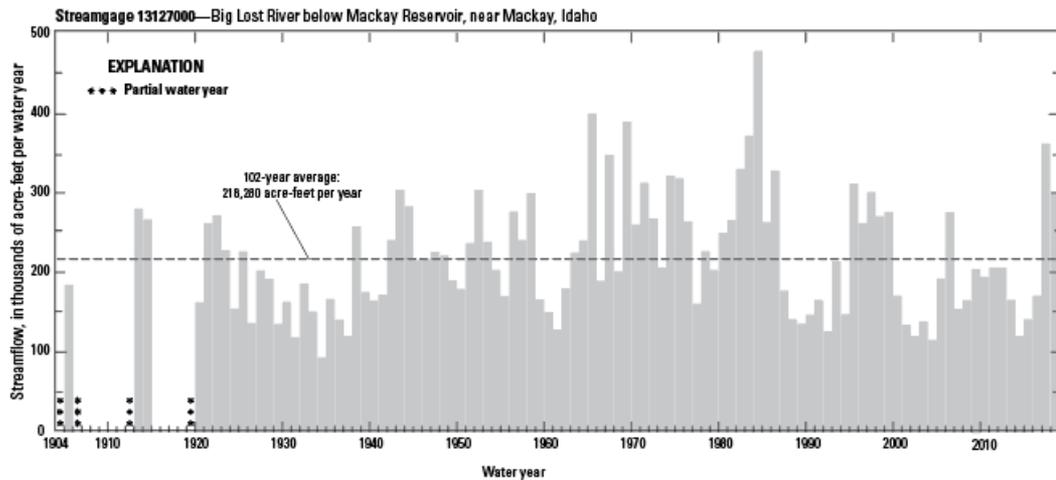
- Water levels in the northern and eastern part of the INL had record lows in 2017, slower to recover
- After record lows in 2016 in western wells, water levels in most wells have been increasing





Northeast-we see influence of groundwater irrigation and larger seasonal variation (4 to 5 ft change)

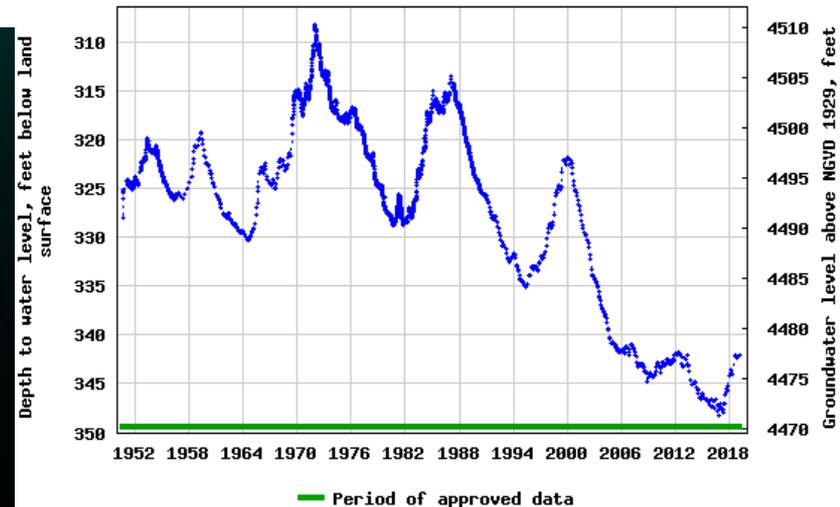




USGS

USGS 434126112550701 04N 30E 07ADB1

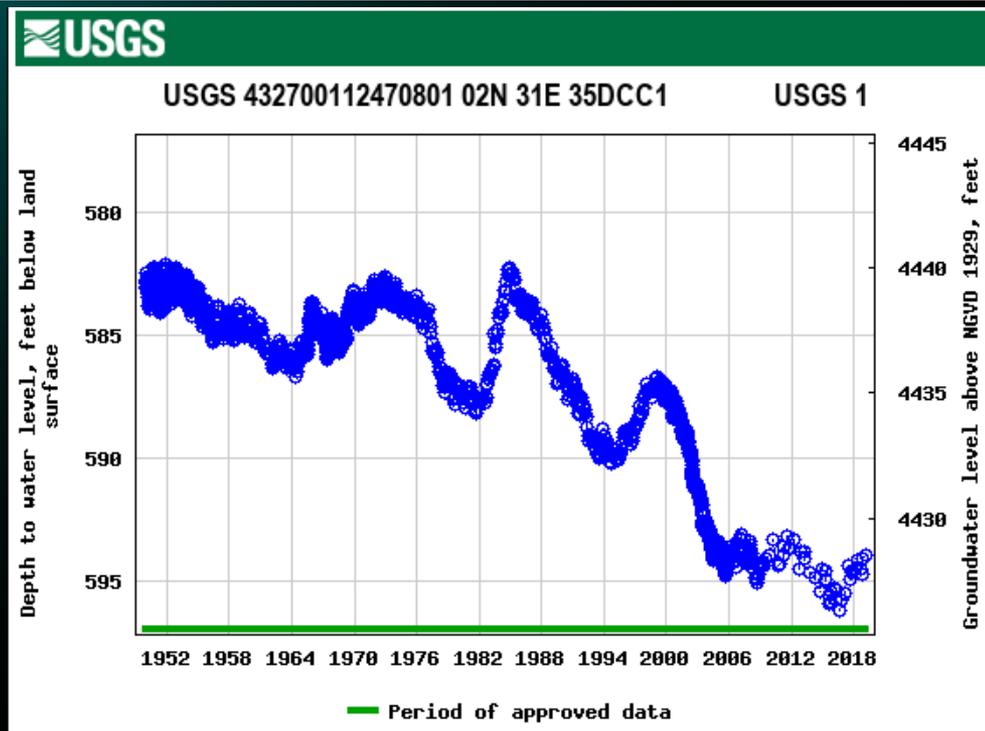
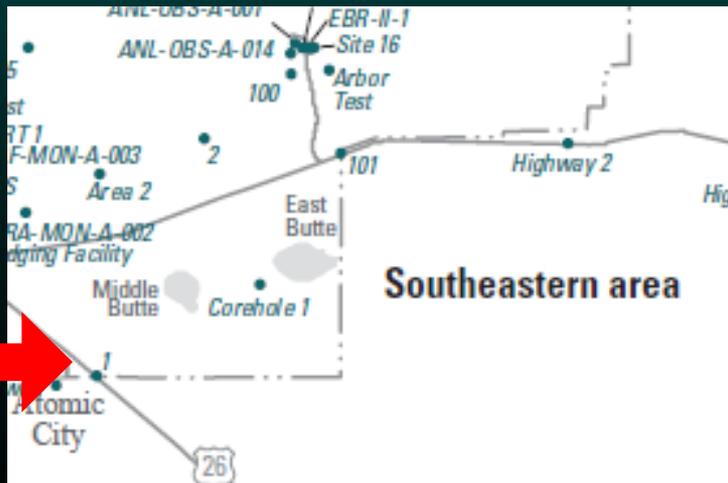
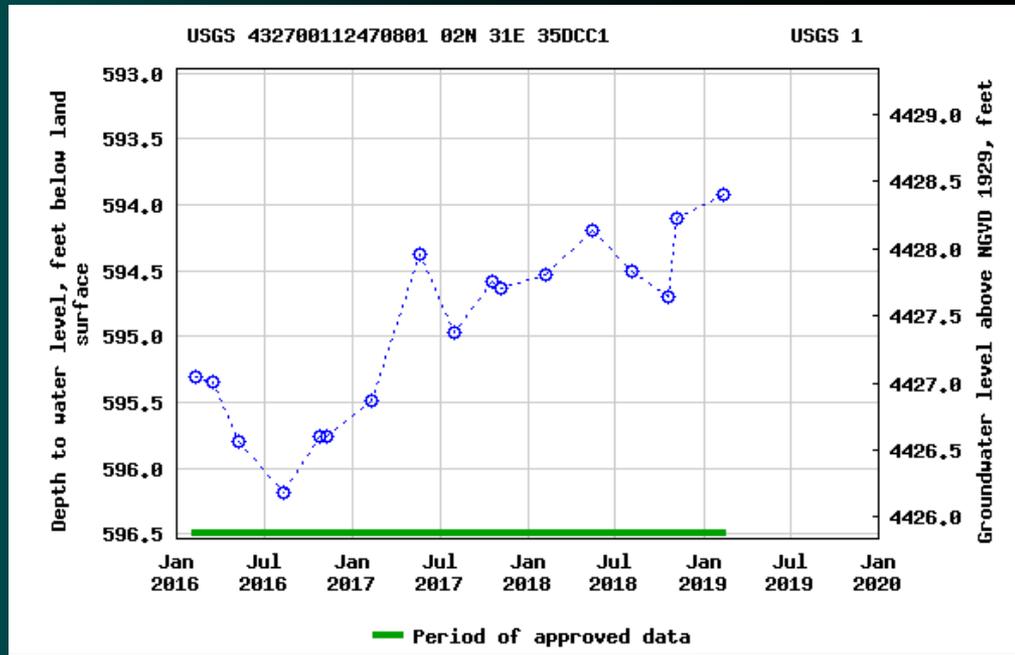
USGS 12

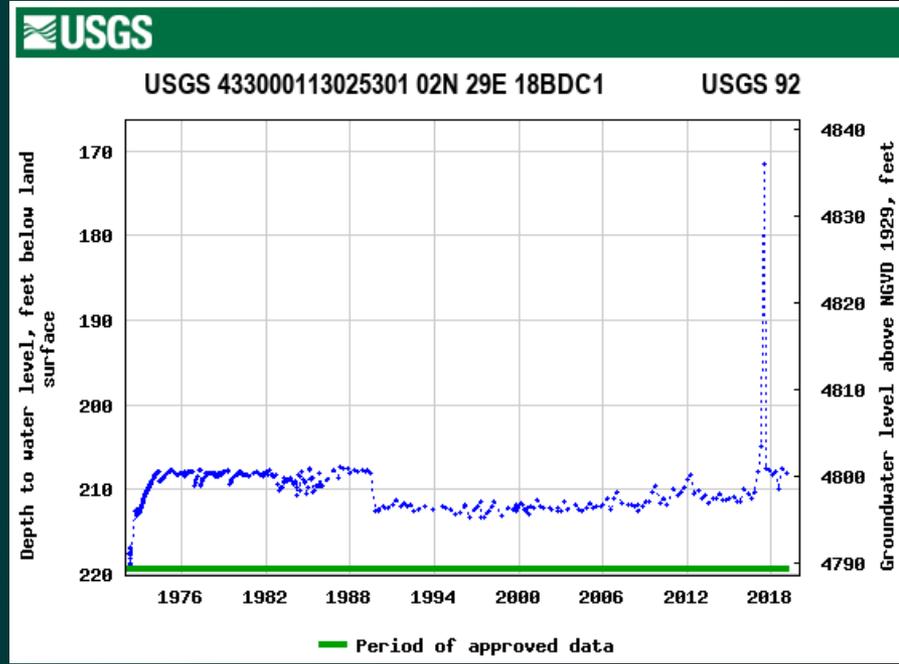
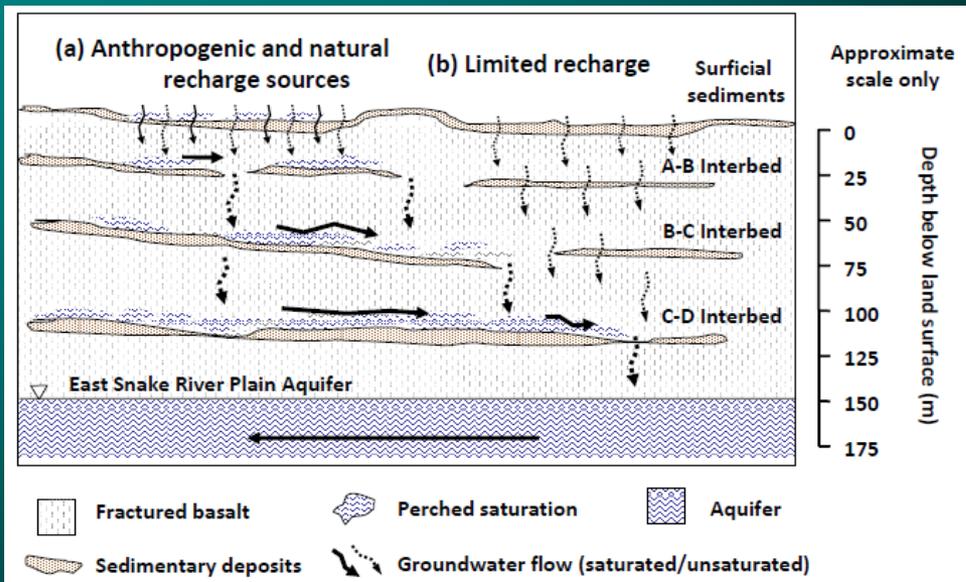


Northwest and southwest more affected by surface water recharge from Big Lost River

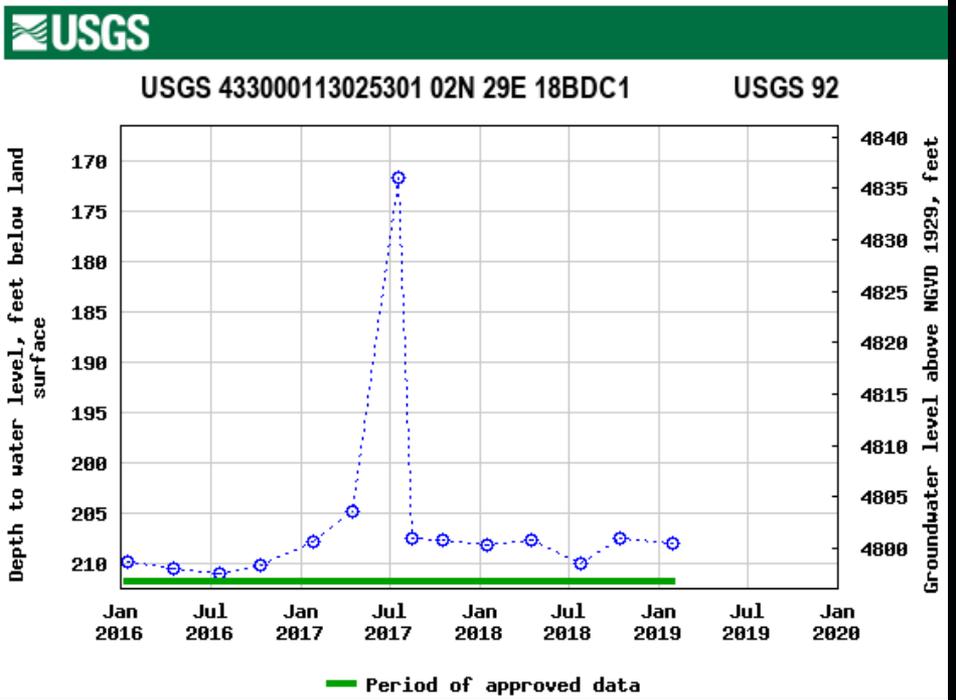
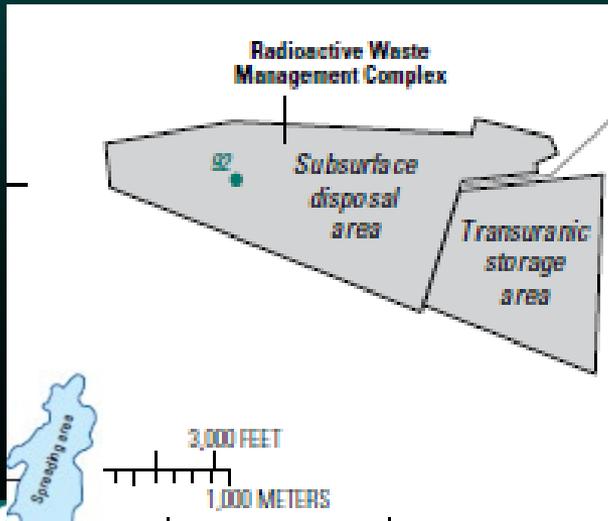


Southeast-see less influence of irrigation or flow in the Big Lost, less seasonal variability (1 to 1.5 ft change) and less overall change





We saw about a 6 ft rise in perched water at RWMC in 2017-18 along with cascading water in July 2017



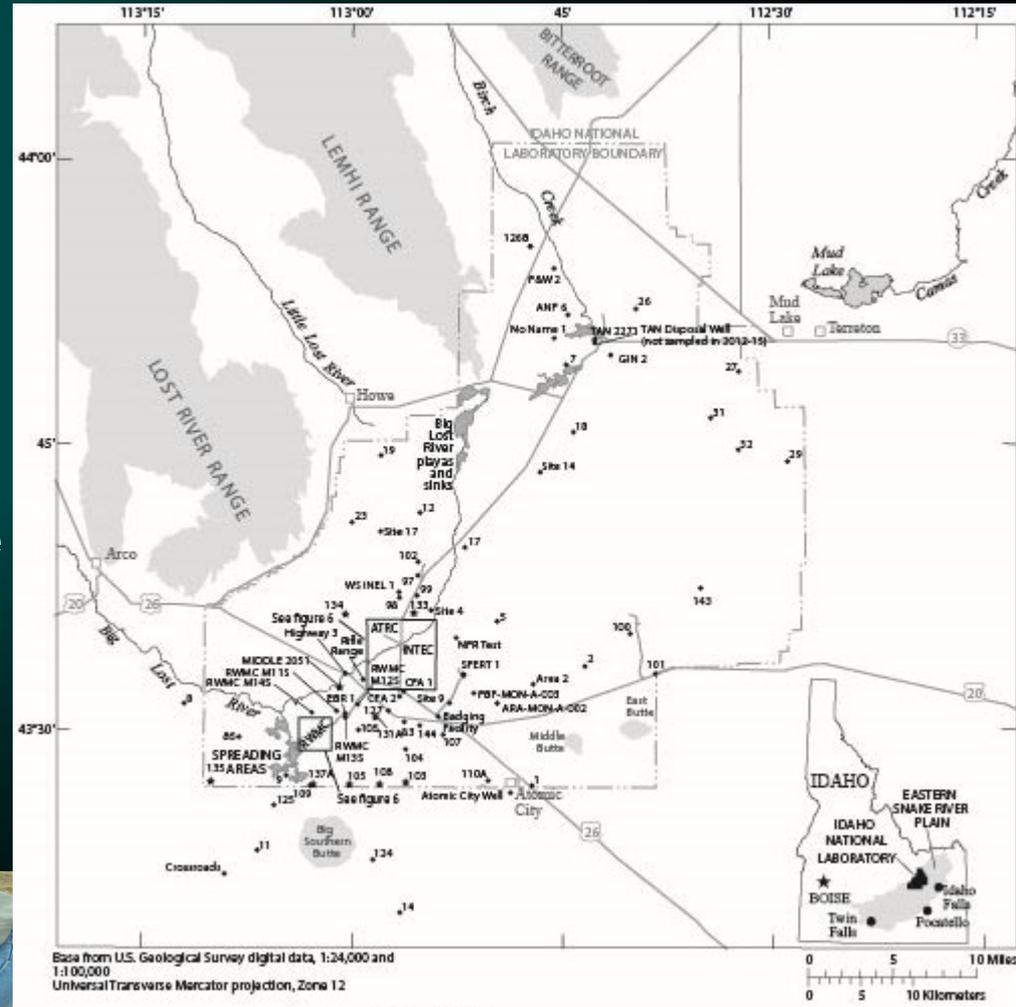
# Water Sample Monitoring



Water quality – annually at 153 sites;  
146 groundwater and 7 surface water

Sample all sites for tritium and chloride

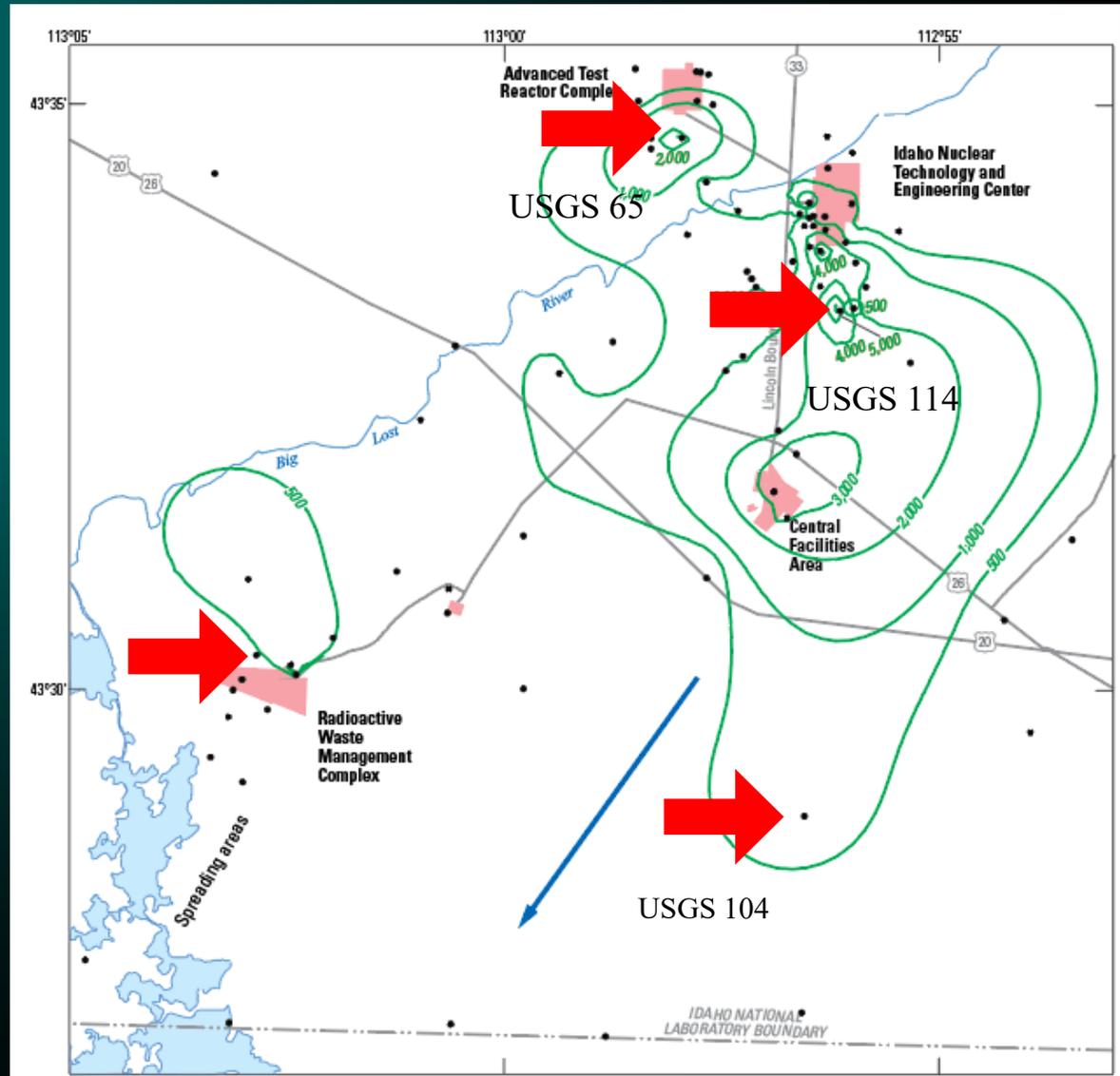
Selected sites for sulfate, sodium,  
fluoride, chromium, Sr-90, Pu, Am,  
alpha, beta, gamma, VOC's, suite of  
trace elements



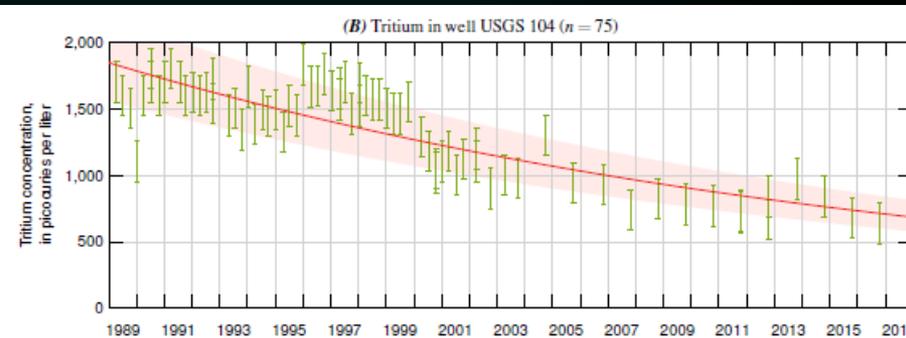
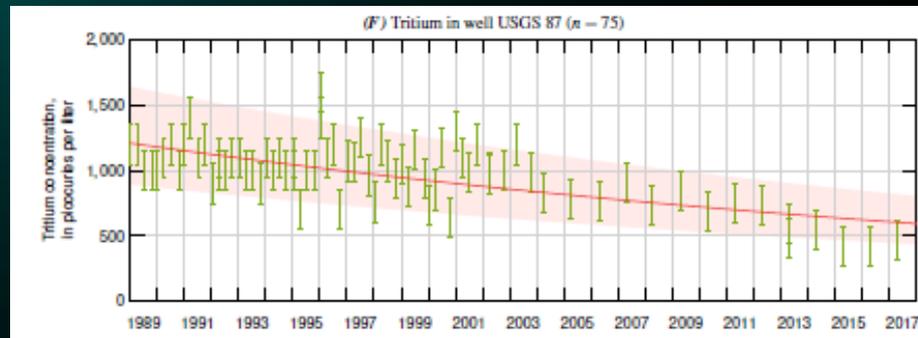
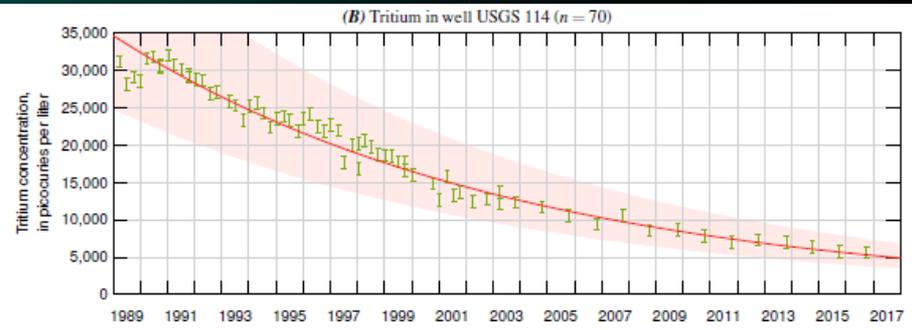
# Tritium-2016-2018

Largest concentration in the aquifer in 2018 was 5,100 +/-90 picocuries/liter in well USGS 114; concentration in USGS 65 was 1,930 +/-80 pCi/L. Concentrations declining in all wells through 2017.

Have not had concentrations above the drinking water standard of 20,000 pCi/L since 1997



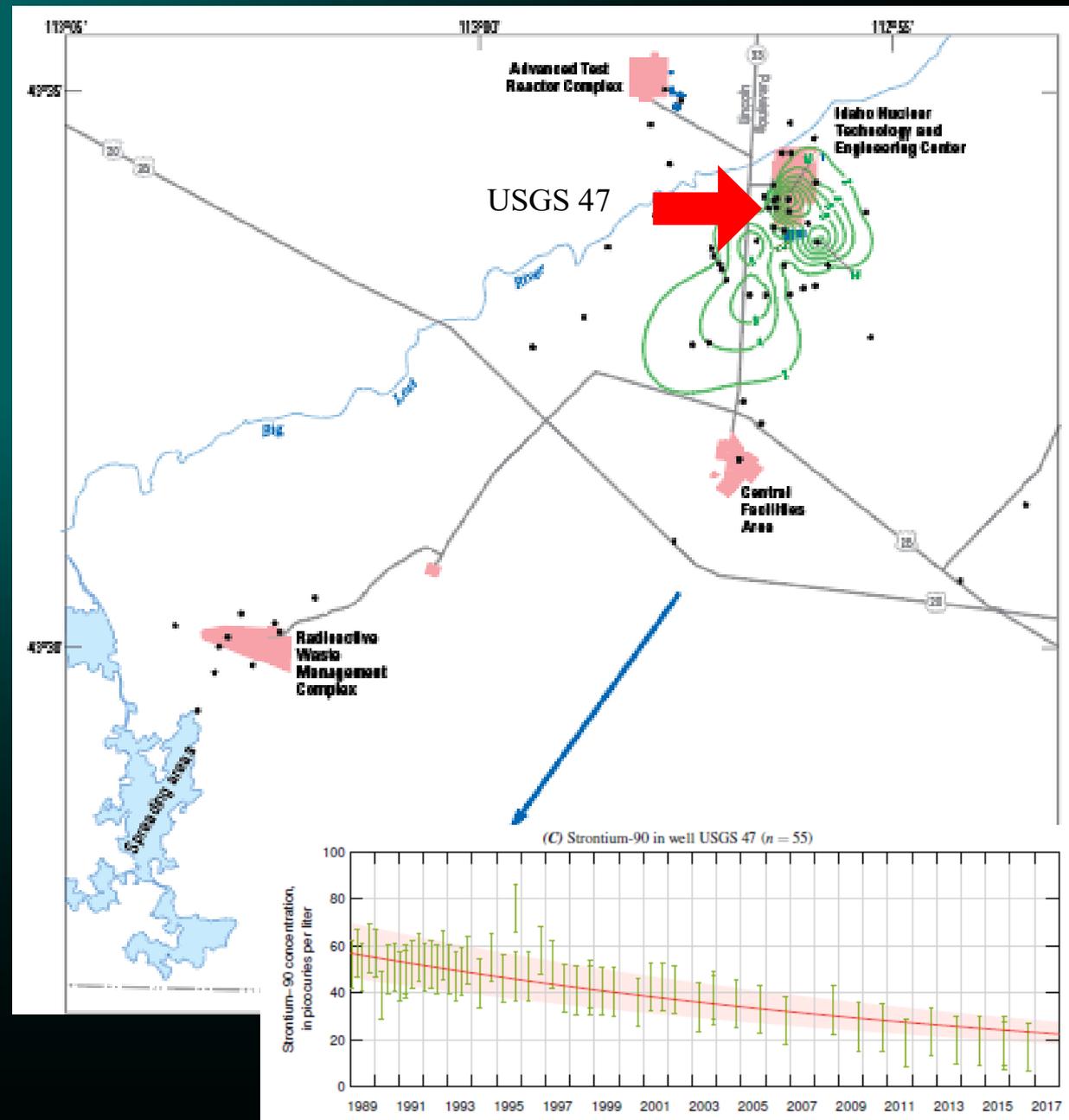
# Tritium trends in wells USGS 65, 114, 87, and 104



# Strontium-90 2016-2018

Only have four wells  
USGS samples with  
concentrations above  
the drinking water  
standard of 8 pCi/L-  
2015 had nine wells-  
Concentrations  
decreasing in all wells.

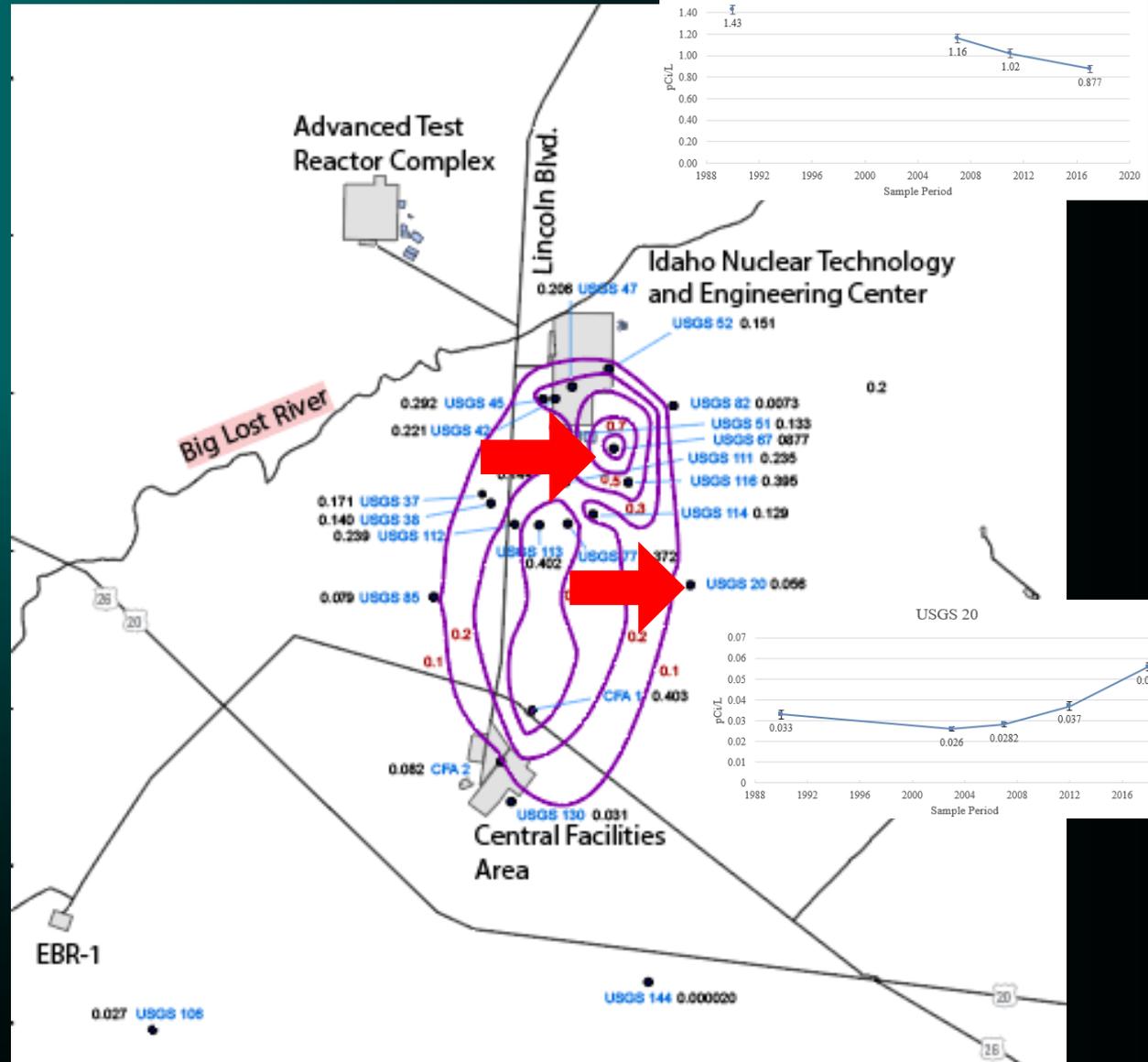
Largest concentration in  
2018 was 14.6+/-0.9  
pCi/L in USGS 47



# Iodine-129- 2017-2018

All concentrations below the drinking water standard of 1 pCi/L in 2018

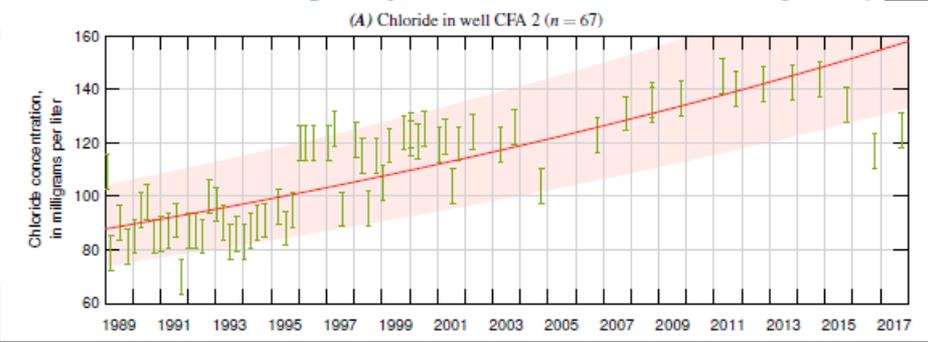
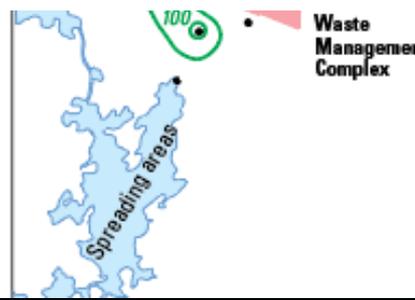
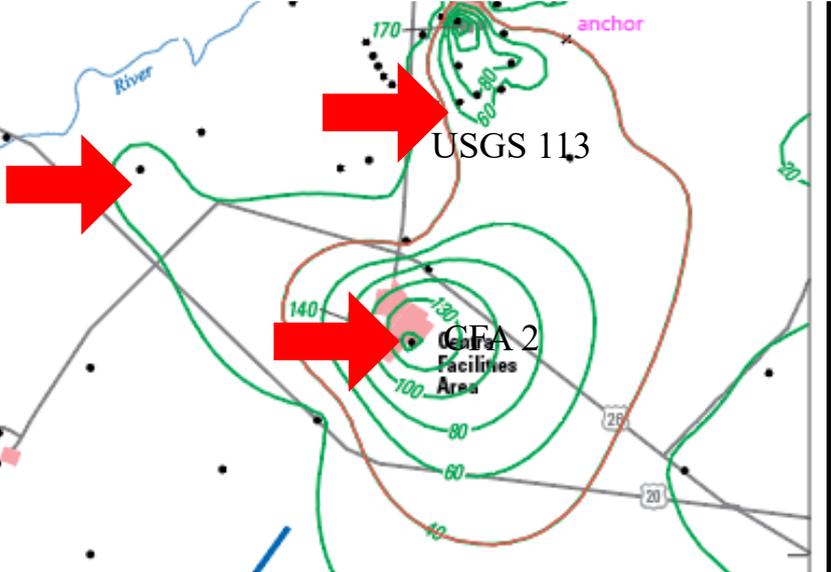
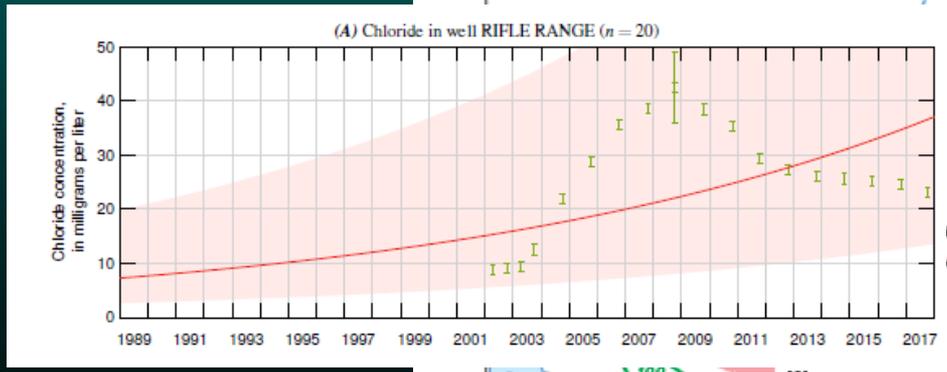
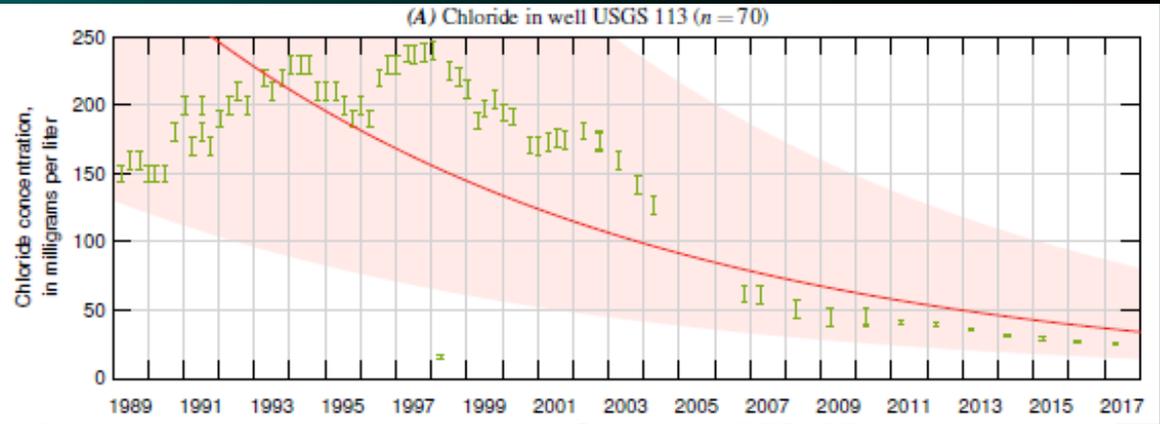
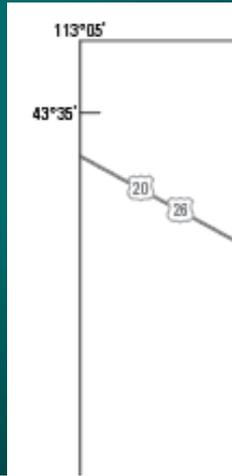
Most wells near INTEC show decreasing trends; wells farther downgradient have increasing trends.



# Chloride-2016-2018

2018 concentration in USGS 113 was 29 mg/L.

Largest concentration was in well at CFA at 144 mg/L

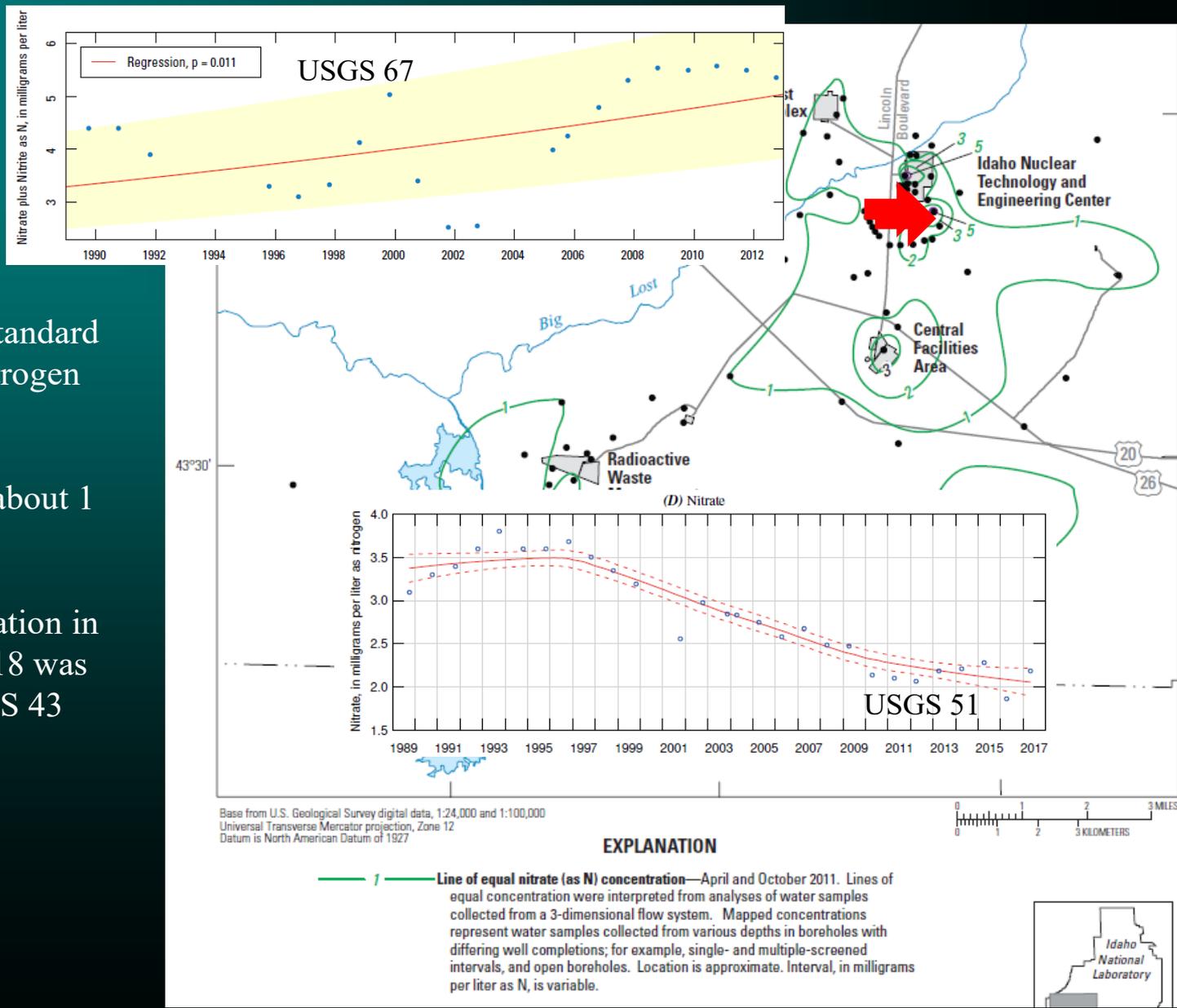


# Nitrate

Drinking water standard is 10 mg/L as Nitrogen

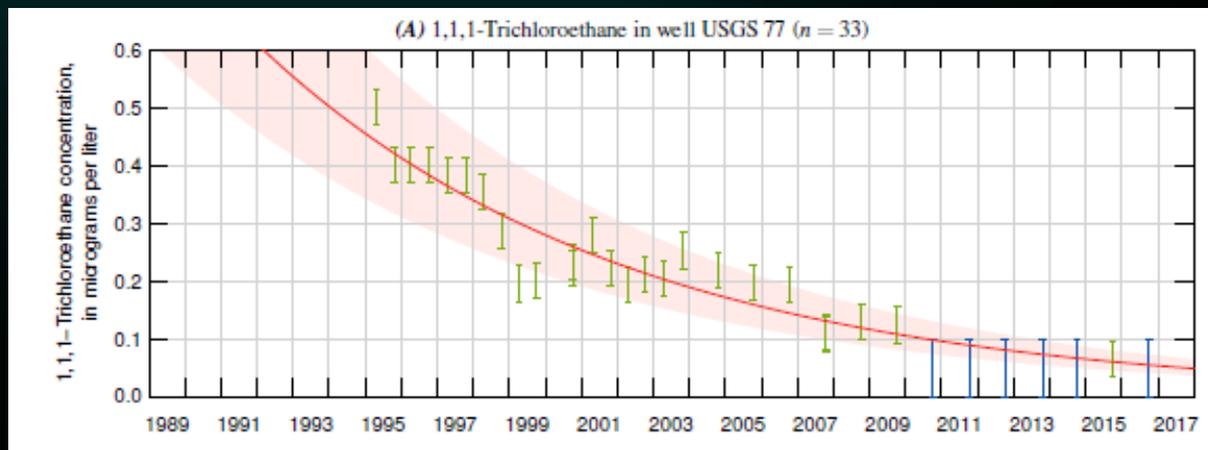
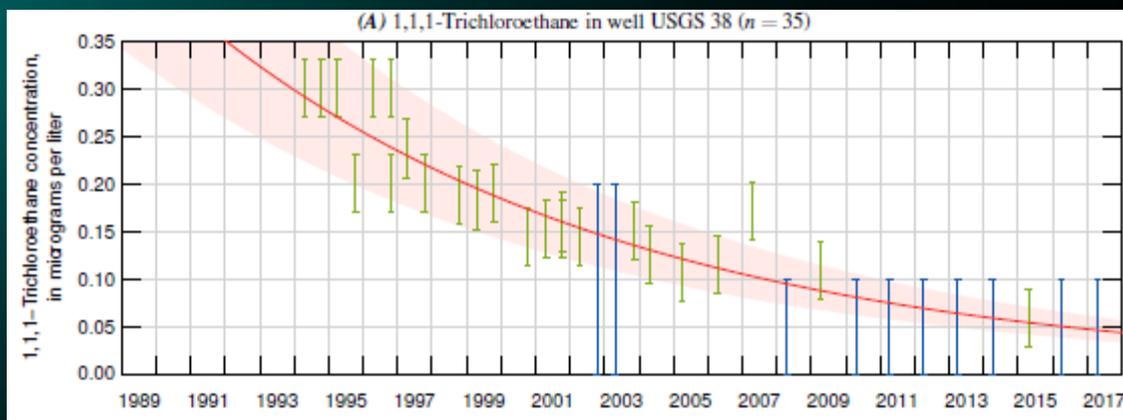
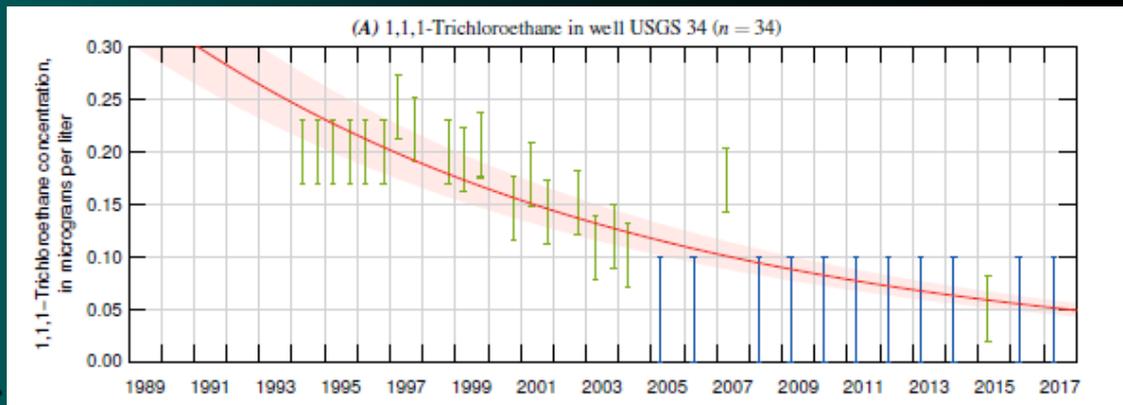
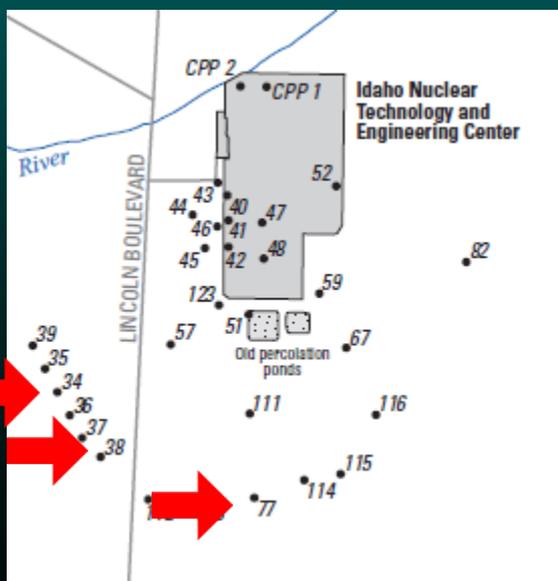
Background concentration is about 1 mg/L

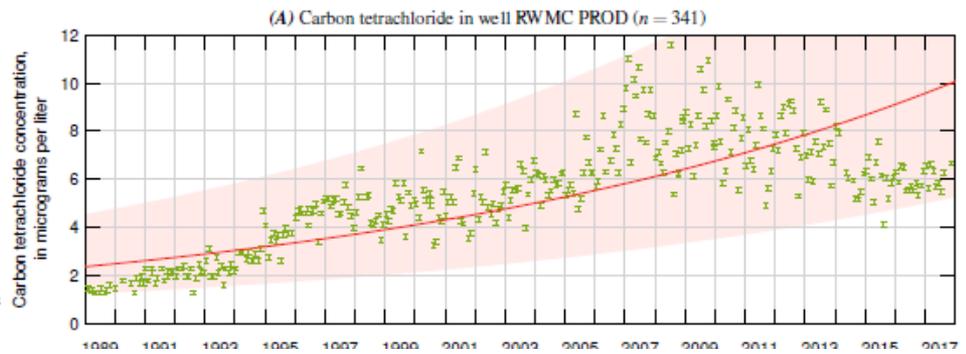
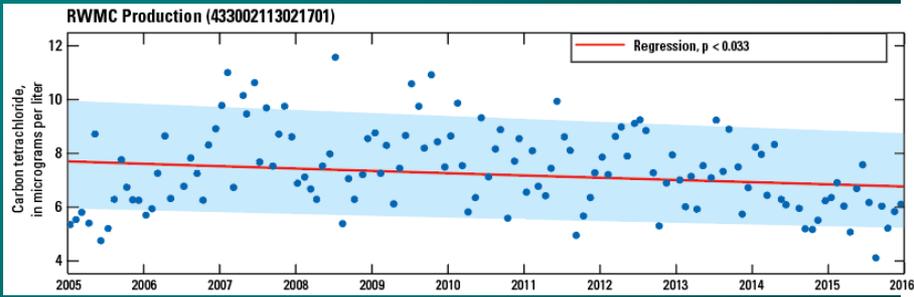
Largest concentration in the aquifer in 2018 was 7.0 mg/L in USGS 67



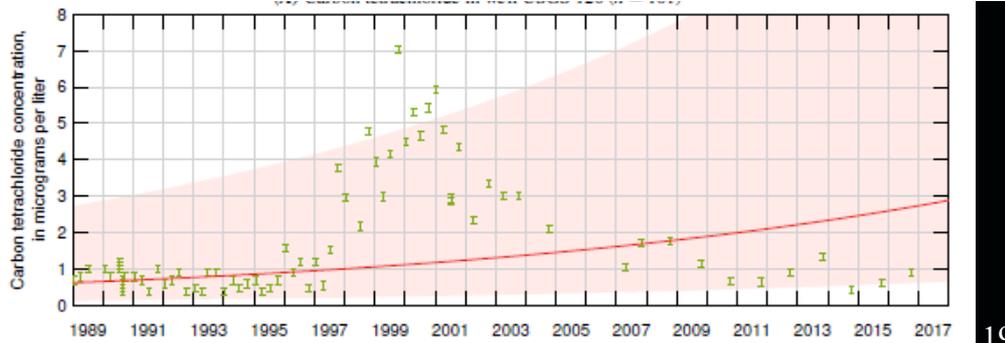
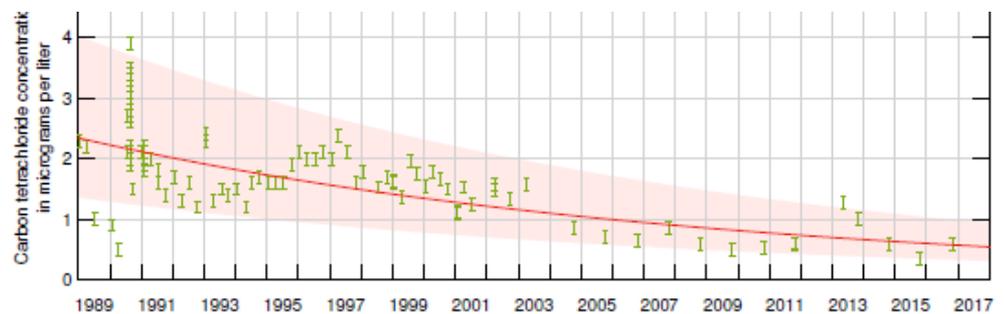
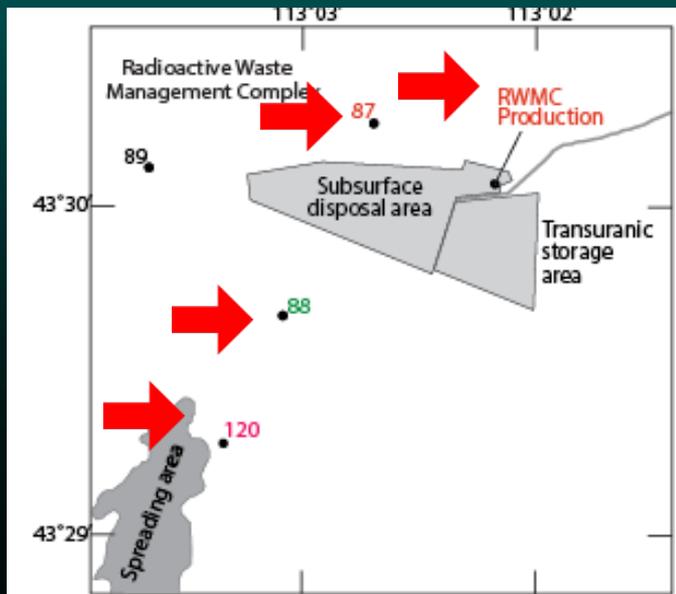
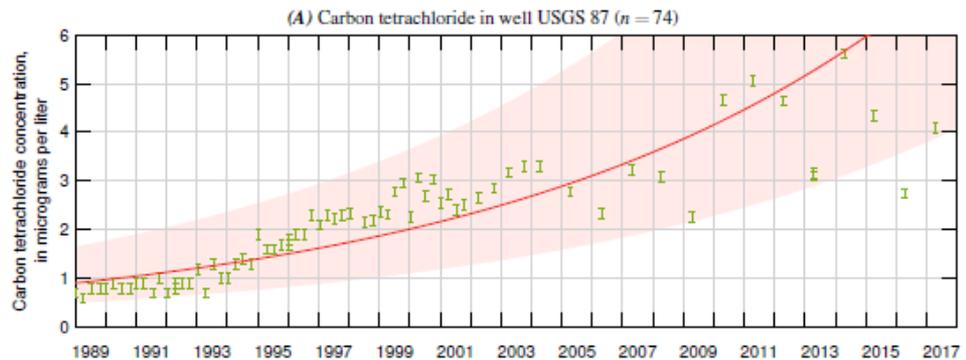
# Volatile organics south of INTEC

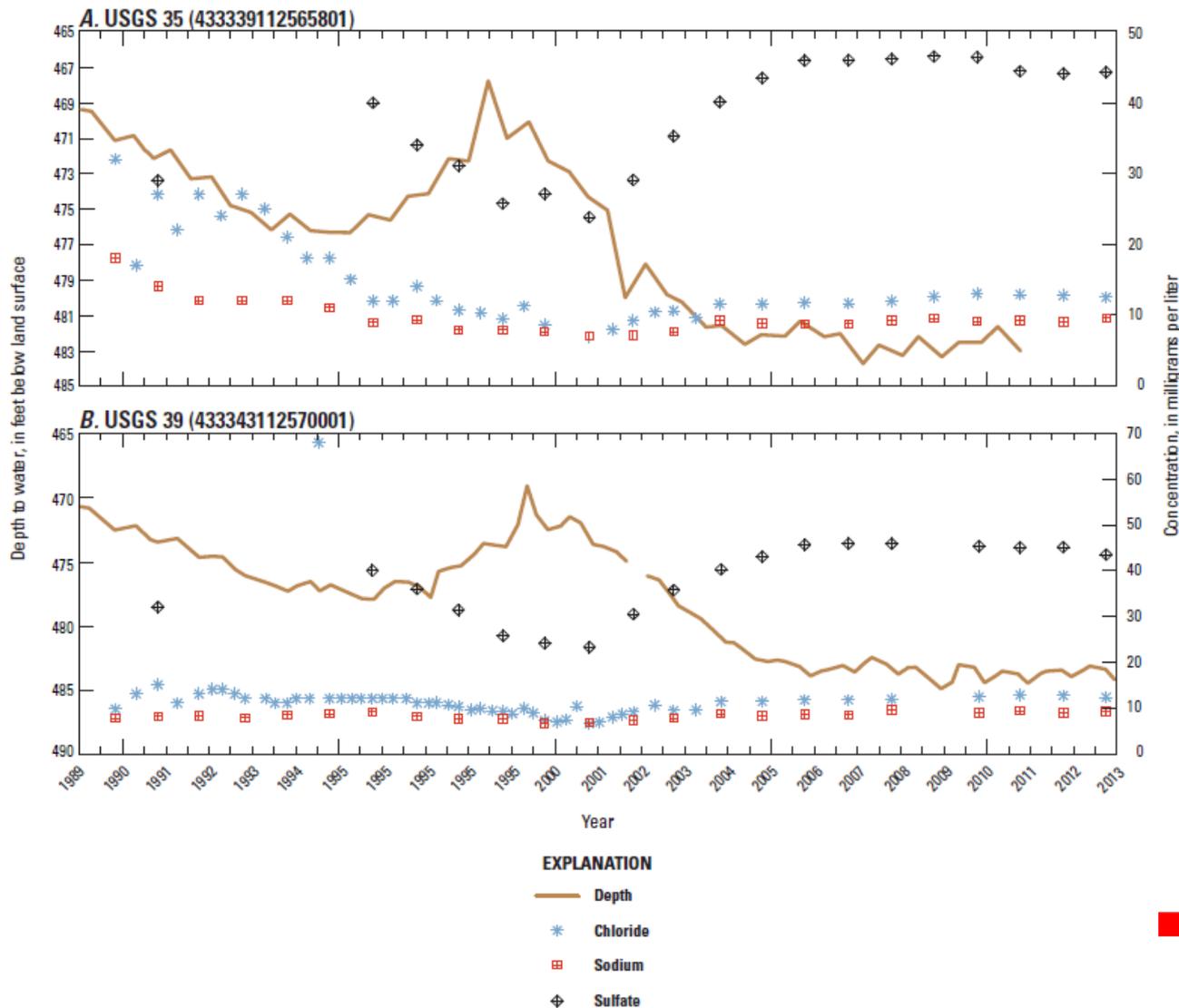
Concentrations of 1,1,1-Trichloroethane have decreased to below the reporting levels recently; always have been below the MCL of 200 micrograms/liter



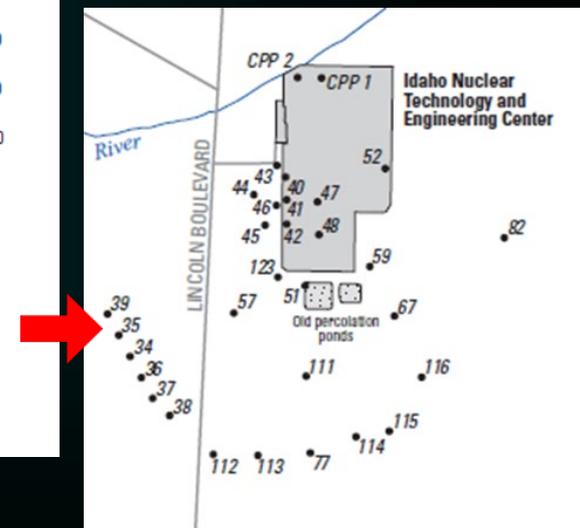


**Carbon tetrachloride**  
 Drinking water standard is 5  $\mu\text{g}/\text{L}$ ;  
 Recently have had concentrations exceeding  
 in wells RWMC Prod. And USGS 87





Several wells have concentration changes that seem to be consistent with wet and dry periods of recharge.

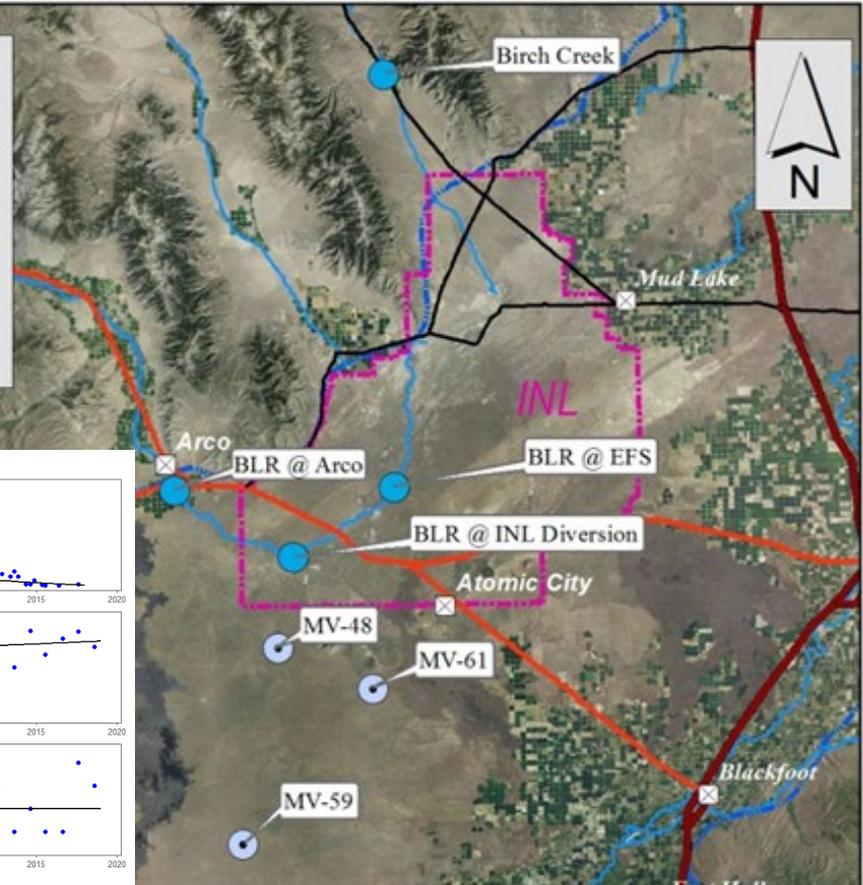
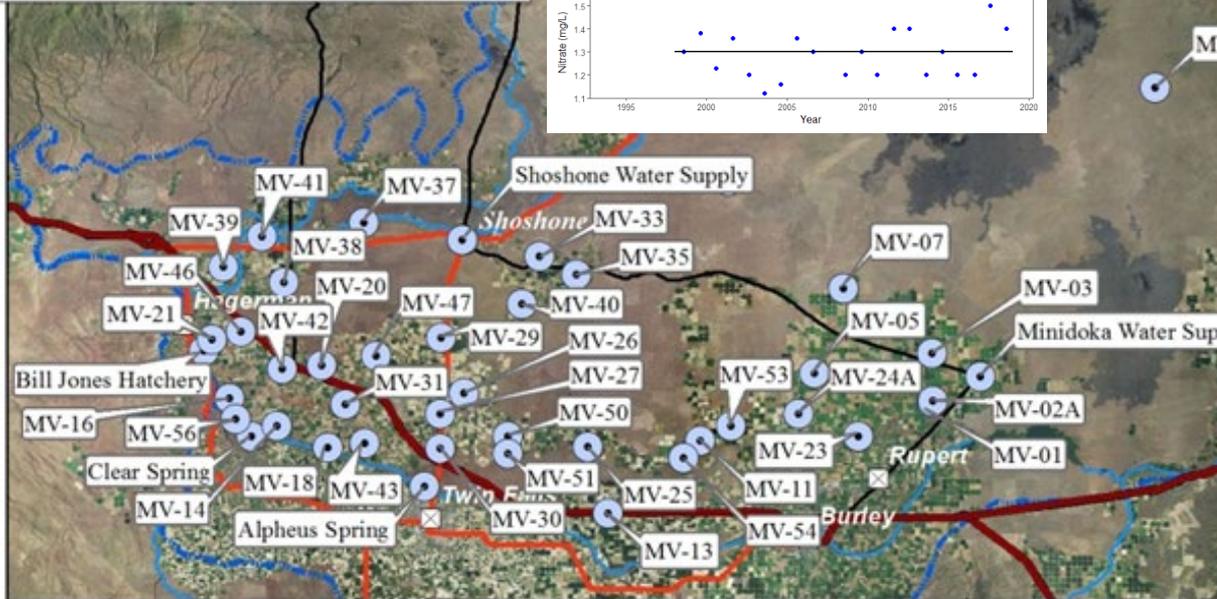
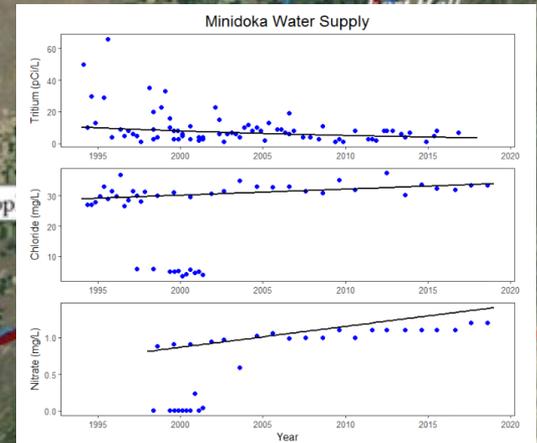
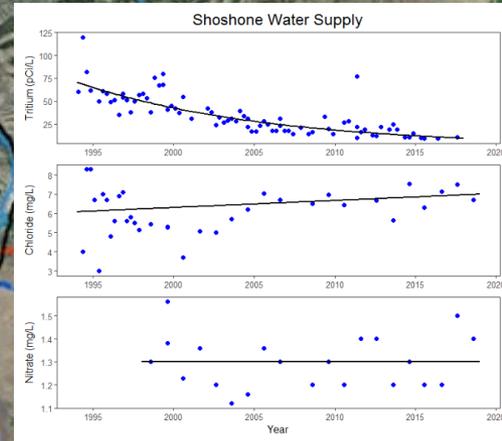
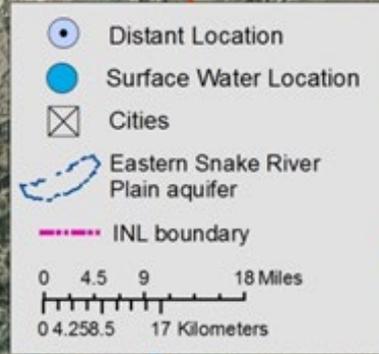


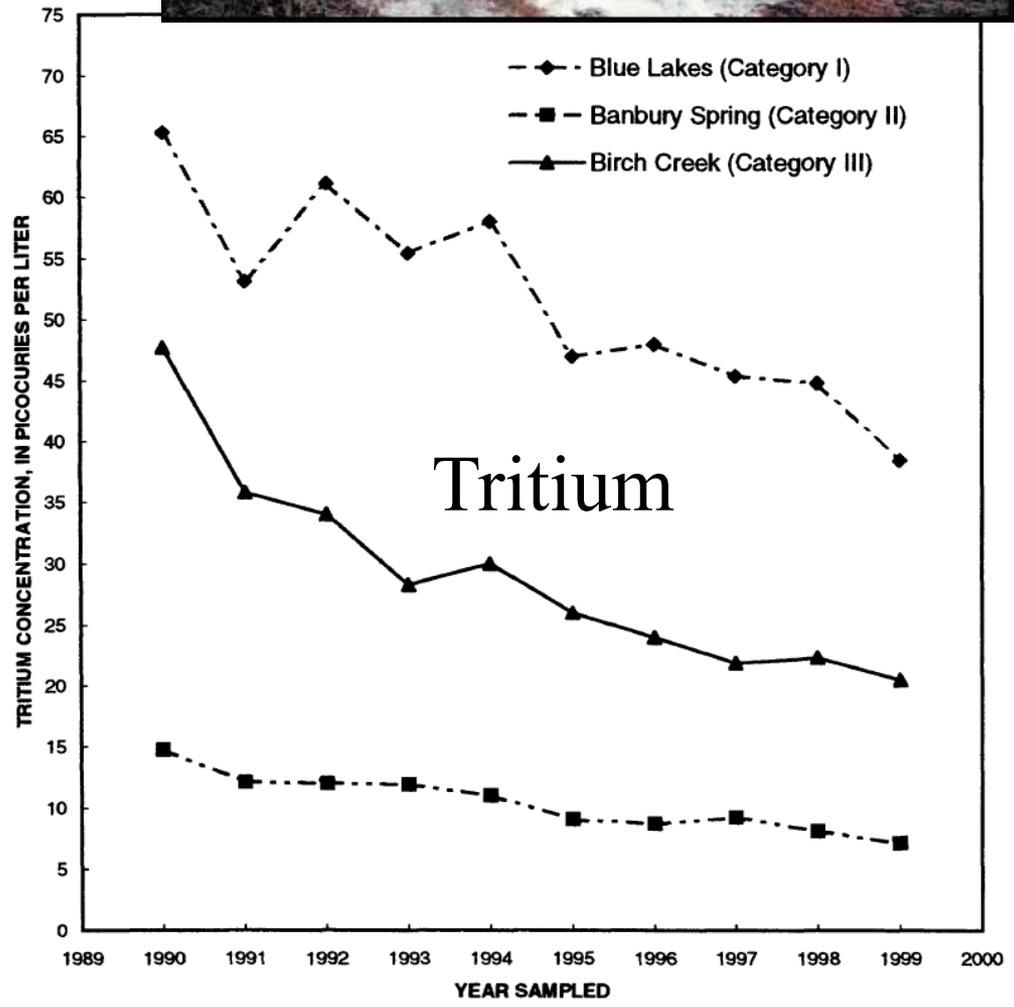
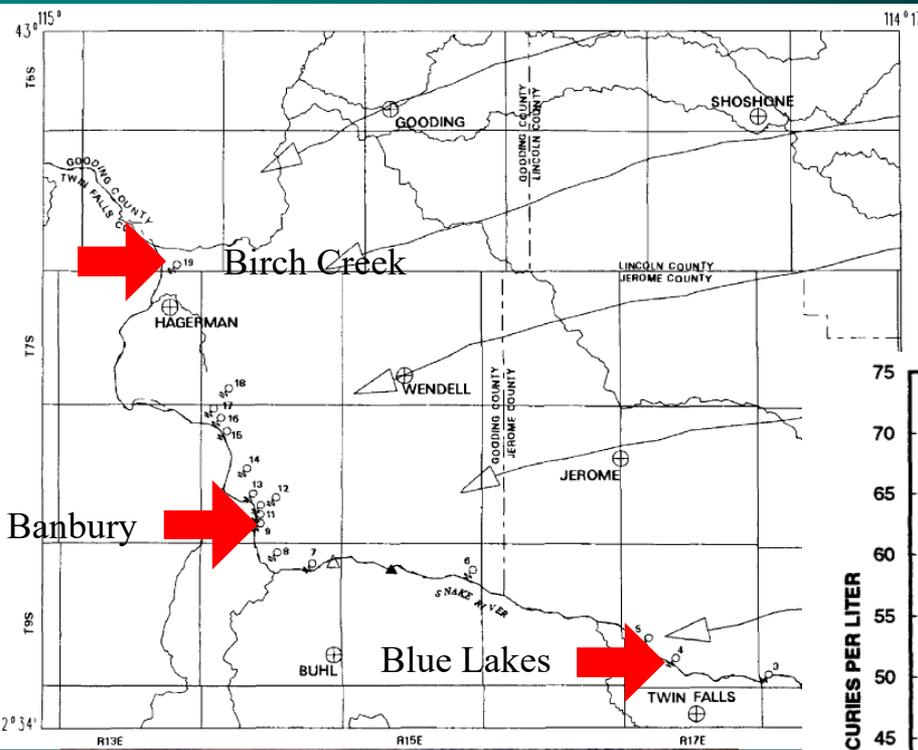
# *Water sampling history in wells downgradient from INL*

- USGS/Idaho Department of Water Resources (IDWR) Magic Valley sampling program-1989-2003-Sampled 59 sites for a variety of radionuclides, cations, anions, nutrients, organics, and pesticides.
- 2004-present-Idaho Department of Environmental Quality-INL Oversight and IDWR-sample for a subset of the constituents from earlier program.
- 1989 through 2001-USGS sampled 19 springs for low-level tritium concentrations.



# INL-OP MV sampling





# IWRB ESPA Managed Recharge – 2017/2018

## Total IWRB Recharge

536,000 AF

### Diversion Rate

Max: 2,387 cfs

Median: 700 cfs

### Big/Little Wood

7,380 af

Median: 15 cfs

### Lower Valley

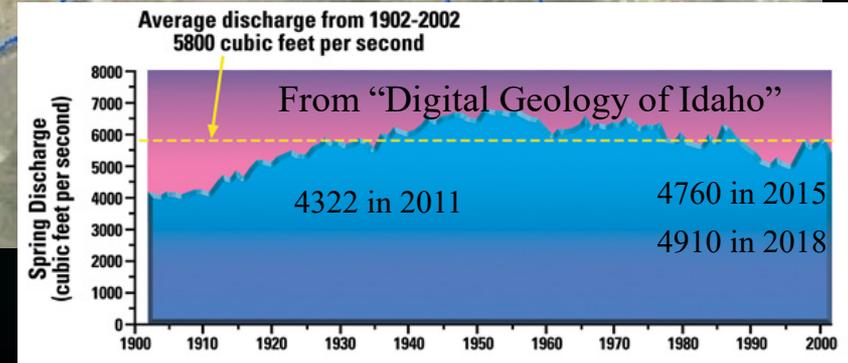
295,655 af

Median: 559 cfs

### Upper Valley

232,966 af

Median: 293 cfs



# Summary

- Water levels in the aquifer at the INL have been mostly increasing over the past 2 years
- Tritium and strontium-90 have been mostly decreasing in the aquifer due to discontinued disposal, dilution, dispersion and radioactive decay.
- Chloride and sodium are decreasing at disposal areas, but increasing in downgradient wells near CFA and RWMC
- Volatile organic compounds are decreasing at and downgradient of INTEC.
- Volatile organic compounds are increasing at 2 wells to the north of RWMC, one well to the south, decreasing in one well to the south



# Summary

- Several wells have concentration changes that appear to correspond to wet and dry cycles of recharge.
- Tritium in thousands springs area showed decreasing trends for period sampled.
- Three different water types are present in the Magic Valley area



# ANY QUESTIONS?

Augustine volcano  
Alaska  
Photo courtesy  
of Cyrus Reed,  
USGS 2006

