

# *Hydrologic conditions of the eastern Snake River Plain aquifer, Idaho National Laboratory and Magic Valley, Idaho*

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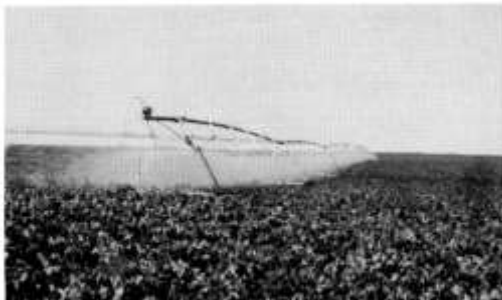
# Presentation Overview

- Summarize water availability at INL following several drought years.
- Summarize water quality of constituents and trends of wells sampled at INL.
- Summarize water quality data collected from the Magic Valley and Thousand Springs area.



Radionuclides, Chemical Constituents, and Organic Compounds in Water from Designated Wells and Springs from the Southern Boundary of the Idaho National Engineering Laboratory to the Hagerman Area, Idaho, 1989

U.S. Geological Survey  
Open-File Report 91-232



Prepared in cooperation with the  
U.S. DEPARTMENT OF ENERGY and IDAHO DEPARTMENT OF WATER RESOURCES

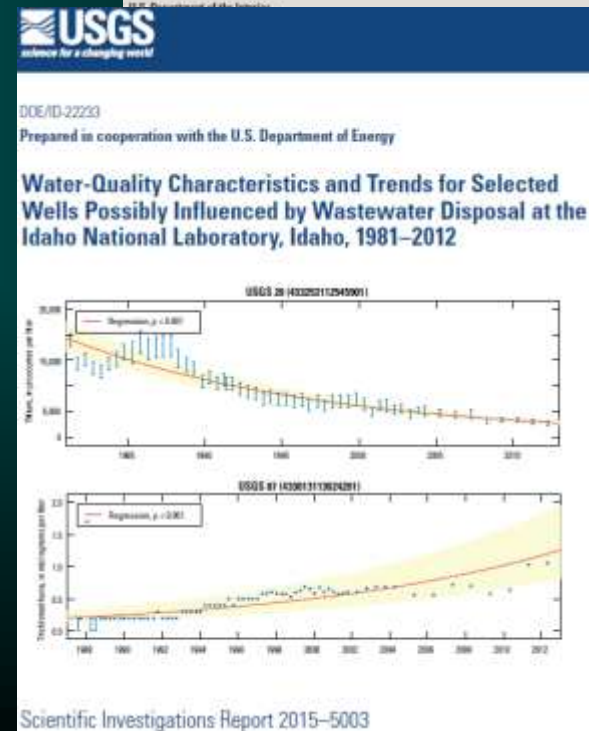
DOI/ID-22180

**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

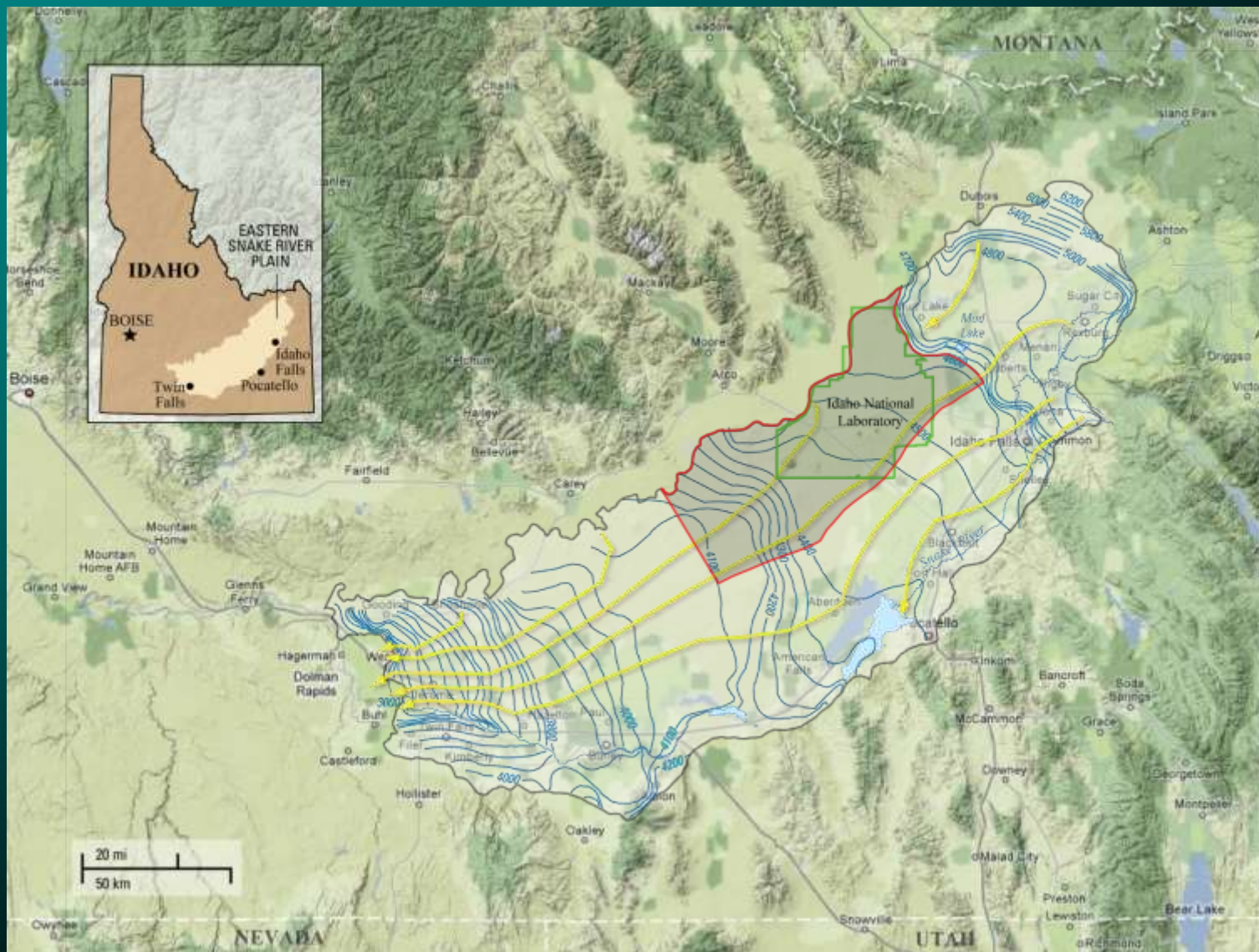


Prepared in cooperation with the U.S. DEPARTMENT OF ENERGY



Scientific Investigations Report 2015-5003





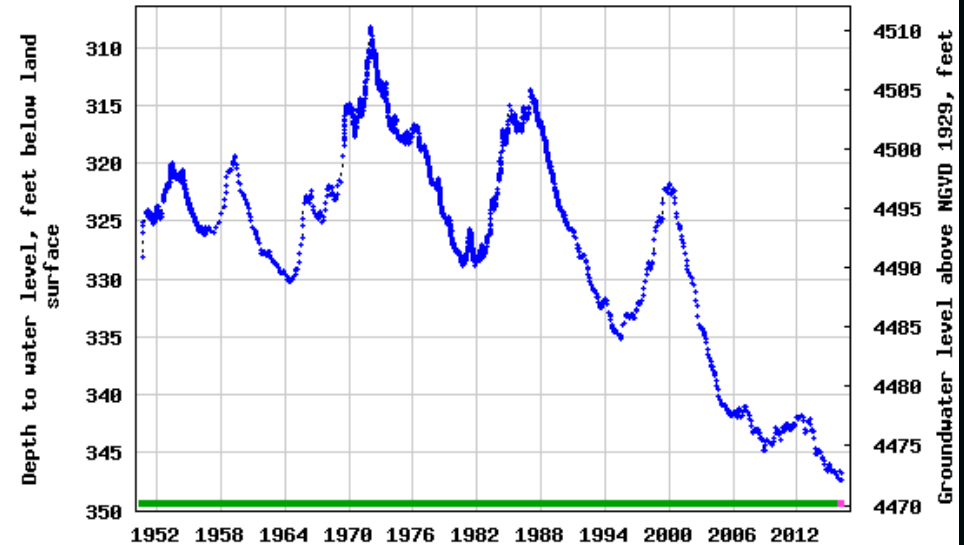
# *Cyclical nature of the Aquifer*

- Eastern Snake River Plain aquifer goes through cycles of increasing and decreasing water levels related to wet and dry cycles.
- Trends seem to indicate new lows and longer drought period
- 2015 had new record low levels in all our wells



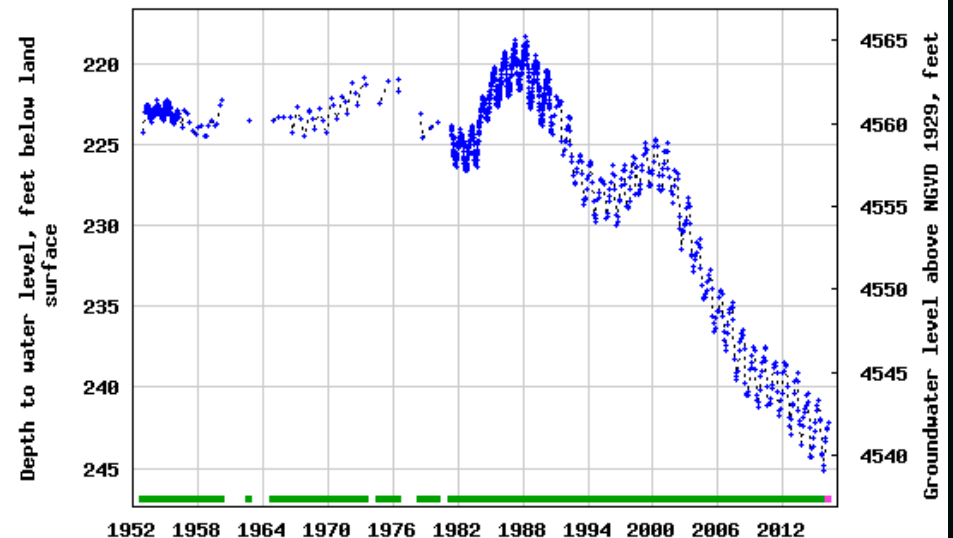
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USGS 12



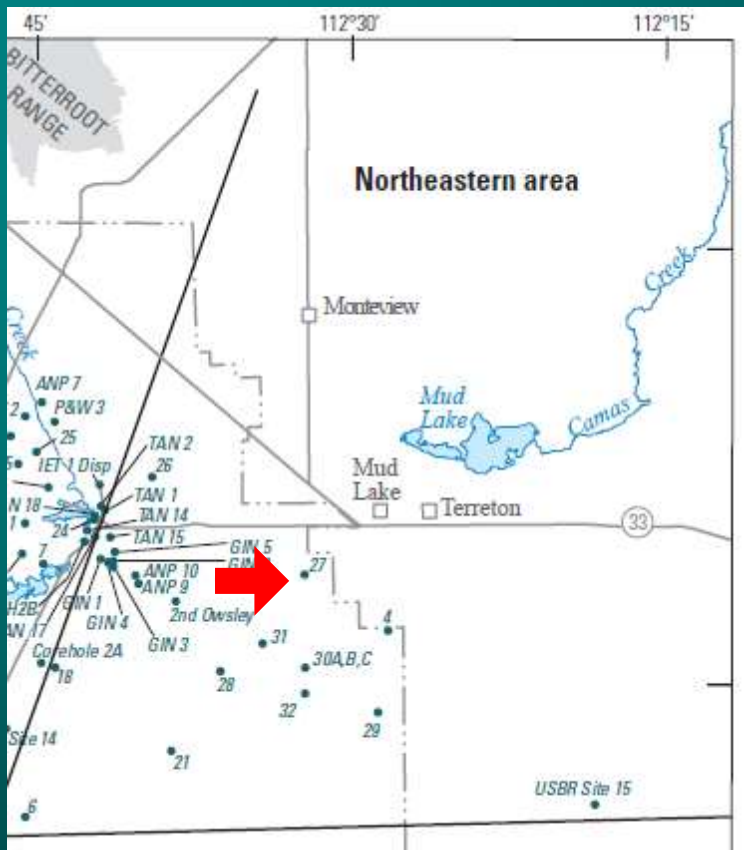
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USGS 27



— Period of approved data

— Period of provisional data

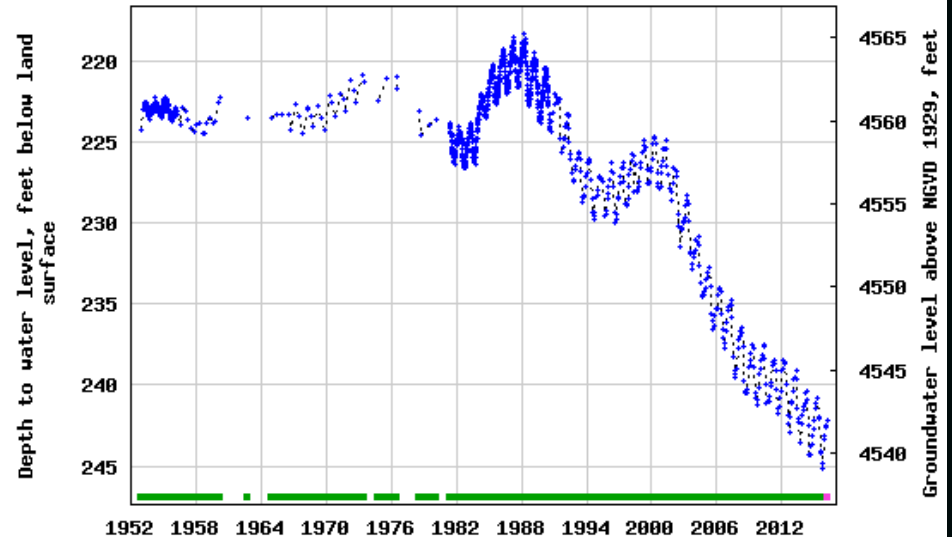


Northeast-we see  
influence of groundwater  
irrigation and larger  
seasonal variation  
(4 to 5 ft change)



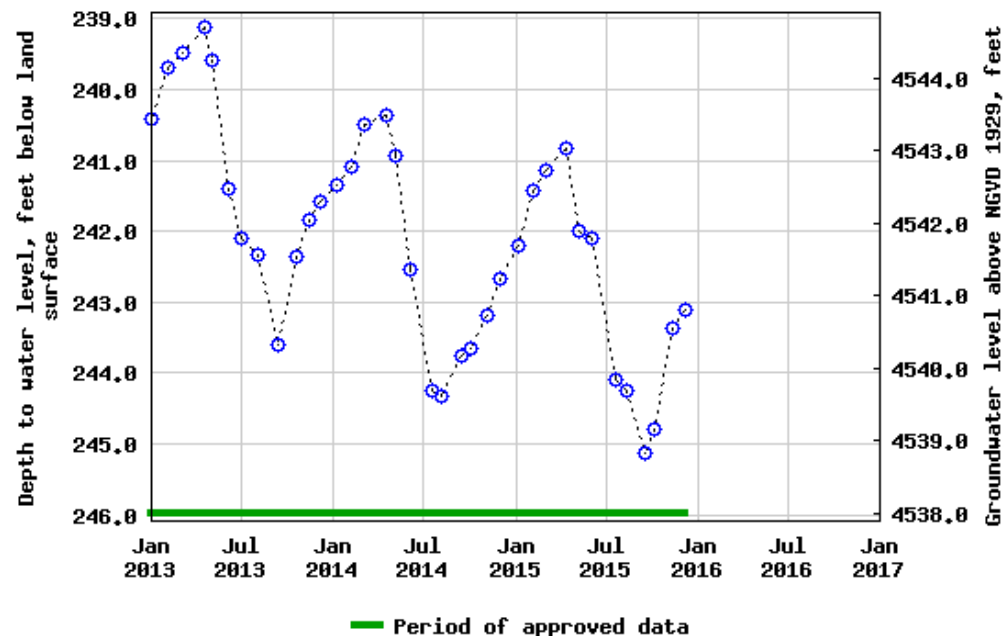
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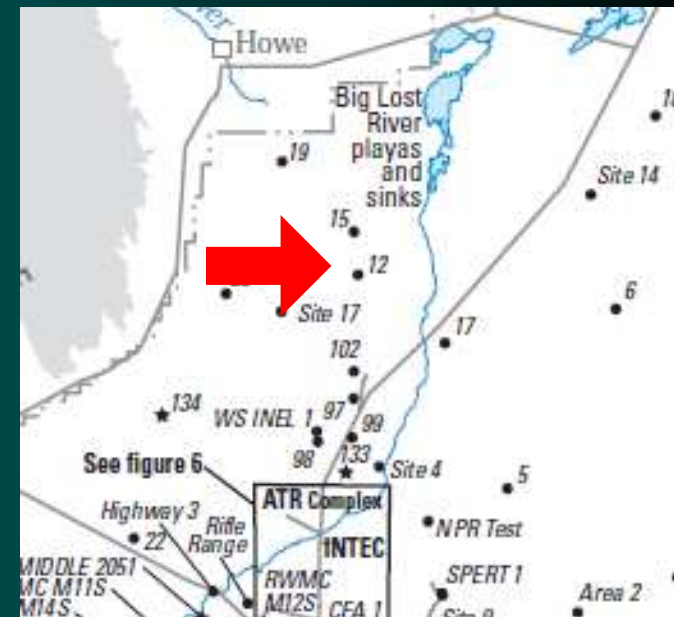
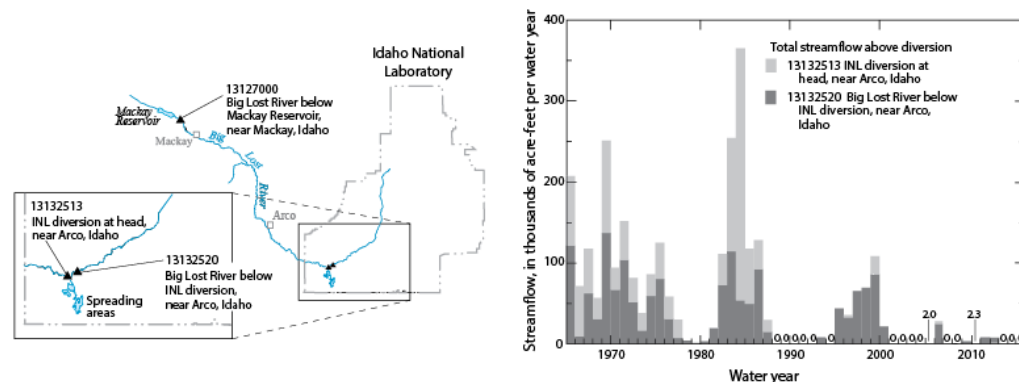
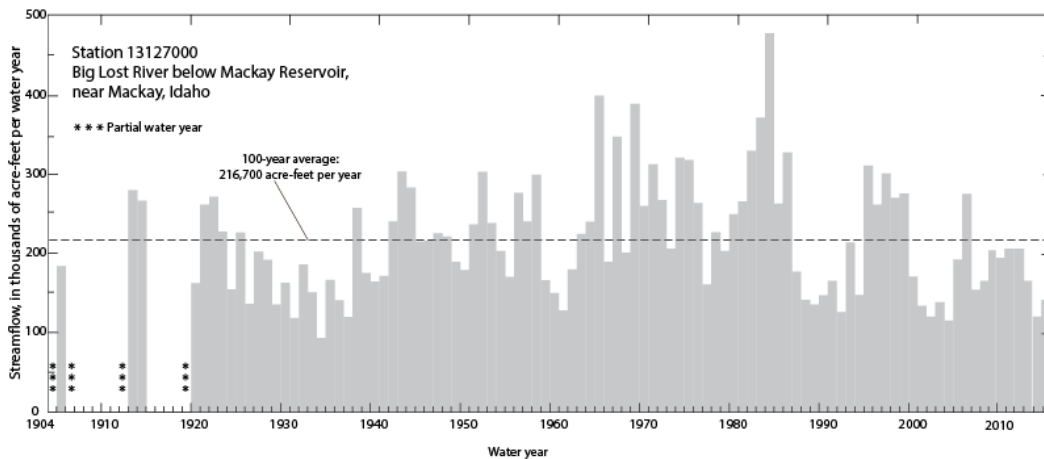
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Period of approved data

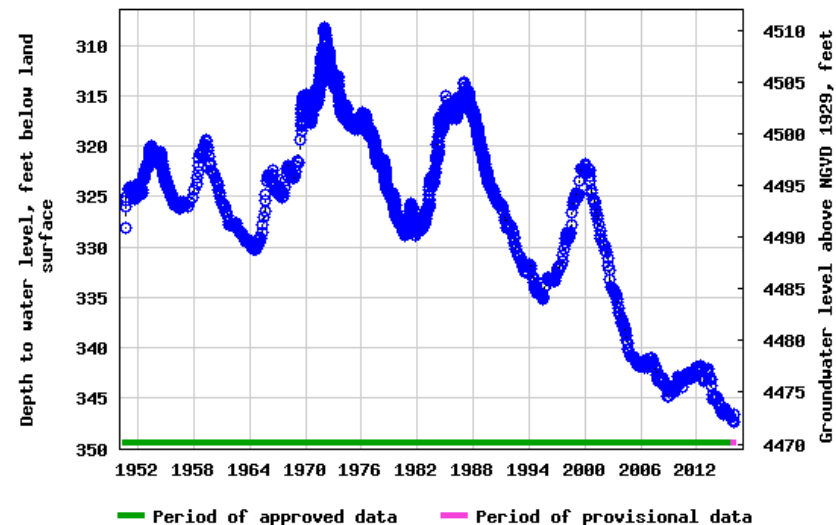




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Northwest and southwest  
more affected by surface  
water recharge from Big  
Lost River

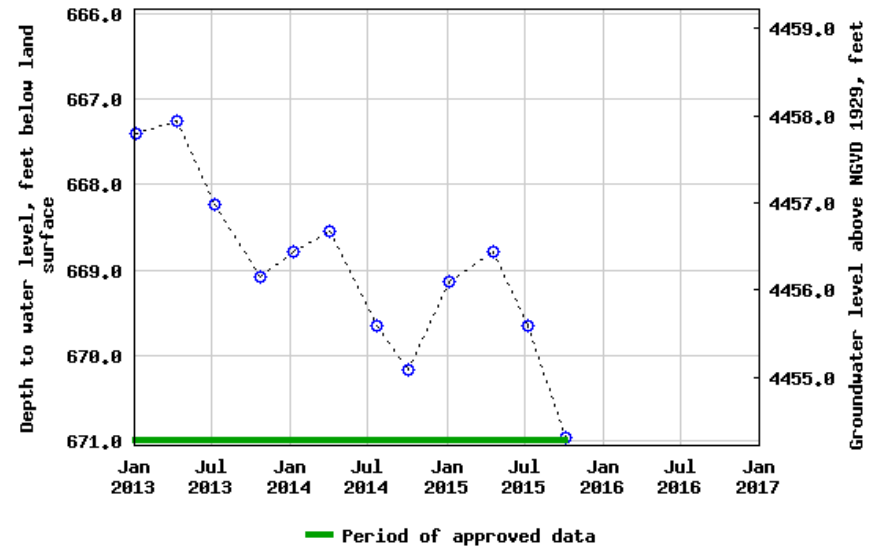
Southeast-see less influence of irrigation or flow in the Big Lost, less seasonal variability (1 to 1.5 ft change) and less overall decline



USGS

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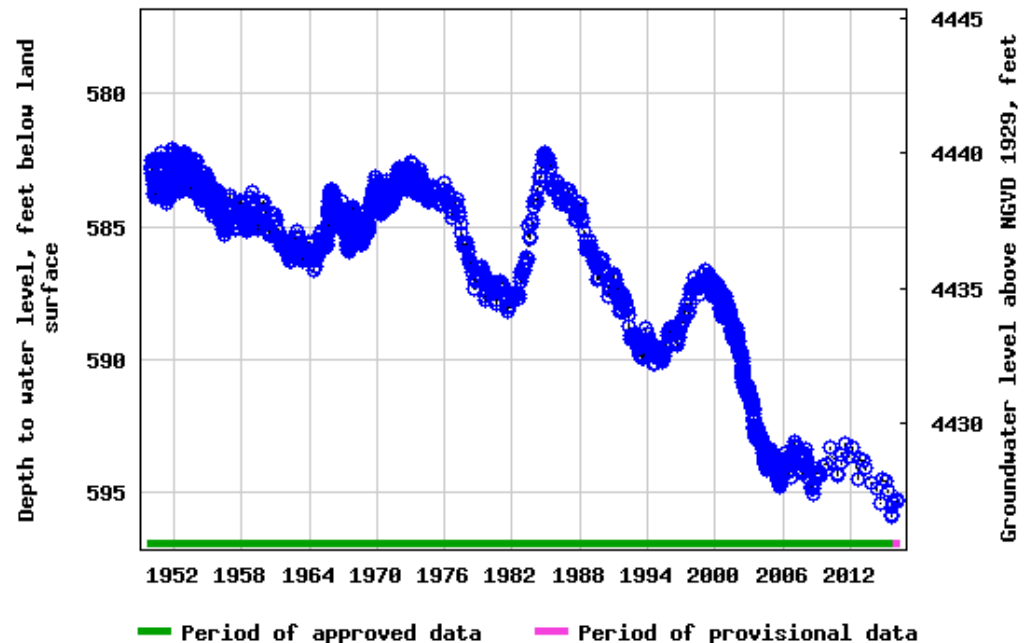
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USGS

USGS 432700112470801 02N 31E 35DCC1

USGS 1



# Water Sample Monitoring at INL

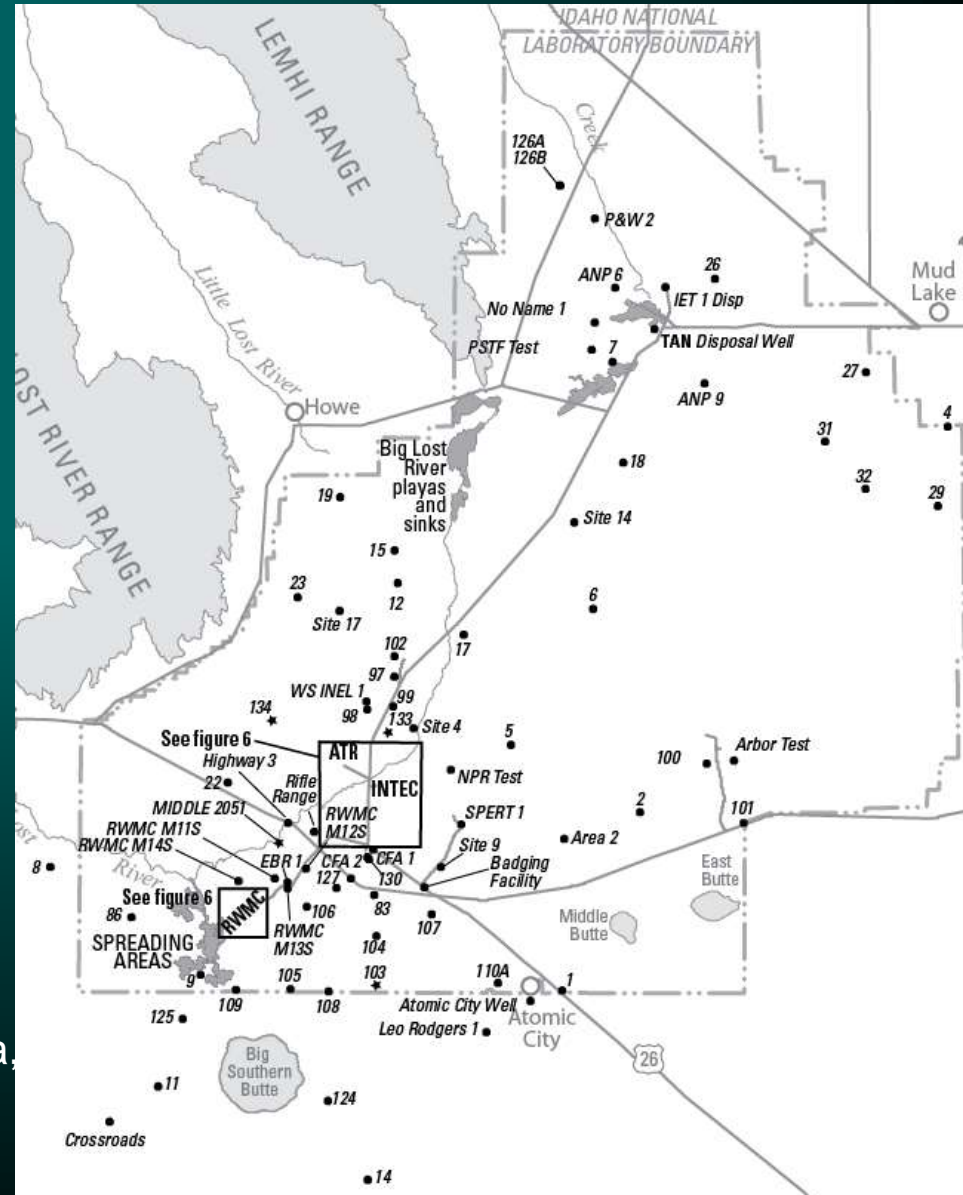


Water quality – annually at 150 sites, but back in the 1990s sampled as many as 200 sites

Sampled quarterly and semi-annually at many wells between early 1960's-2002; annual sampling since

## Sample all sites for tritium and chloride

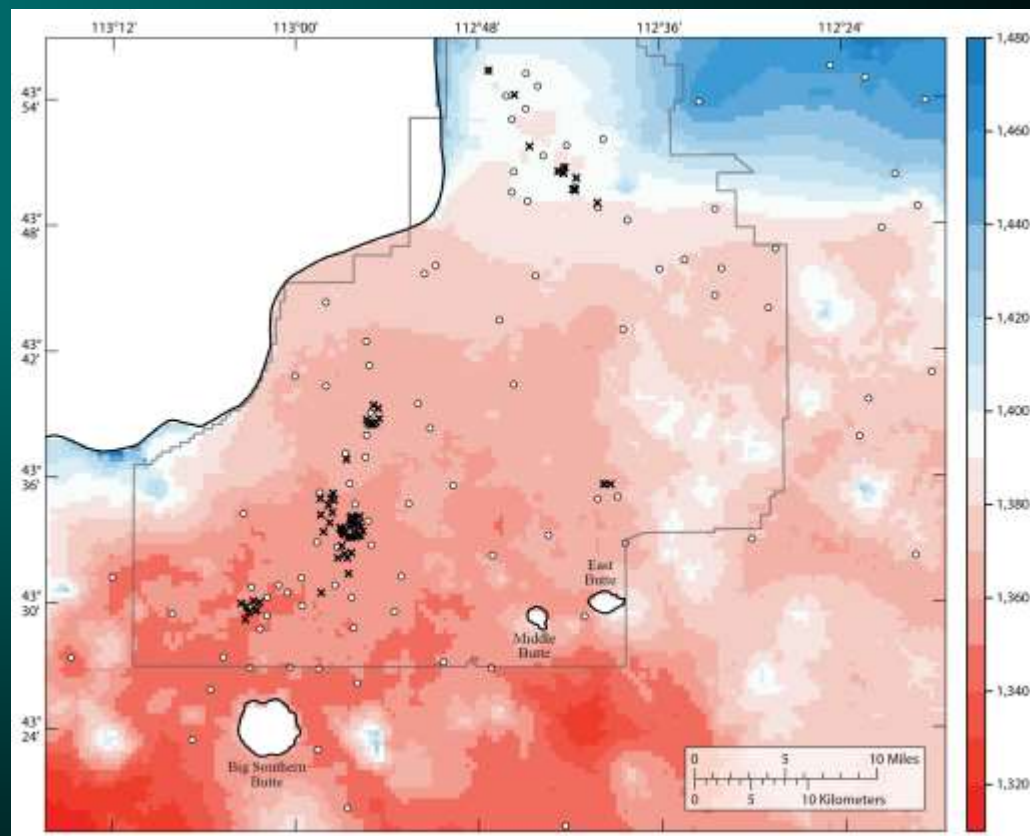
Selected sites for sulfate, sodium, fluoride, chromium, Sr-90, Pu, Am, alpha, beta, gamma, VOC's, TOC, suite of trace elements





# *USGS INL water-quality sample program Optimization study*

- Study Objectives
  - Discover potential sources of data redundancy in existing USGS INL water sample monitoring program to address questions posed by DOE: Which wells to sample; how often; and for what constituents.
  - Started 3 Phase study in 2011



# *Final phase-Water sample optimization*

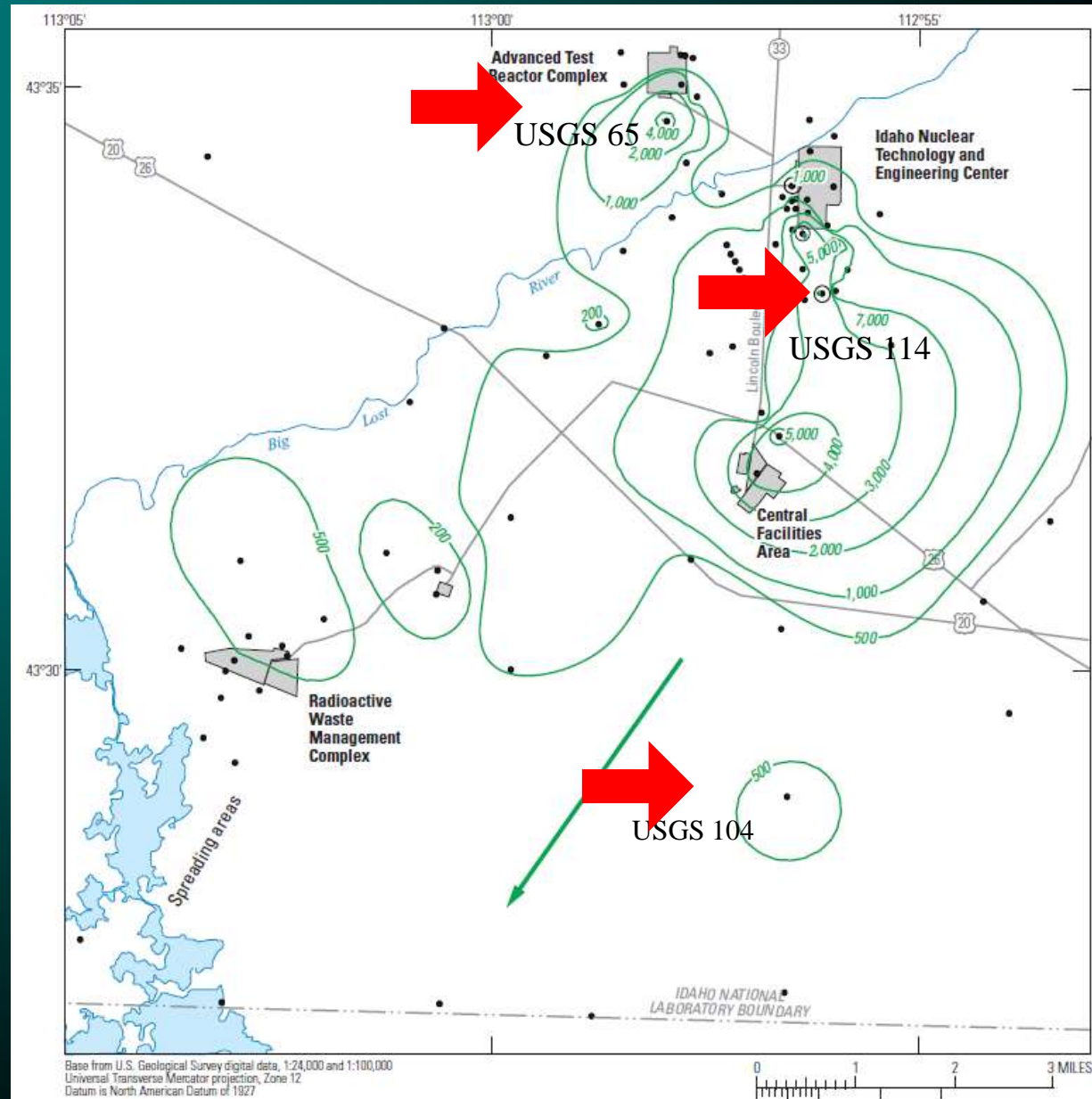
- Use an iterative thinning algorithm that removes at random, certain fractions of the historic dataset, but preserves the original trend.
- Number of well locations is reduced by searching for pairs of wells with highly correlated water-quality conditions and removing one or the other because of redundancy.
- Similarly, for water samples collected from an individual well, the number of constituents to include in laboratory analysis is reduced by searching for pairs of constituents with highly correlated concentrations.



# Tritium-2011-2015

Largest concentration in the aquifer in 2014 was 6,330 +/-140 in well USGS 114; concentration in 2015 in USGS 65 was 2,460 +/-100 pCi/L

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

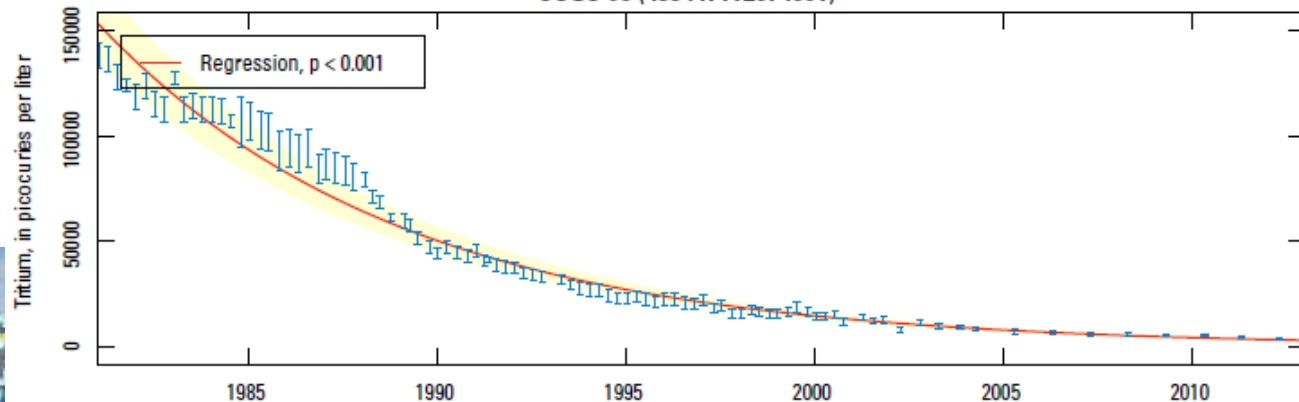


From Davis and others, 2013 (DOE/ID-22226)

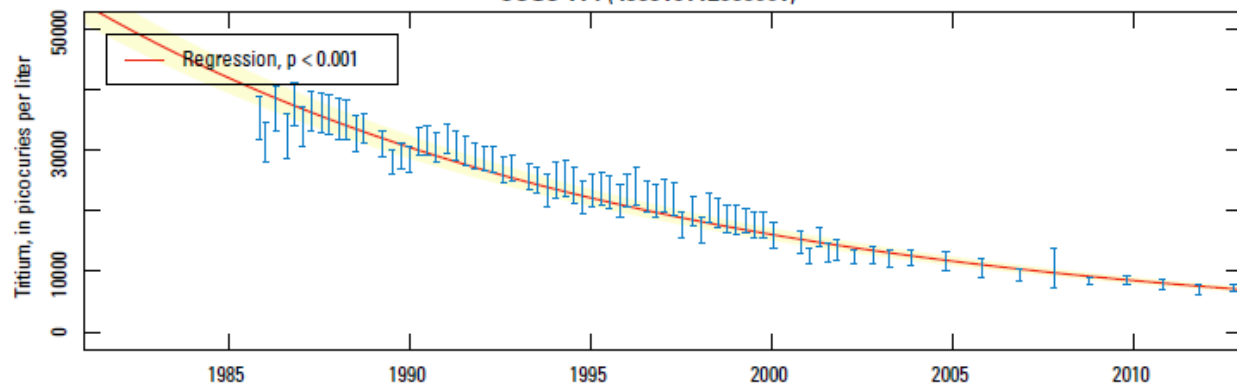




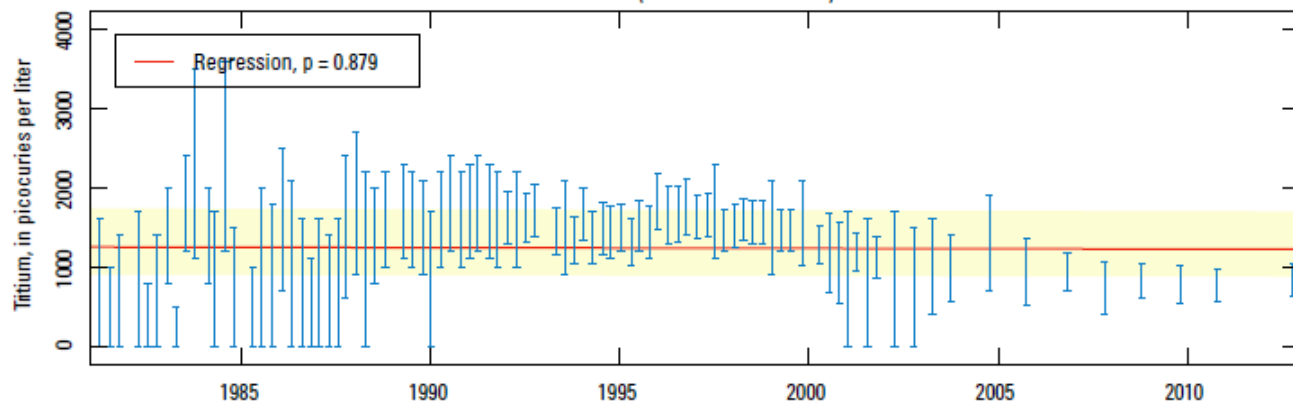
USGS 65 (433447112574501)



USGS 114 (433318112555001)



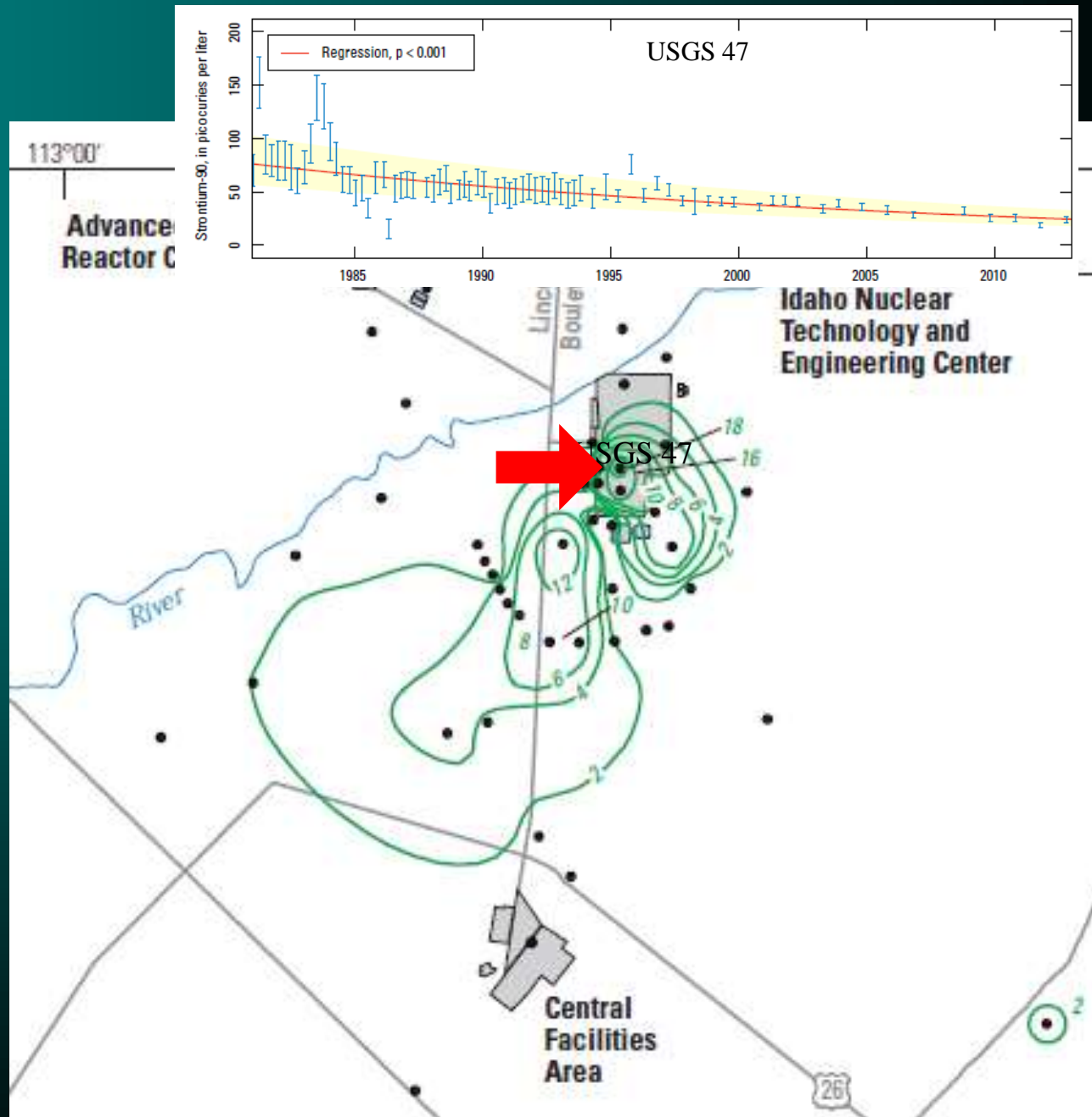
USGS 104 (432856112560801)



## Strontium-90 2011-2014

Still have nine wells  
USGS samples with  
concentrations above  
the drinking water  
standard of 8 pCi/L.

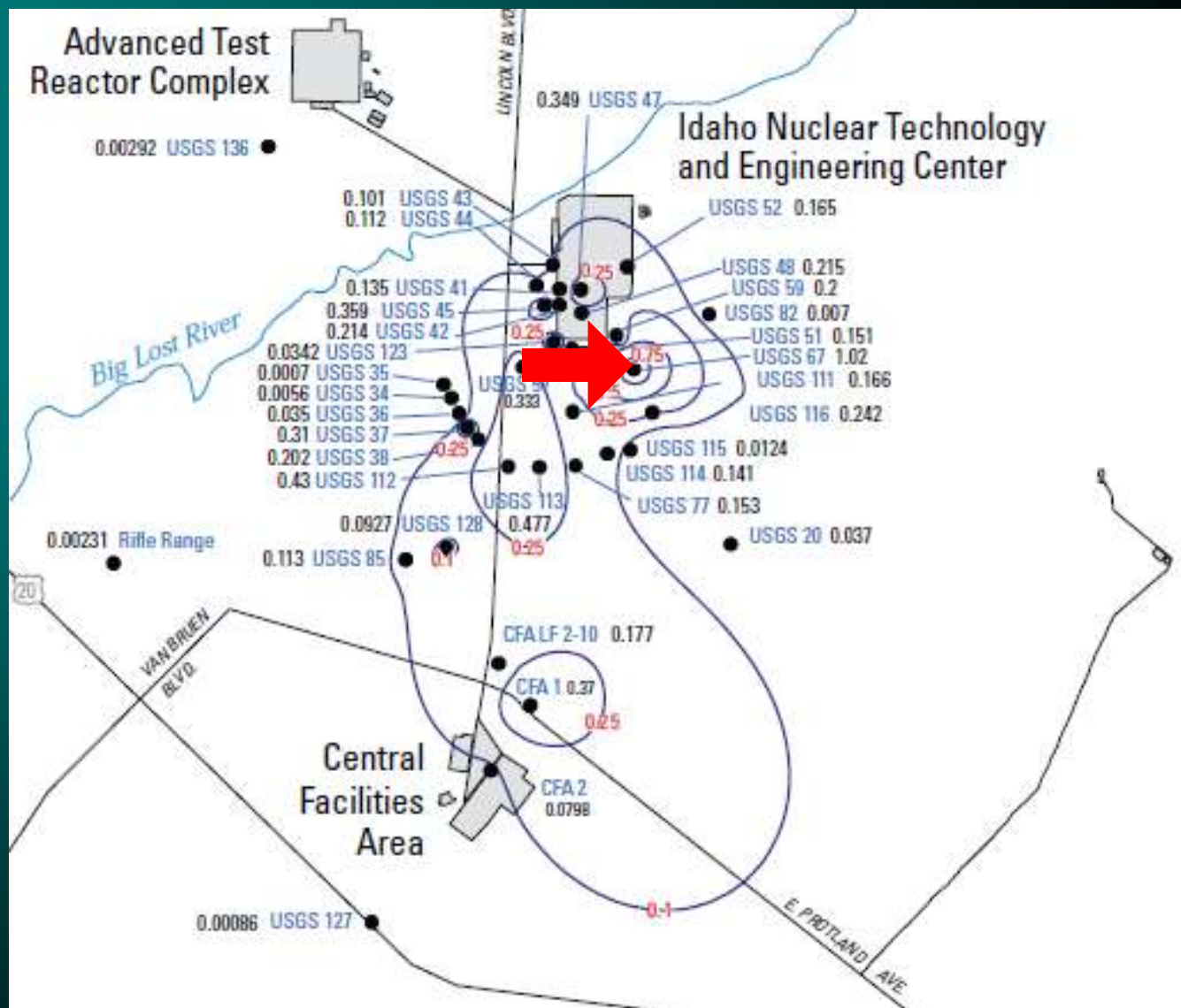
Largest concentration in  
2014 was 19.6 $\pm$ 1  
pCi/L in USGS 47



From Davis and others, 2013 (DOE/ID-22226)

## Iodine-129-2011-2012

Still one well (USGS 67) with a concentration above the drinking water standard of 1 pCi/L (1.02 +/-0.04 pCi/L)

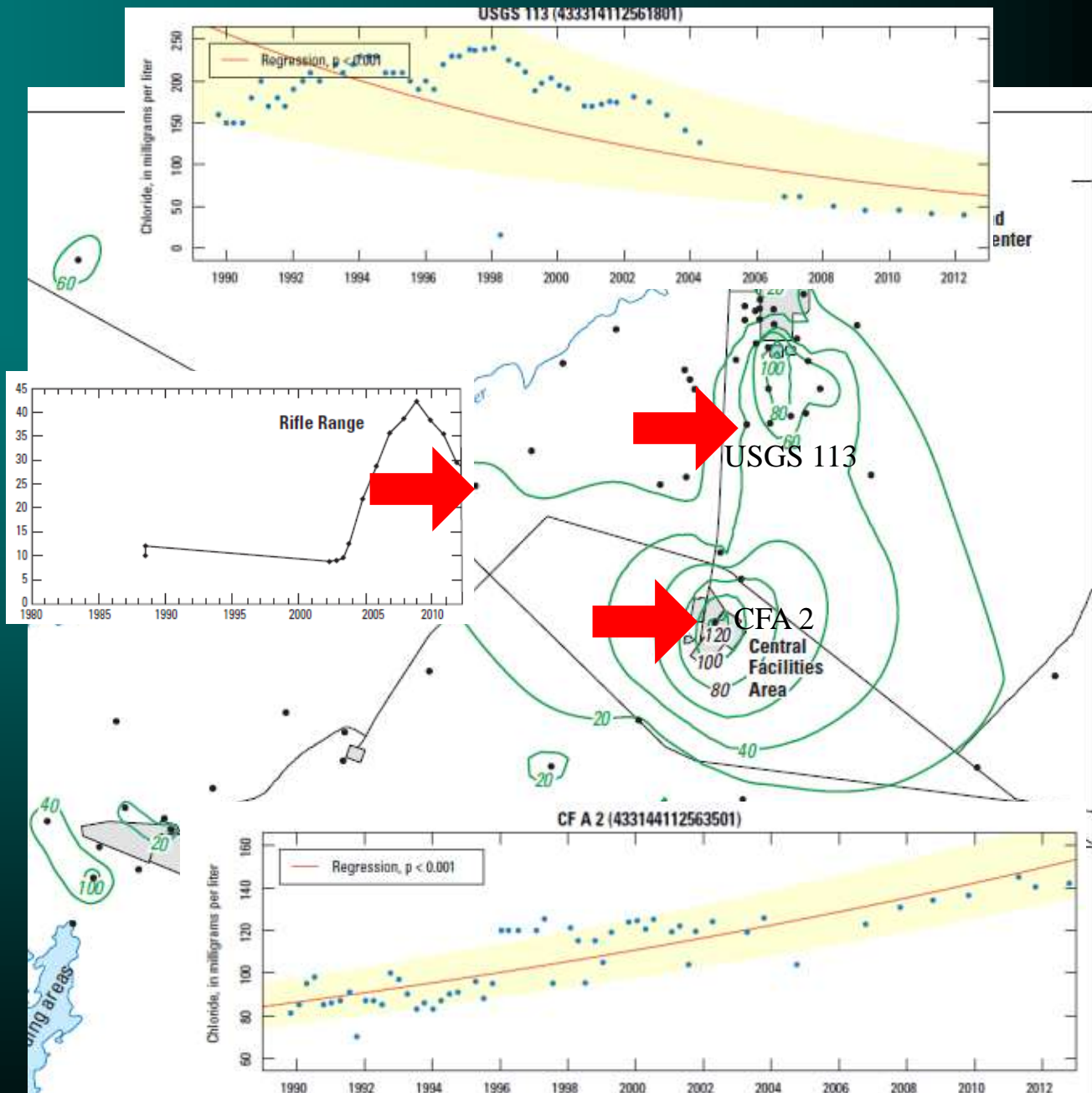




# Chloride-2011-2015

2015 concentration in USGS 113 was 29 mg/L.

Largest concentration was in CFA-2 at 134 mg/L

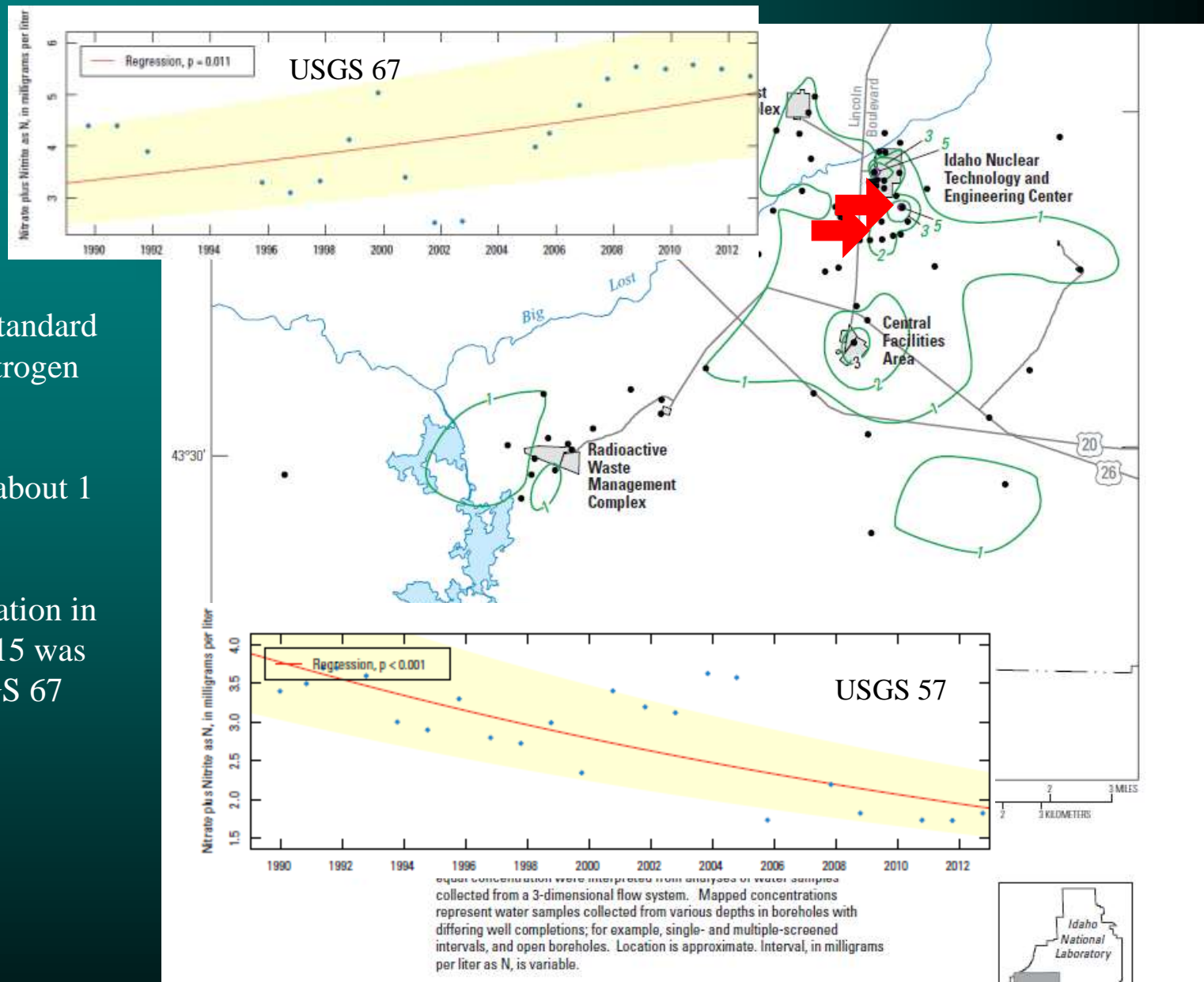


# Nitrate

Drinking water standard is 10 mg/L as Nitrogen

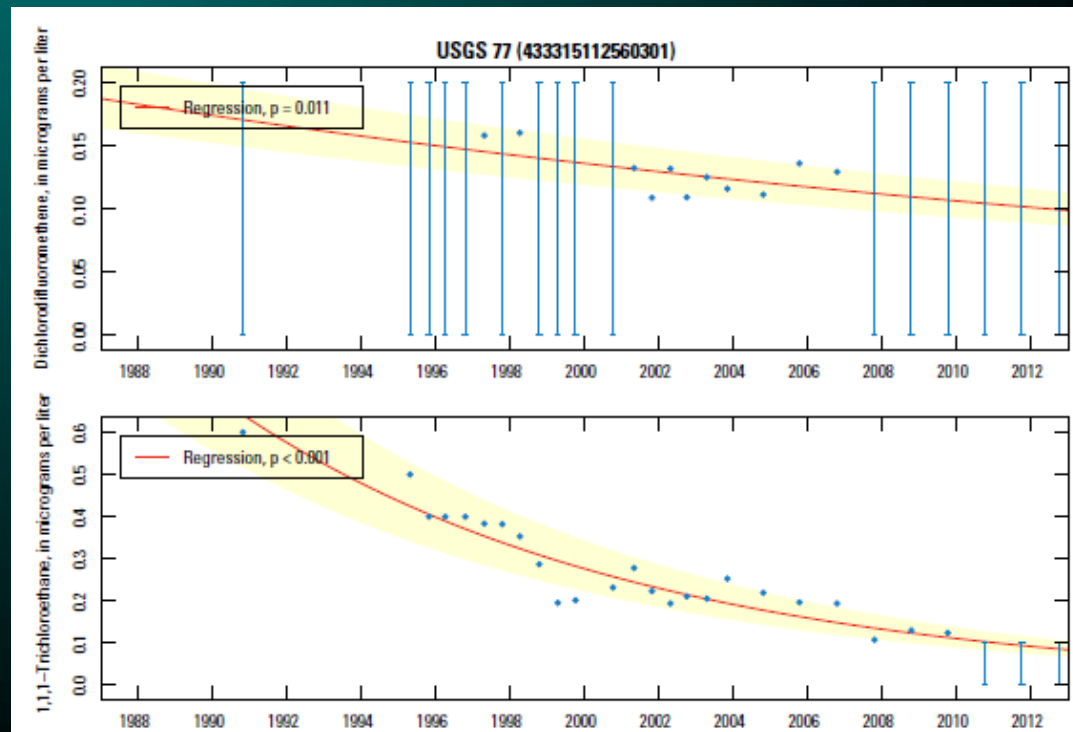
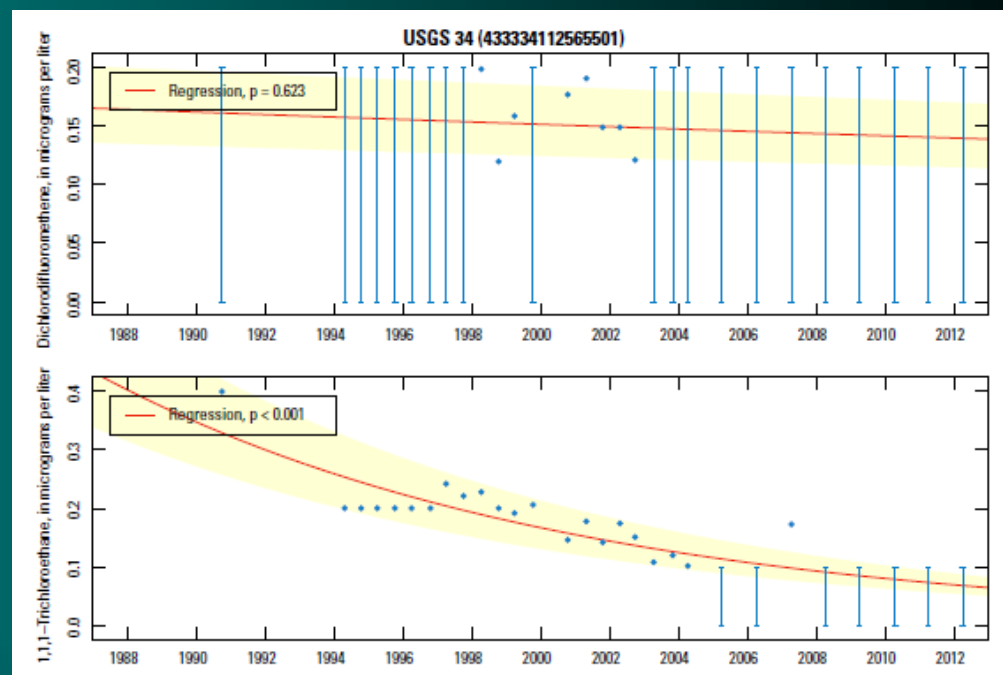
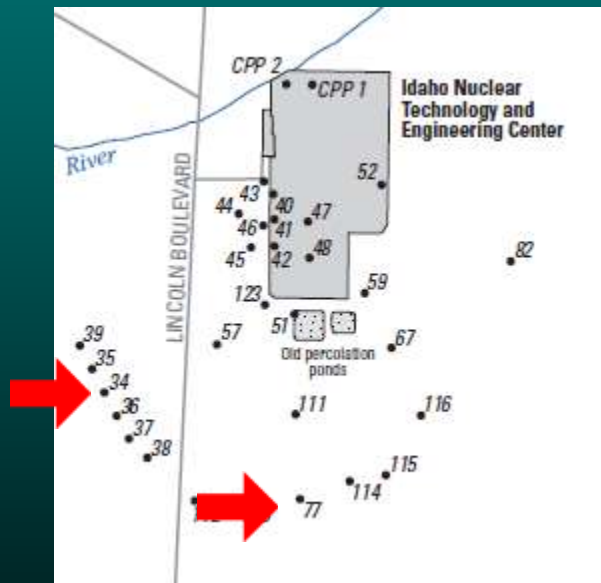
Background concentration is about 1 mg/L

Largest concentration in the aquifer in 2015 was 5.5 mg/L in USGS 67



# *Volatile organics south of INTEC*

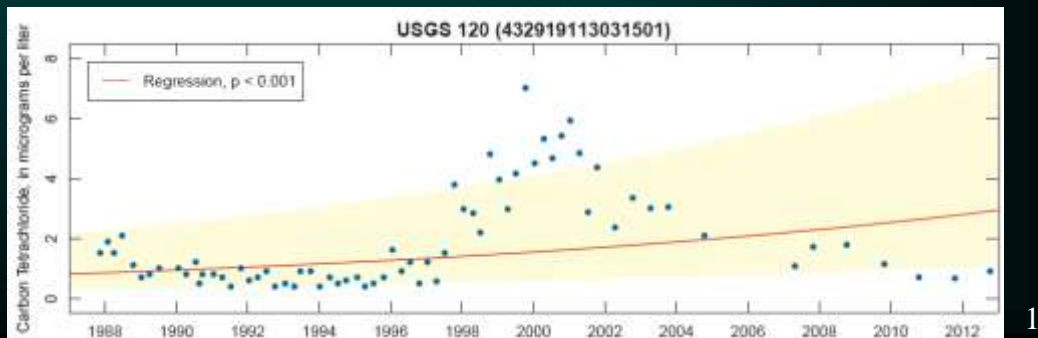
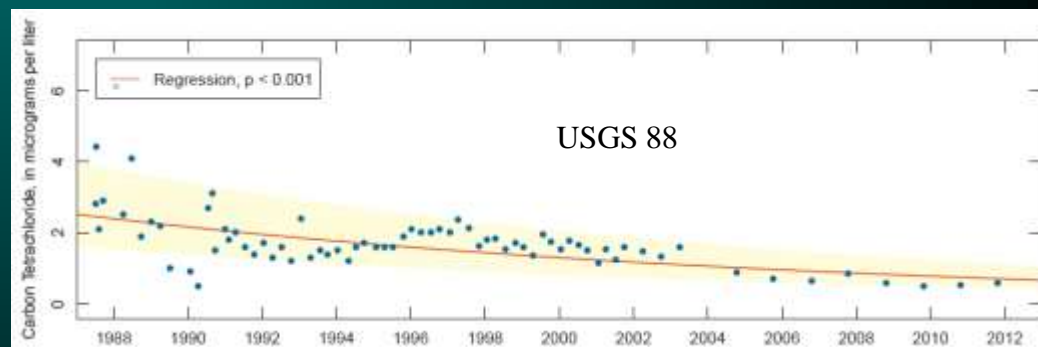
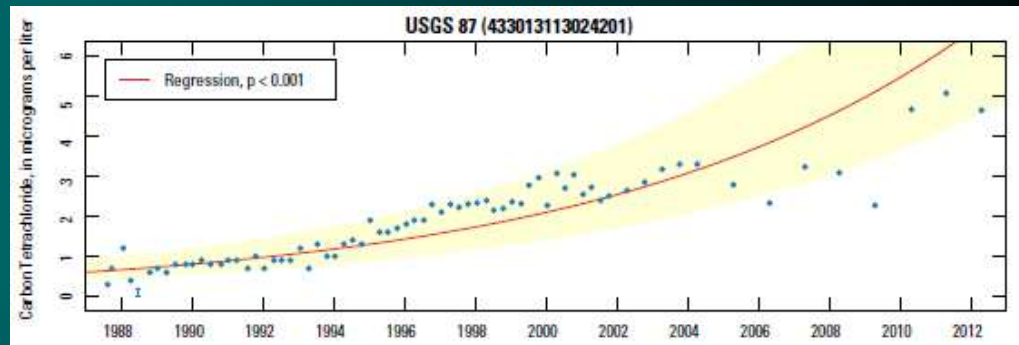
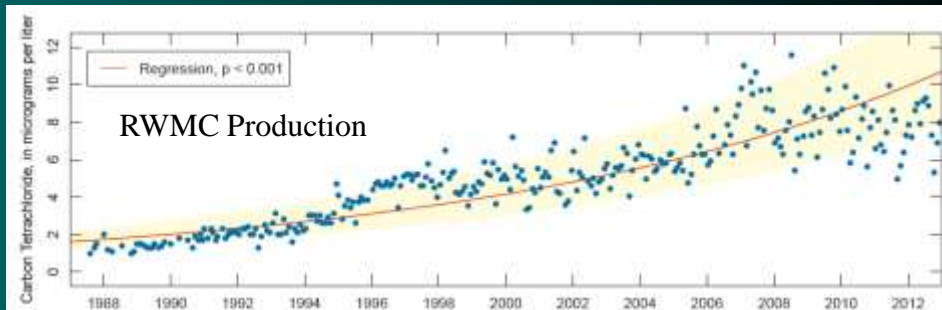
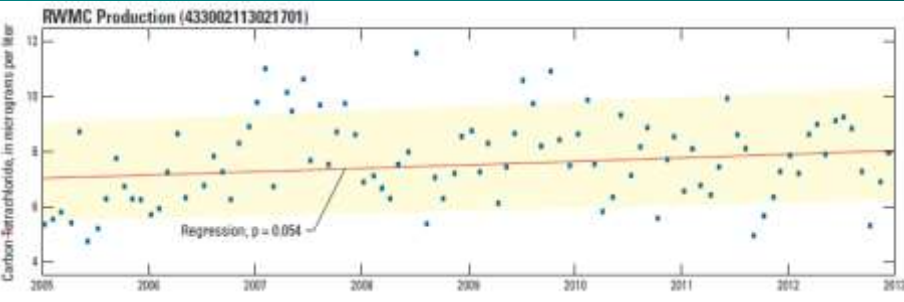
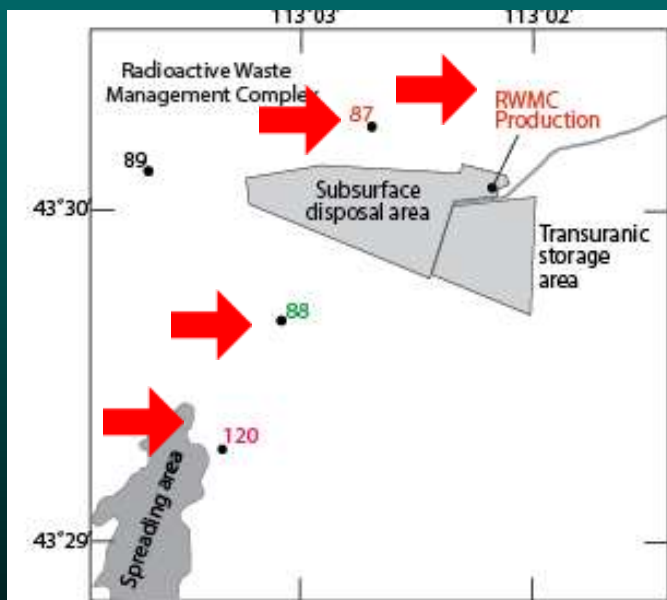
Concentrations of TCA have decreased to below the reporting levels recently; always have been below the MCL of 200 micrograms/liter

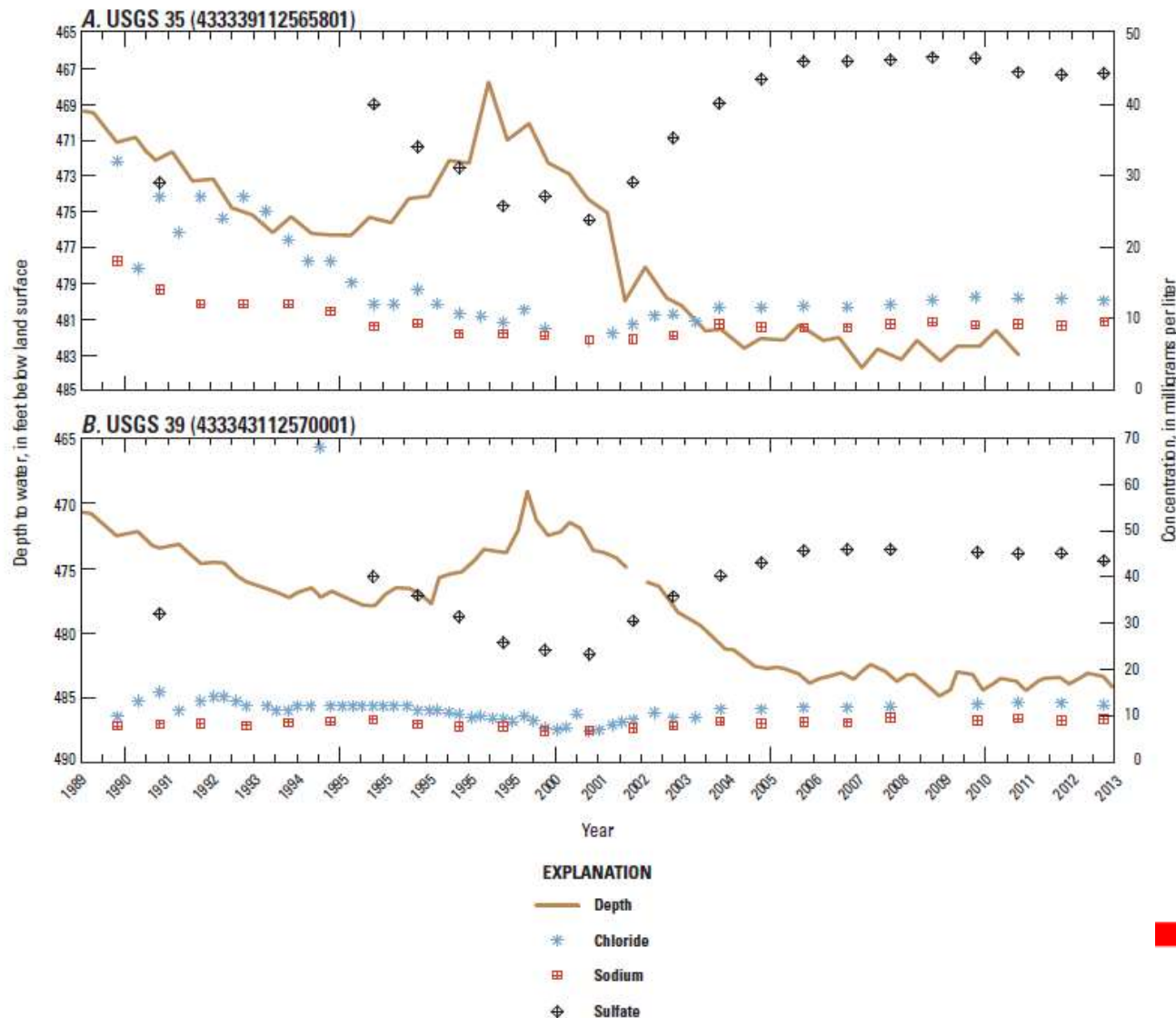




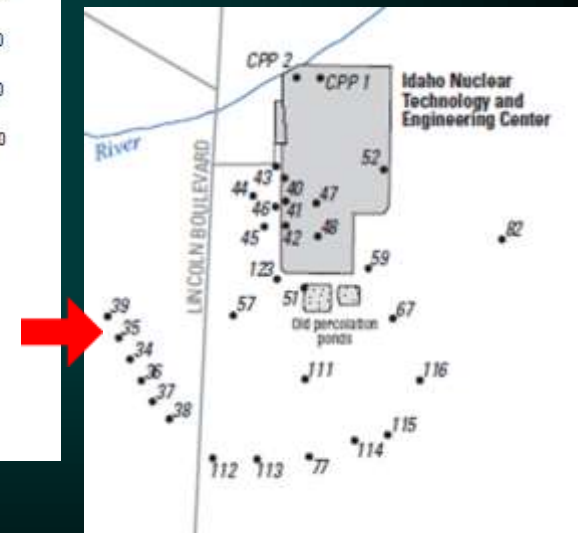
# Carbon tetrachloride

Drinking water standard is 5 µg/L





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



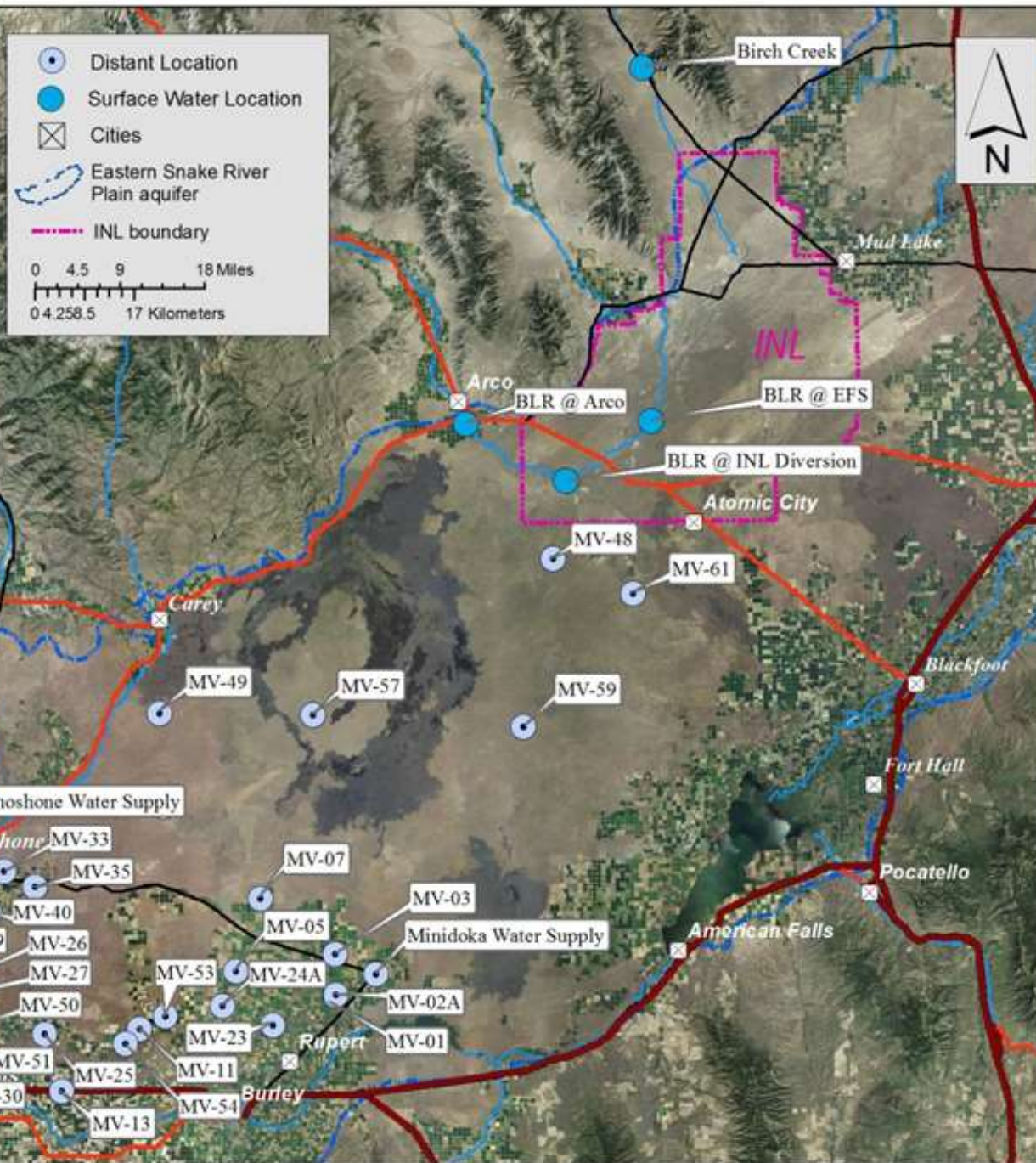
# *Water sampling history in wells downgradient from INL*

- 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.

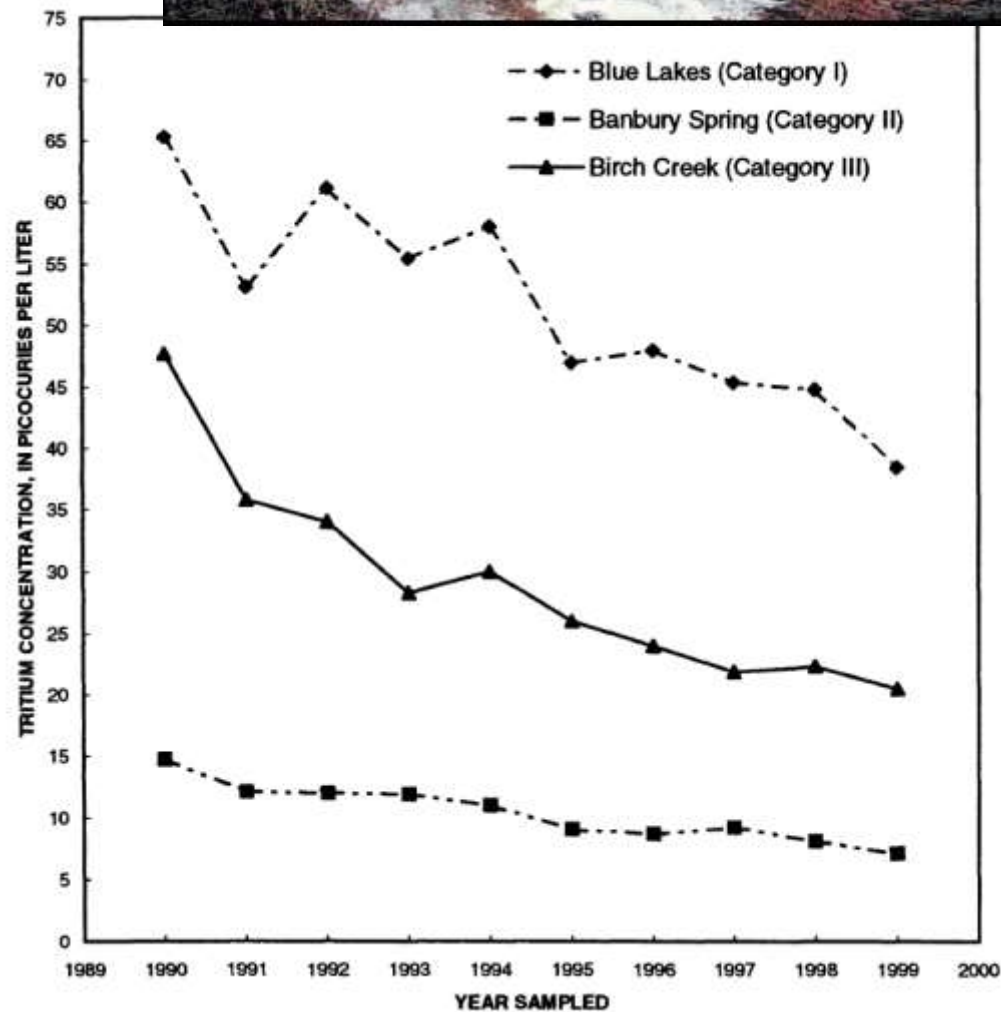
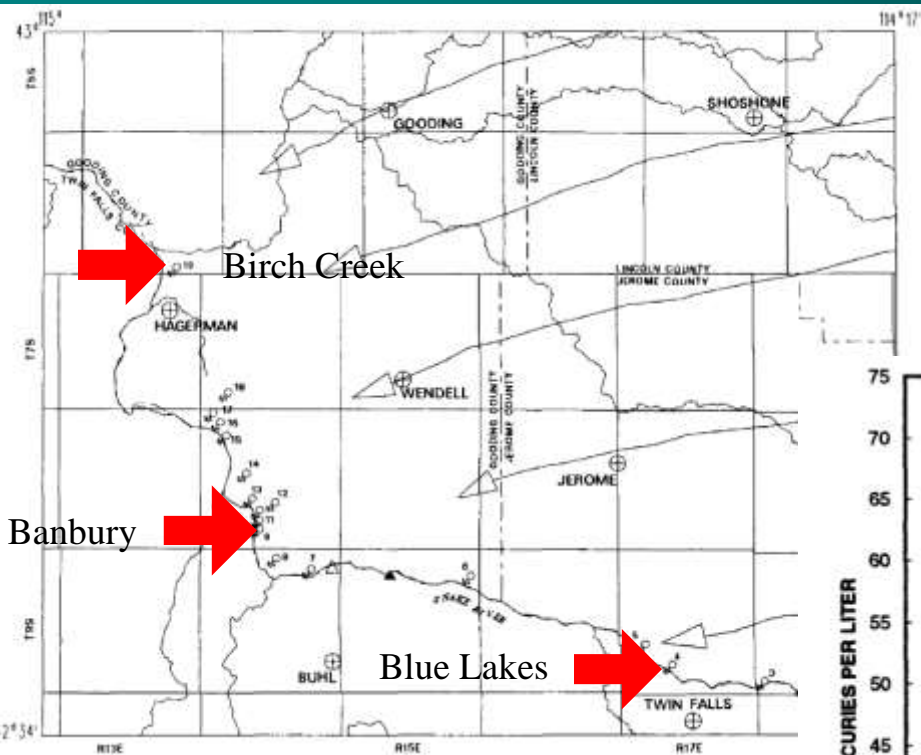




# INL-OP MV sampling



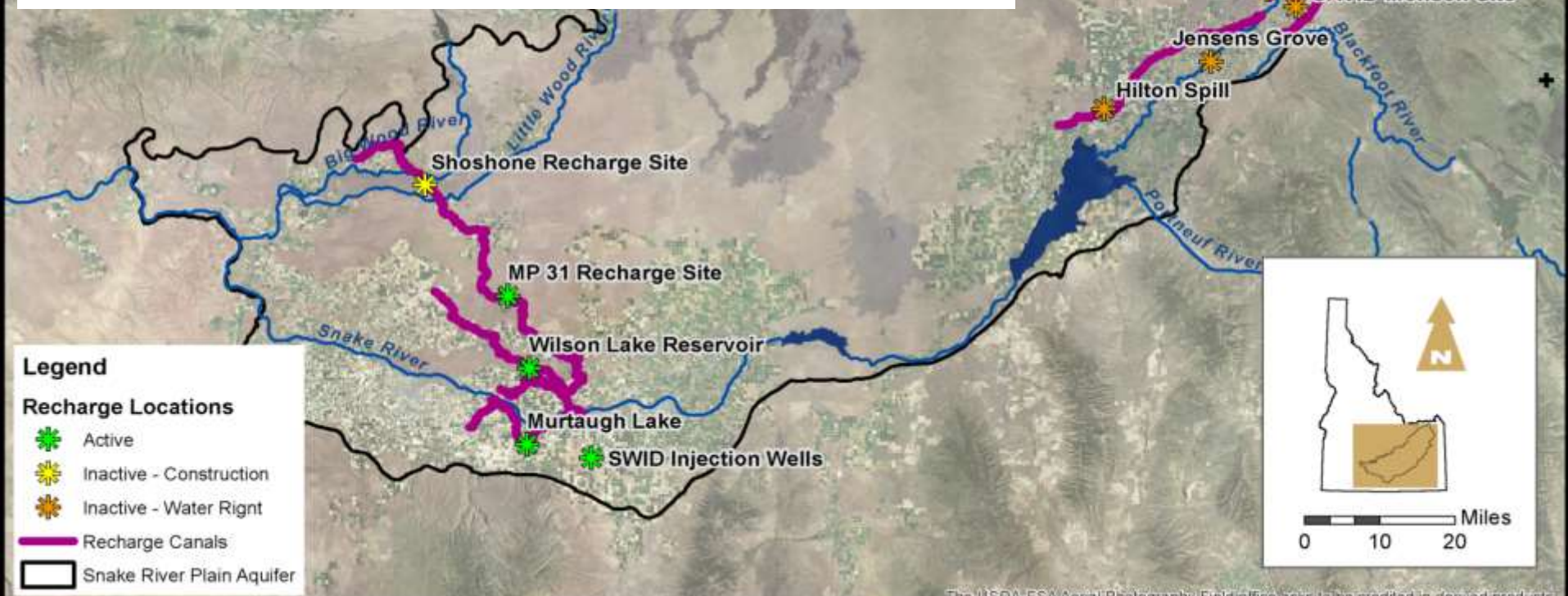
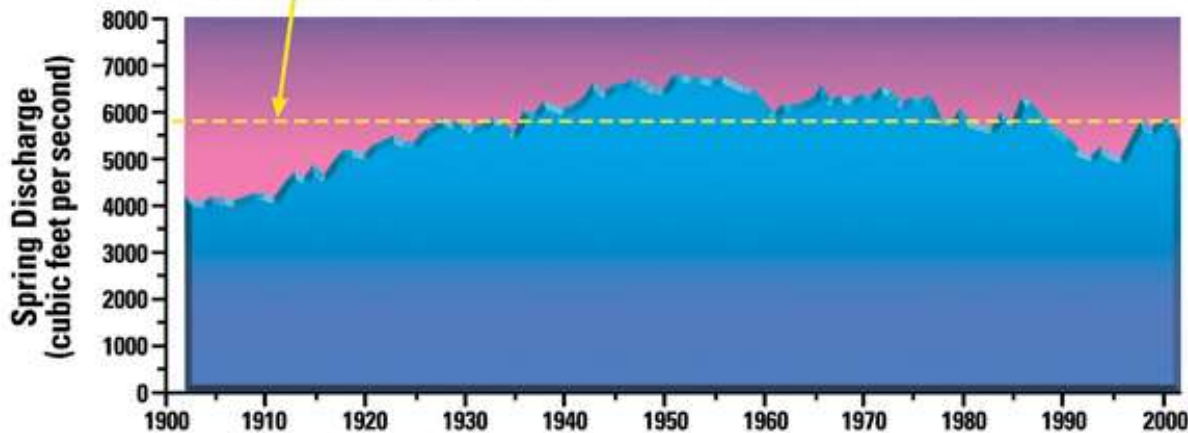




# IWRB - Canals & Locations used for Managed Recharge

Average discharge from 1902-2002  
5800 cubic feet per second

From "Digital Geology of Idaho"





# Summary

- Water levels in the aquifer at the INL have been mostly decreasing over the past 15 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

