

# Ground Water Quality Concerns in Southwest Idaho

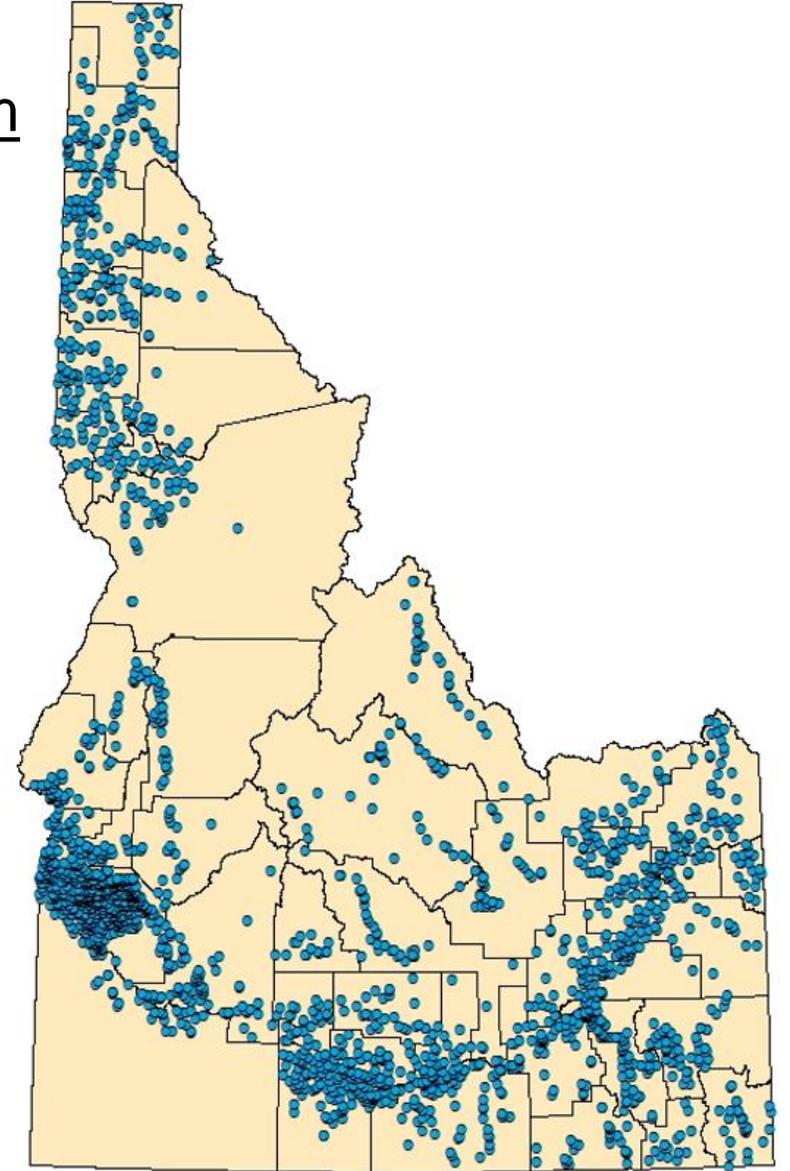
## Presentation Overview

- Statewide Ambient Ground Water Quality Monitoring Program overview
- Provide summary of the “Big 3” contaminants of concern in Southwest Idaho
  - Arsenic
  - Nitrate
  - Uranium
- Treasure Valley uranium study
  - Gus Womeldorph, IDWR
- Nitrate Priority Areas
  - Kathryn Elliott, DEQ



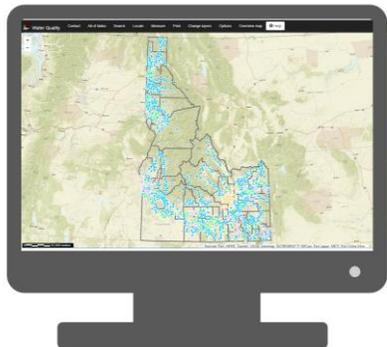
## Statewide Ambient Ground Water Quality Monitoring Program

- “Statewide Program” began sampling wells in 1990
- To date, have sampled 2,130 unique wells resulting in over 750,000 results
- Typically target ~300 wells each year with a 5-year rotation
  - 200-250 of those 300 wells are sampled
- The program provides data to homeowners, other agencies, and the general public



Data are housed in the Environmental Data Management System (EDMS) and are available for download at:

<https://maps.idwr.idaho.gov/map/edms>



What does the Statewide Program sample for?



IDAHO DEPARTMENT OF HEALTH & WELFARE  
DIVISION OF PUBLIC HEALTH



| IDWR Statewide Program: 2019 Constituents |           |                        |
|---|-----------|------------------------|
| Field Parameters                          | Metals    | Nutrients              |
| pH  | Arsenic   | Ammonia                |
| Conductivity                              | Cadmium   | Nitrate+Nitrite        |
| Depth to Water                            | Calcium   | Total Phosphorus       |
| Dissolved Oxygen                          | Copper    | Pesticides             |
| Temperature                               | Iron      | Atrazine               |
| Common Ions                               | Magnesium | Glyphosate             |
| Chloride                                  | Manganese | Imidacloprid           |
| Fluoride                                  | Potassium | Metolachlor            |
| Sulfate                                   | Selenium  | Collaborative Sampling |
| Alkalinity                                | Silica    | Methane                |
| Emerging Contaminants                     | Sodium    | N-15 isotope           |
| BPA                                       | Uranium   |                        |
| Triclosan                                 |           |                        |

## Quick primer on Maximum Contaminant Levels (MCLs)

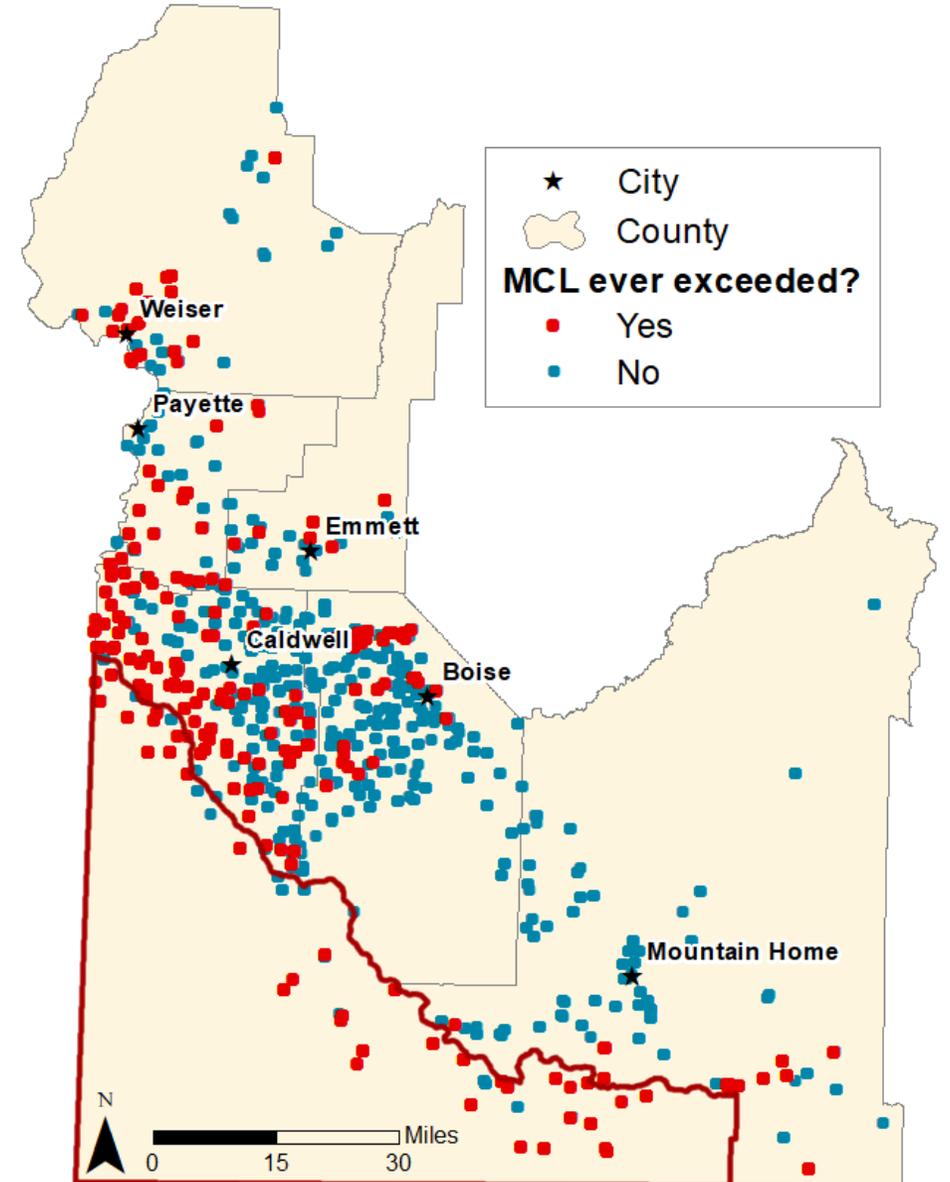
- MCLs are drinking water standards set by the EPA
  - MCLs are enforced in public water systems under the Safe Drinking Water Act
- Treatment is recommended for private wells that exceed the MCL
- Now let's move into some results...

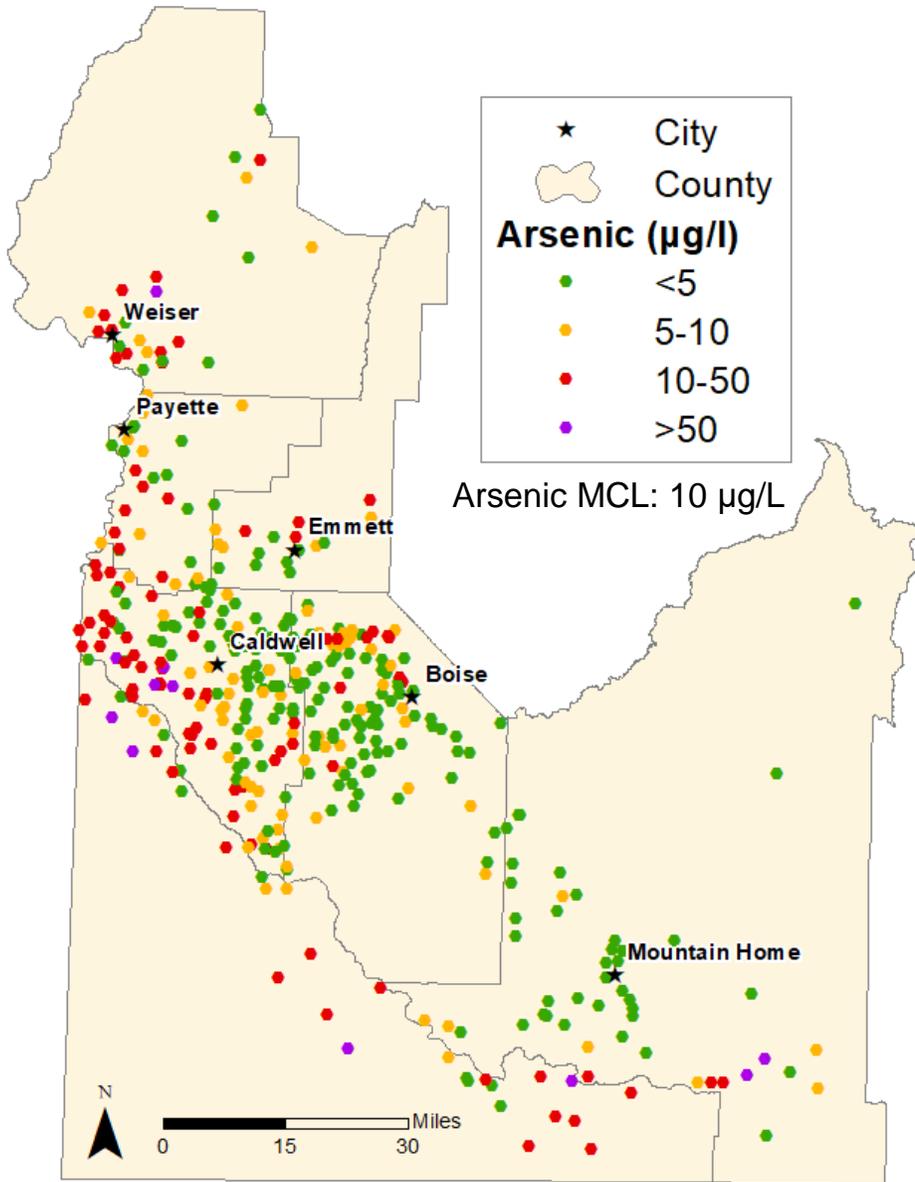


Arsenic

- Naturally occurring
- MCL is 10 µg/L (0.010 mg/L)
- SW Idaho: 635 sites sampled since 1990
  - 219 sites with at least one MCL exceedance (34% of wells sampled)

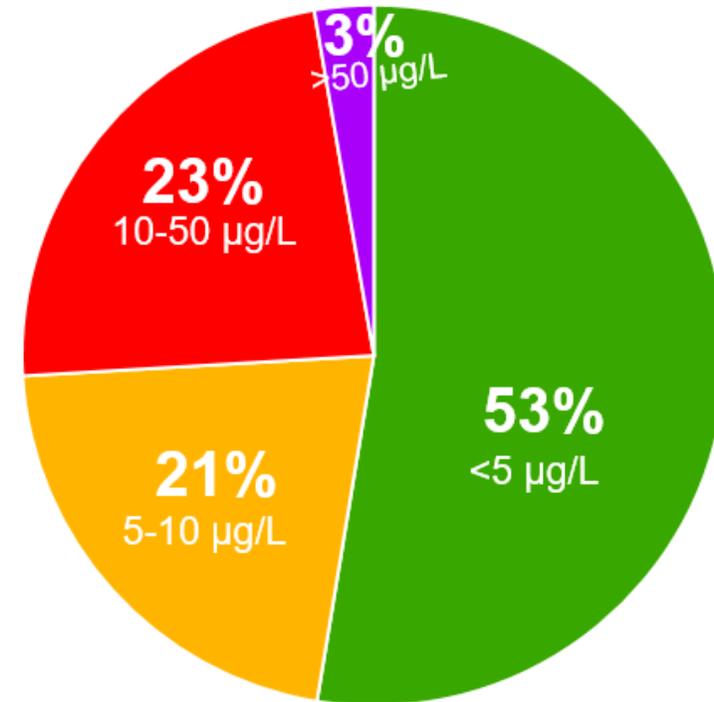
| County     | % of wells with at least one Arsenic MCL exceedance |
|------------|---|
| Ada        | 17%   |
| Canyon     | 43%   |
| Elmore     | 17%   |
| Gem        | 28%   |
| Owyhee     | 69%   |
| Payette    | 50%   |
| Washington | 50%   |





## Arsenic concentrations from the last decade

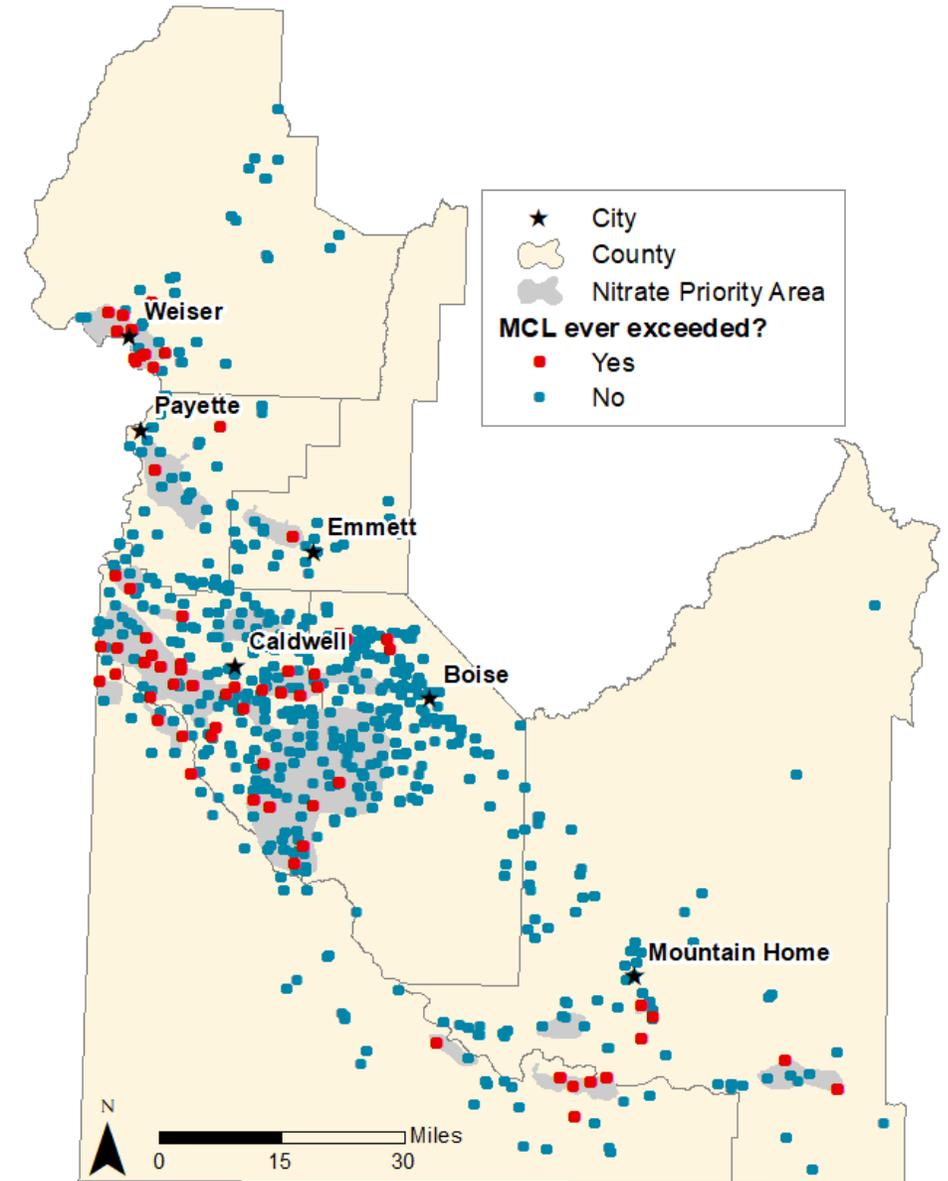
- 405 wells sampled in SW Idaho from 2010-2019

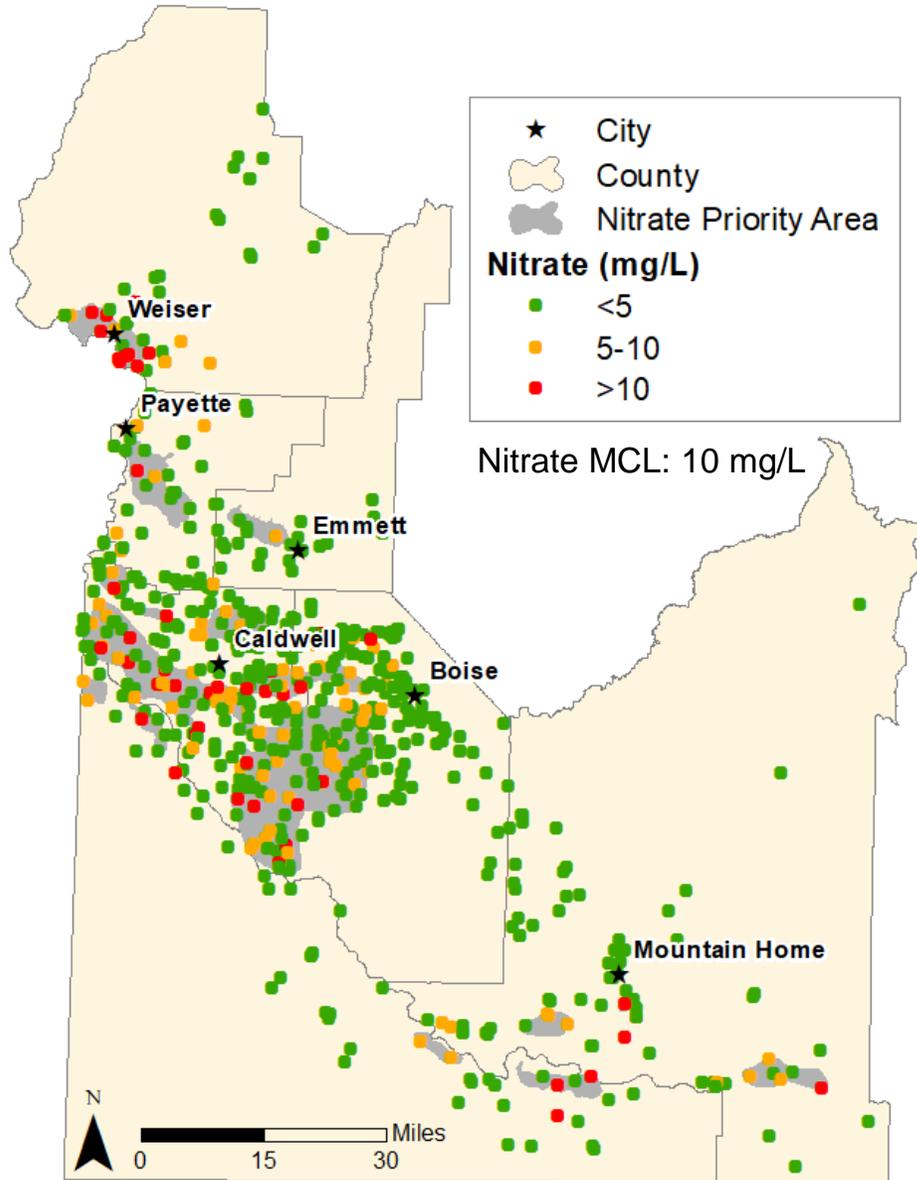


## Nitrate

- Originates from anthropogenic and natural sources
- MCL is 10 mg/L
- SW Idaho: 634 sites sampled since 1990
  - 69 sites with at least one exceedance (11% of wells sampled)

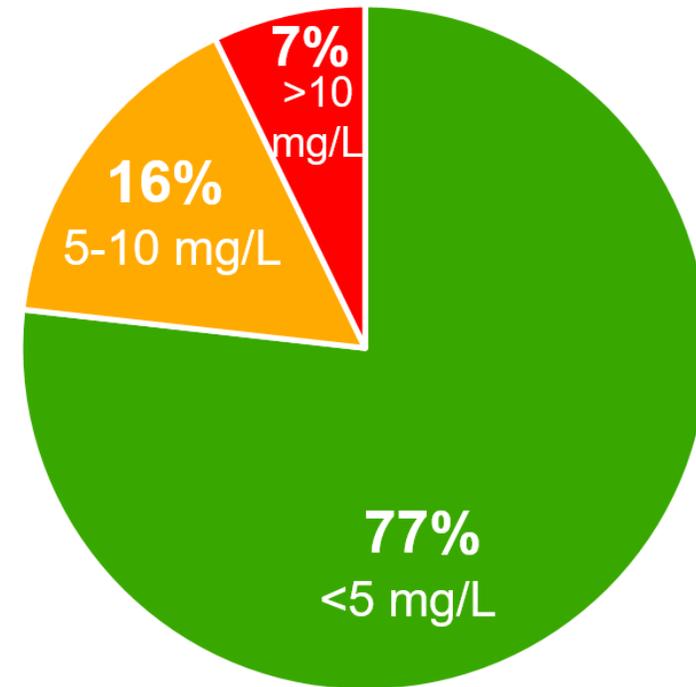
| County     | % of wells with at least one Nitrate MCL exceedance |
|------------|---|
| Ada        | 5%  |
| Canyon     | 14%   |
| Elmore     | 8%  |
| Gem        | 3%  |
| Owyhee     | 20%   |
| Payette    | 5%  |
| Washington | 30%   |





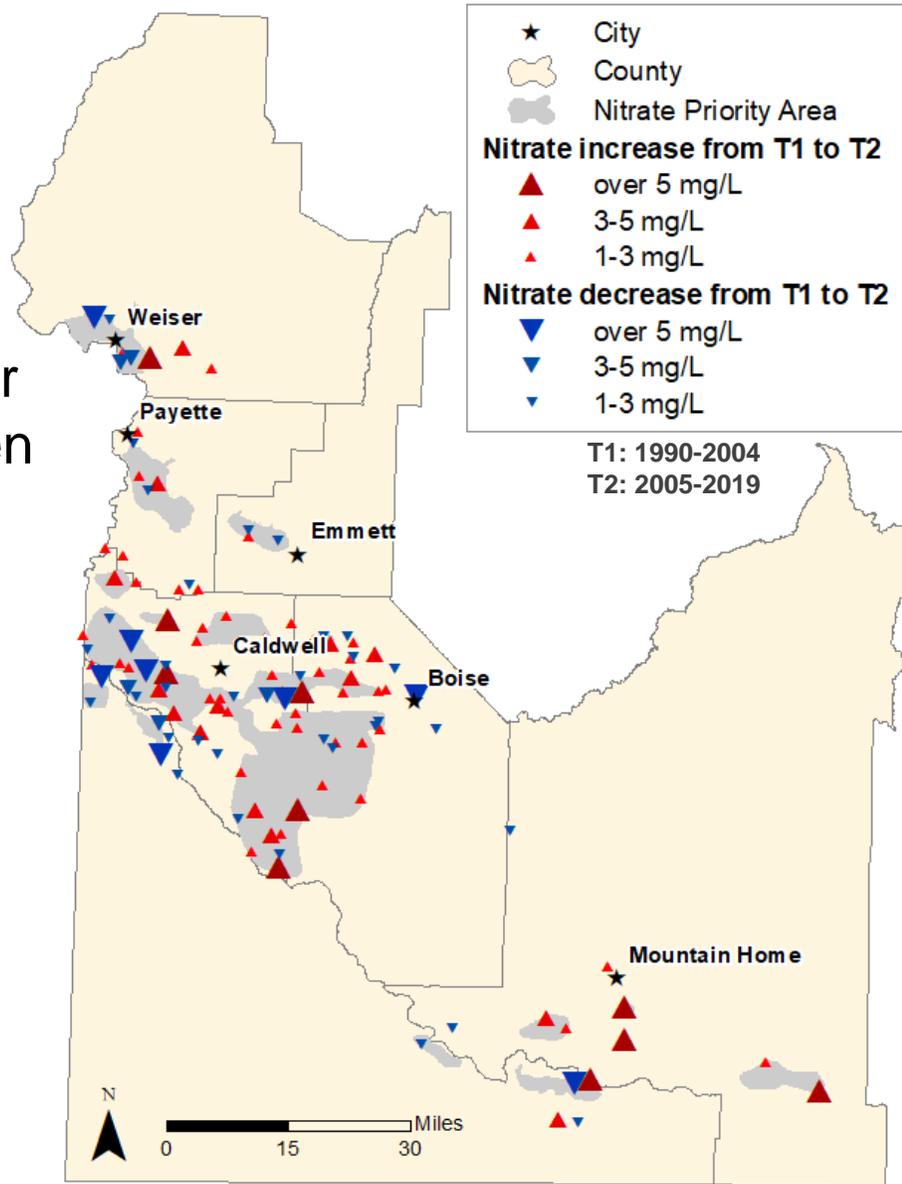
## Nitrate concentrations from the last decade

- 405 wells sampled from 2010-2019

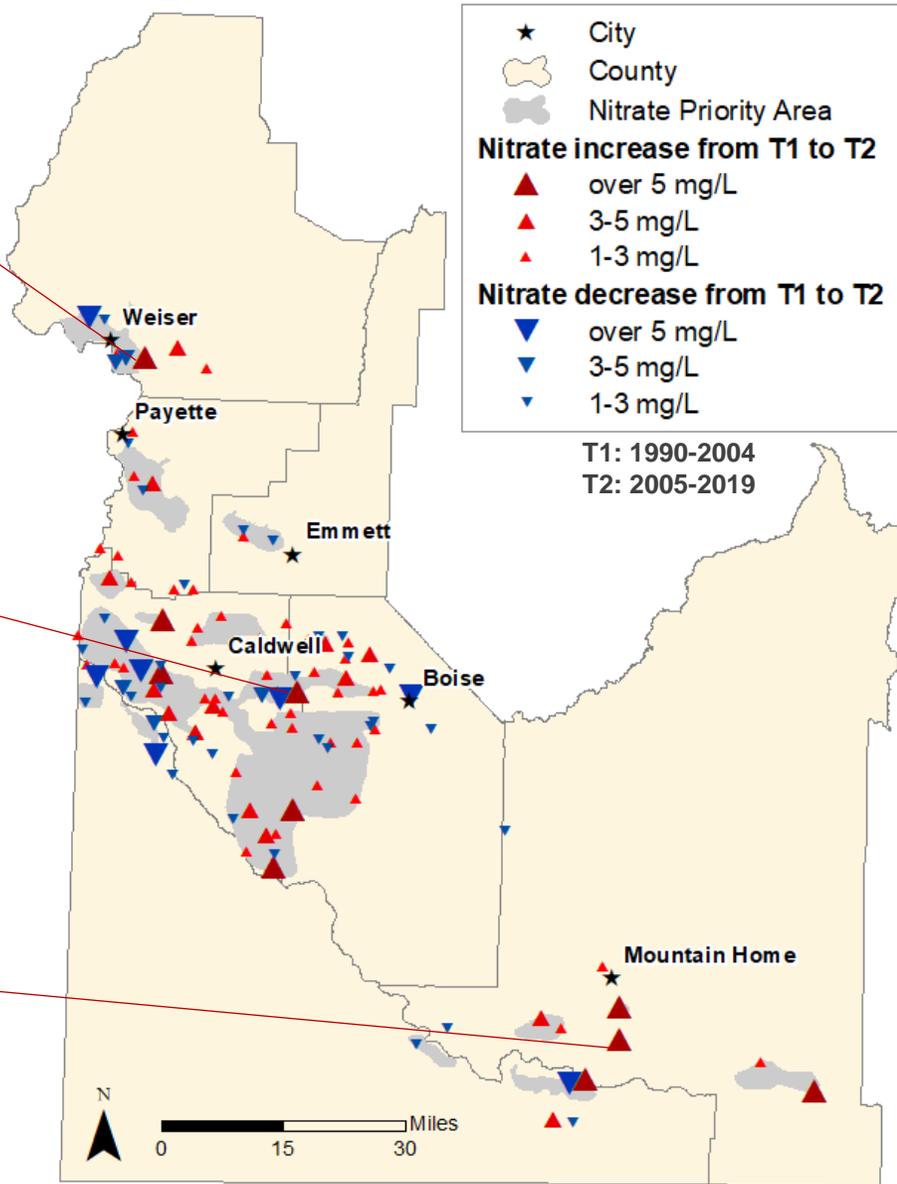
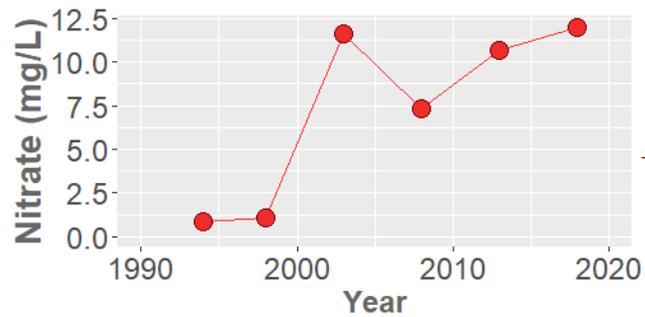
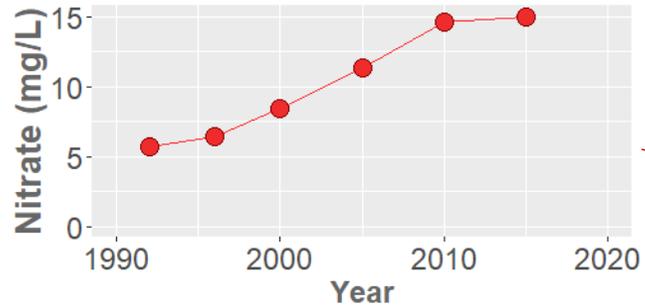
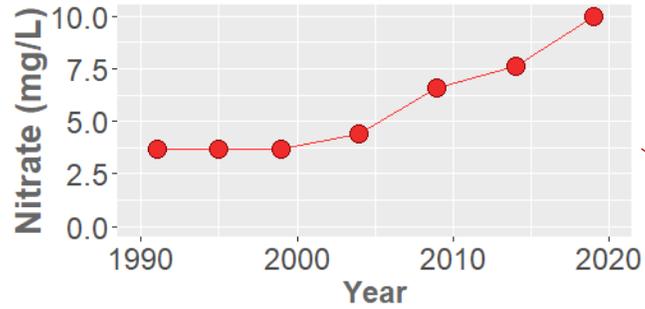


Are nitrate concentrations increasing or decreasing?

- Can look at changes in average concentrations for each site sampled between two time periods
  - T1: 1990-2004
  - T2: 2005-2019

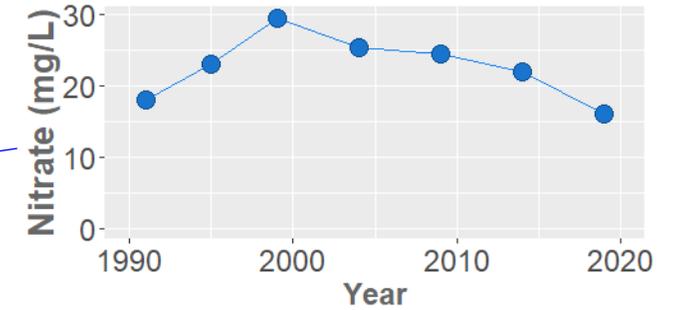
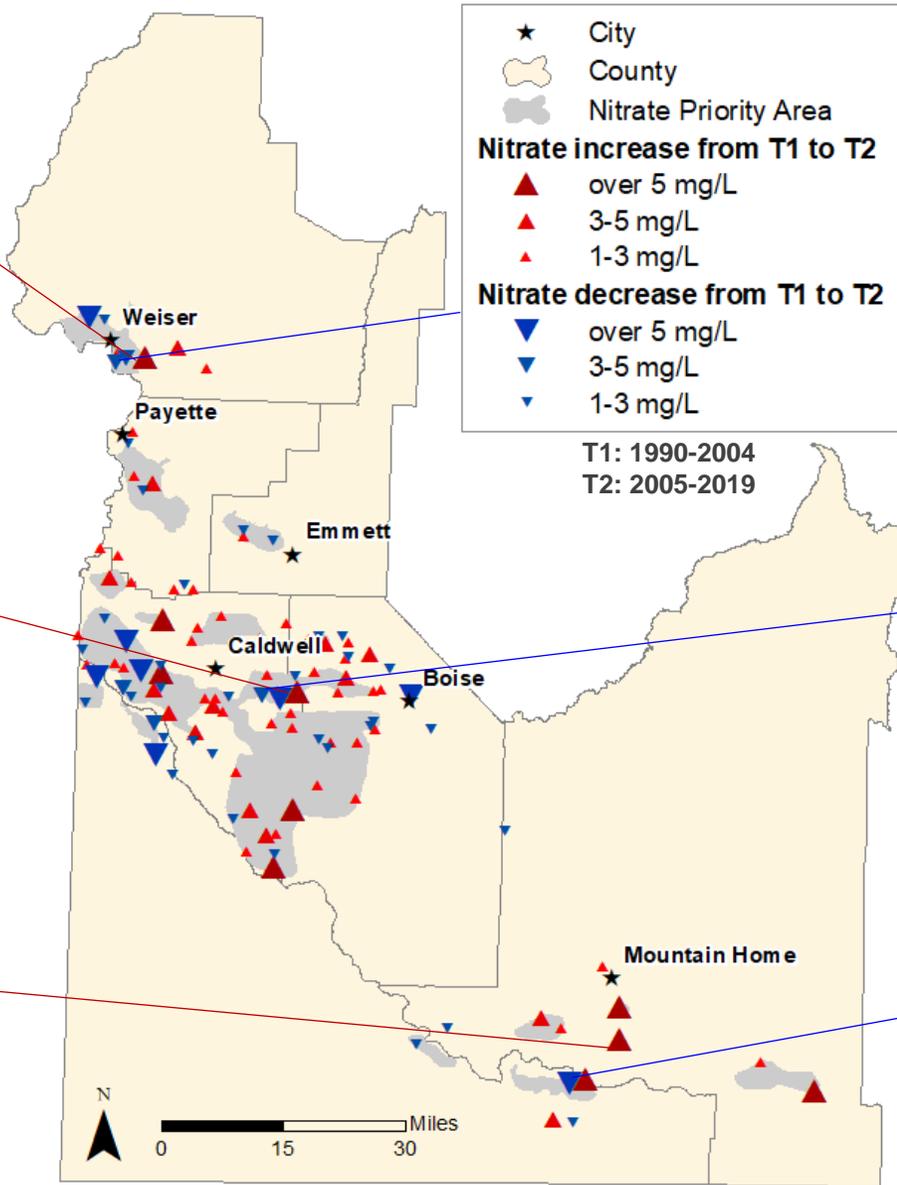
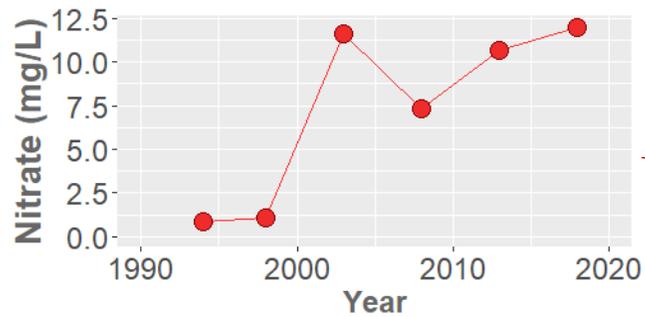
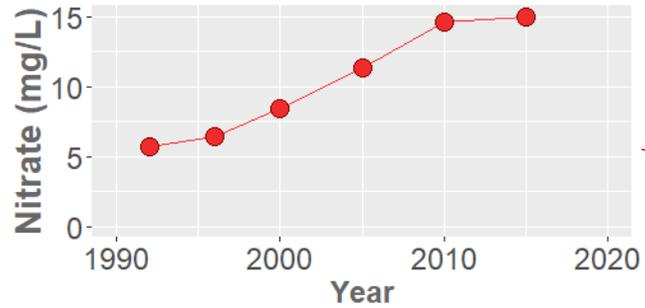
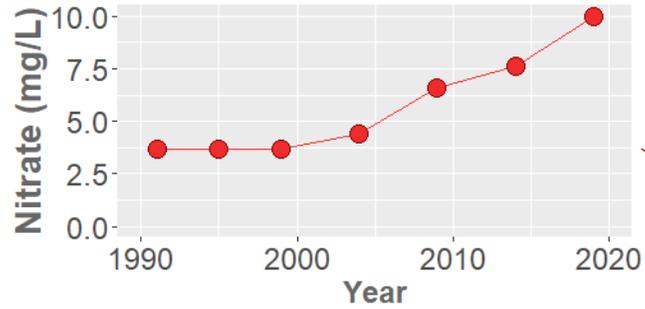


A few examples of wells showing an **increase** in nitrate



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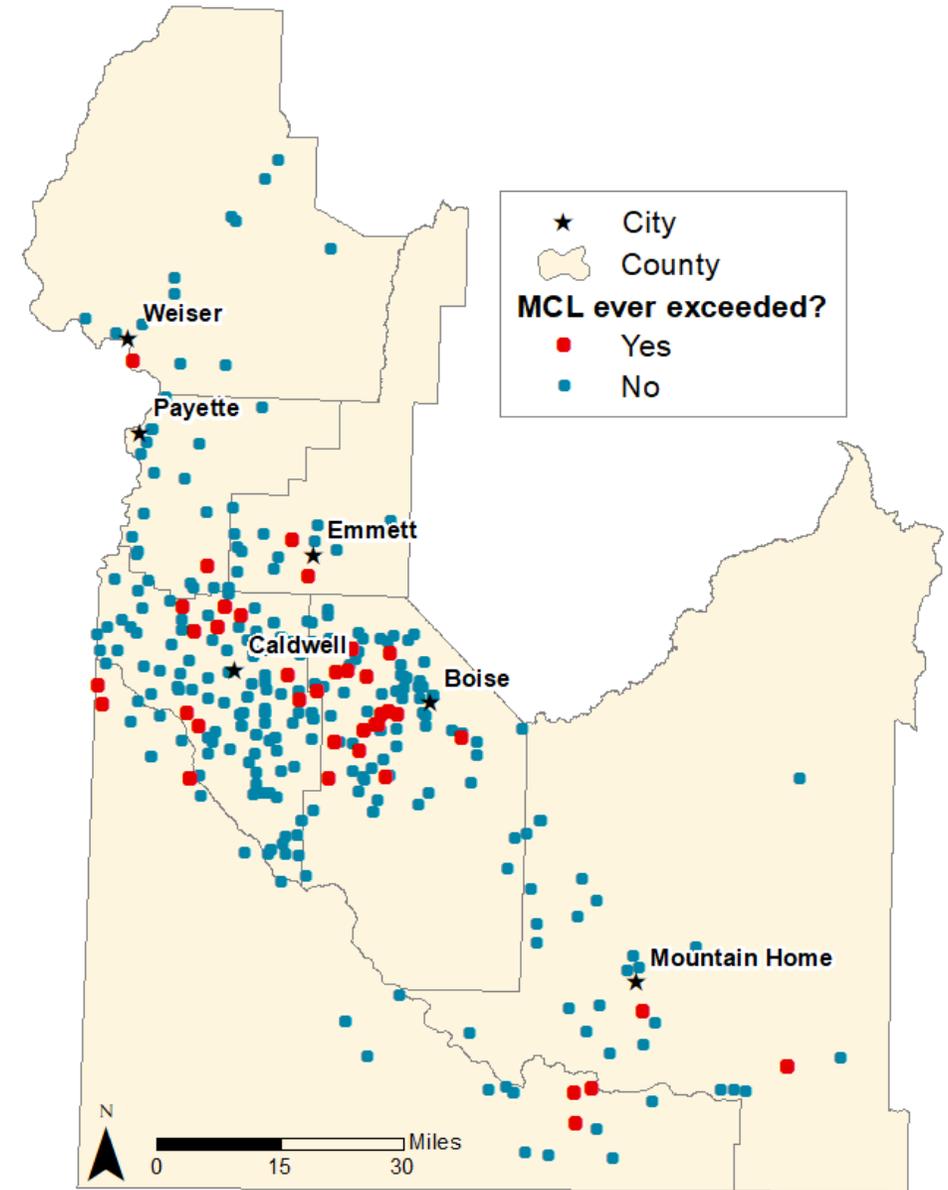
...and some that show **decreasing** nitrate

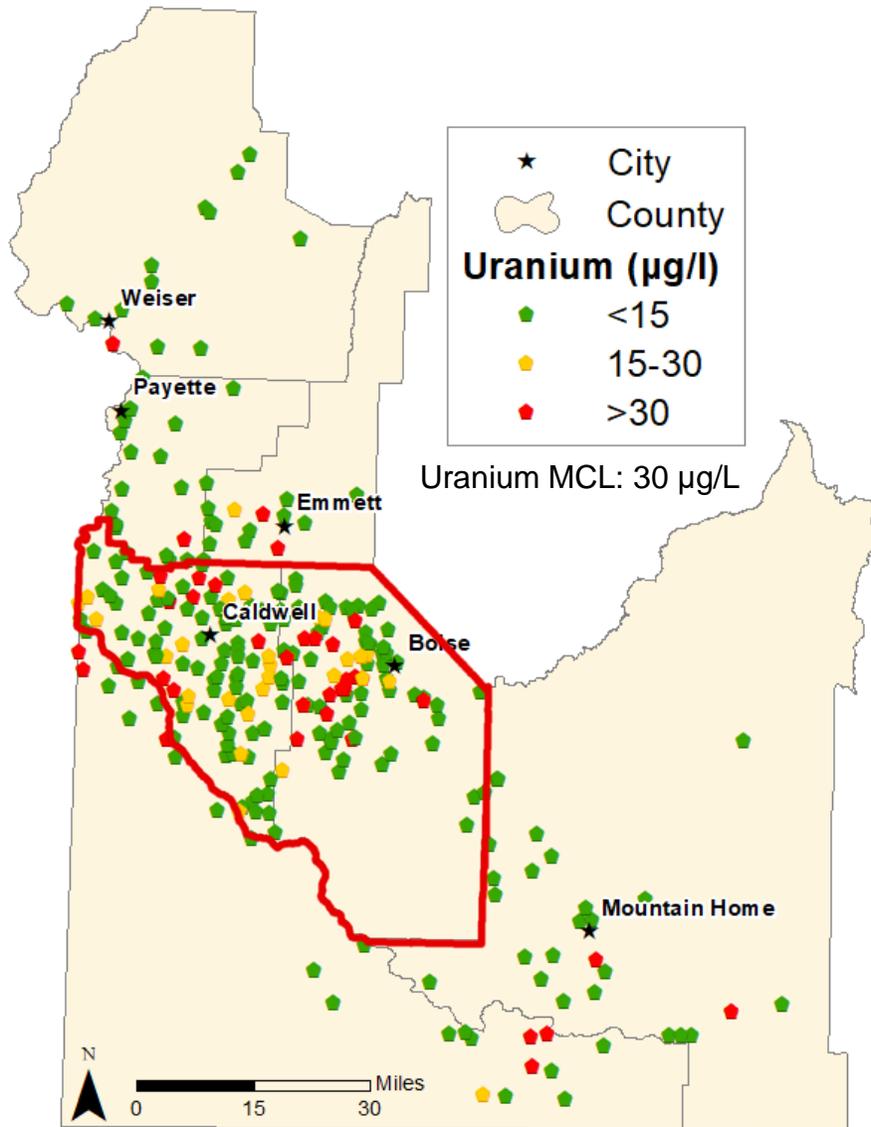


## Uranium

- Naturally occurring
- MCL is 30 µg/L
- SW Idaho: 281 sites sampled since 1990
  - 38 sites with at least one exceedance (14% of wells sampled)

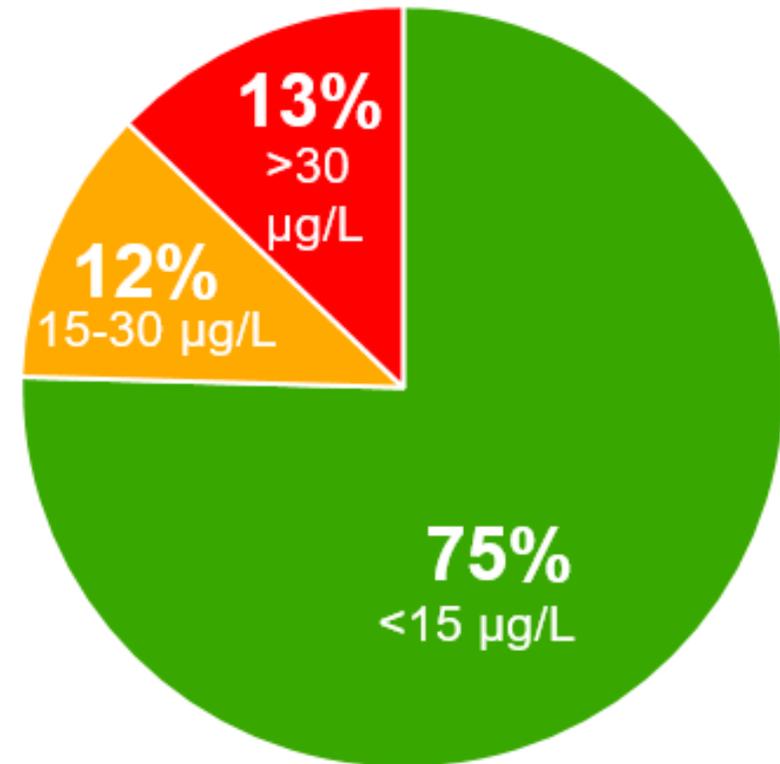
| County     | % of wells with at least one Uranium MCL exceedance |
|------------|---|
| Ada        | 20%   |
| Canyon     | 10%   |
| Elmore     | 7%  |
| Gem        | 13%   |
| Owyhee     | 23%   |
| Payette    | 6%  |
| Washington | 8%  |





Uranium: most recent values from period of record

- 281 wells sampled from 1991-2019



# Uranium in the Treasure Valley

Where is it, and how can it be managed?

Gus Womeldorph

### TREASURE VALLEY WELLS SHOW ELEVATED URANIUM

*BSU, Water Resources joint report shows number of Ada, Canyon county wells have unsafe Uranium levels*

By **XAVIER WARD**

Especially in the West, where water can be scarce, the quality of the groundwater is vital to the health of communities.

In the Treasure Valley's urban areas, the quality of water is monitored by municipal agencies that clean the water before it goes out to consumers. People who rely on well water, however, are often responsible for their own water quality.

"It seems from what we found that [Uranium is] present throughout the valley, and there's some variability," said Gus Womeldorph, a recent graduate of Boise State University, whose master's thesis



Wells across the Treasure Valley show elevated levels of Uranium, which occurs naturally in the sediment.

containing 30 micrograms per liter of Uranium or greater is unfit for drinking. In Womeldorph's study, 37% of domestic wells, or 54 total wells, showed unsafe levels of Uranium. By contrast, 18.5%, or 210 wells, of public supply wells showed unsafe levels of Uranium. The data set for Ada County covered less than 2% of total wells in the county.

In Canyon County, 15.5% of domestic wells, or 58, showed levels of Uranium that exceed federal standards. For public supply wells, 14.1%, or 156, showed

nants, exceed safe levels, install a reverse osmosis water filter on your system, which costs around \$200.

"You don't really know what you're drinking until you sample your wells," said Tom Neace, manager of the Ground Water Protection Section.

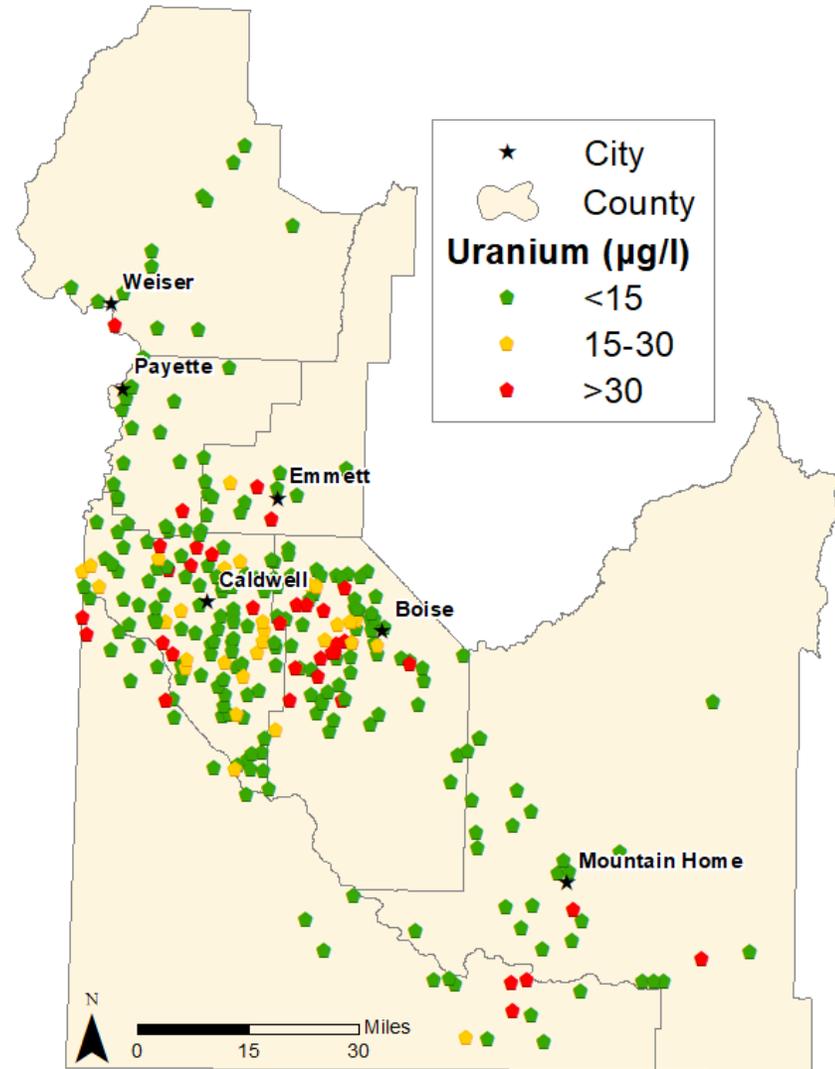
Neace said if your water is a public utility, coming from Suez or another local water company, it's being tested before it reaches customers, and is likely safe but well owners are responsible for testing their own supply.



COURTESY OF ADA COUNTY

# Uranium in Ground Water

- Drinking Water Standard: **30  $\mu\text{g/L}$**
- Toxicity concerns
  - Kidney toxicity
  - Cancer risk
- Sources
  - Natural
  - Anthropogenic



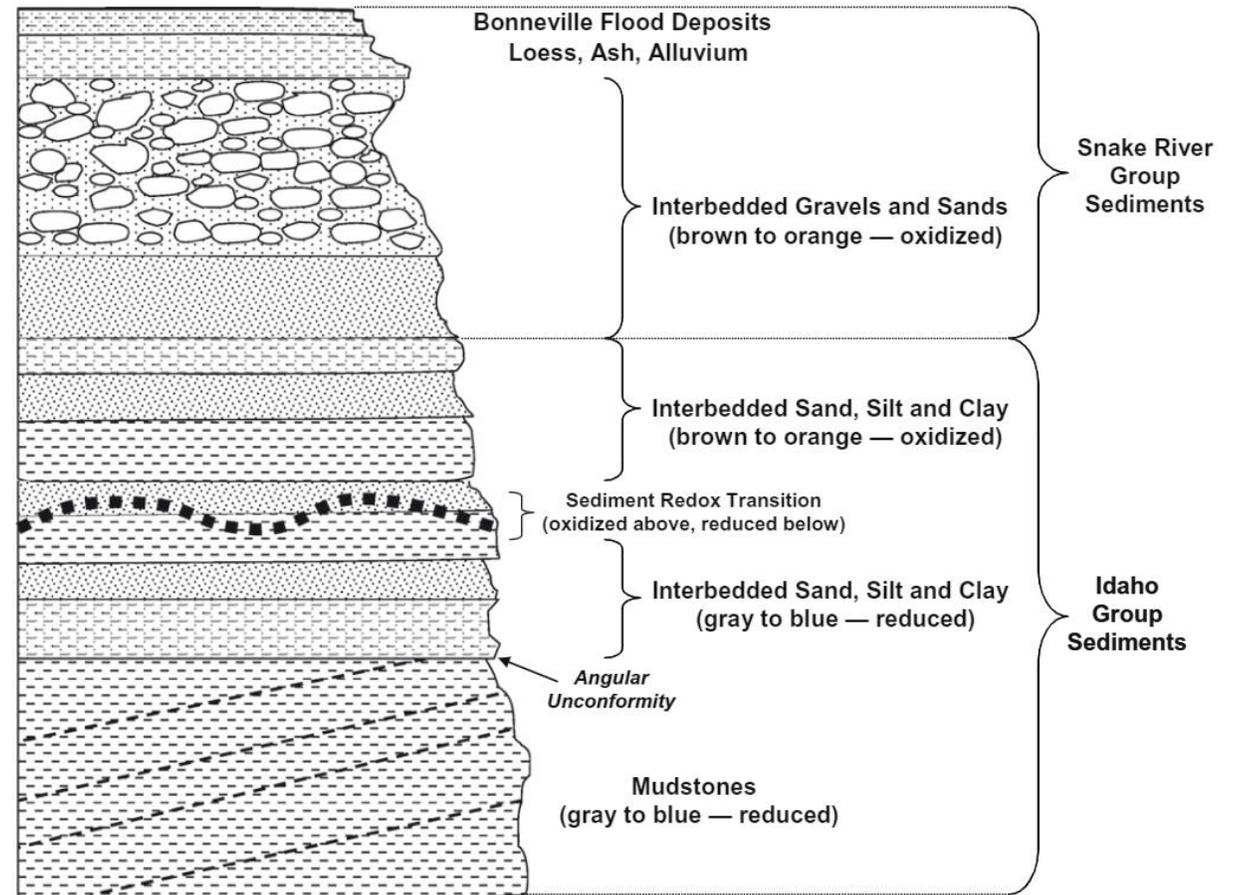
# Study Objectives

1. Characterize Uranium
2. Critique Uranium monitoring
3. Management recommendations



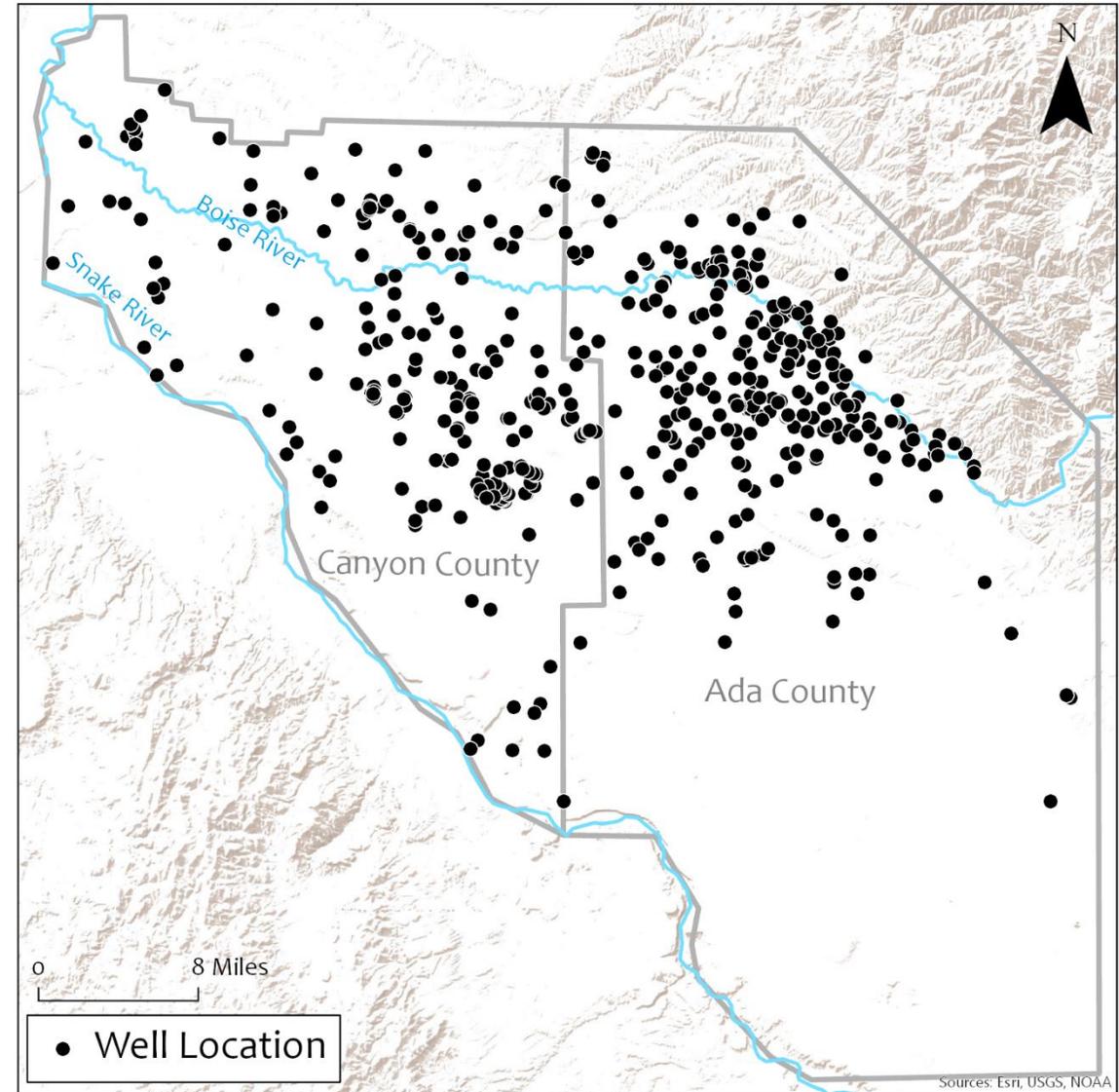
# Treasure Valley Hydrogeology

- Multi-layered flow systems
  - Shallow, oxygen-rich
  - Deep, confined systems
- **Sediment Redox Transition**
  - Oxygen-rich above
  - Oxygen-poor below



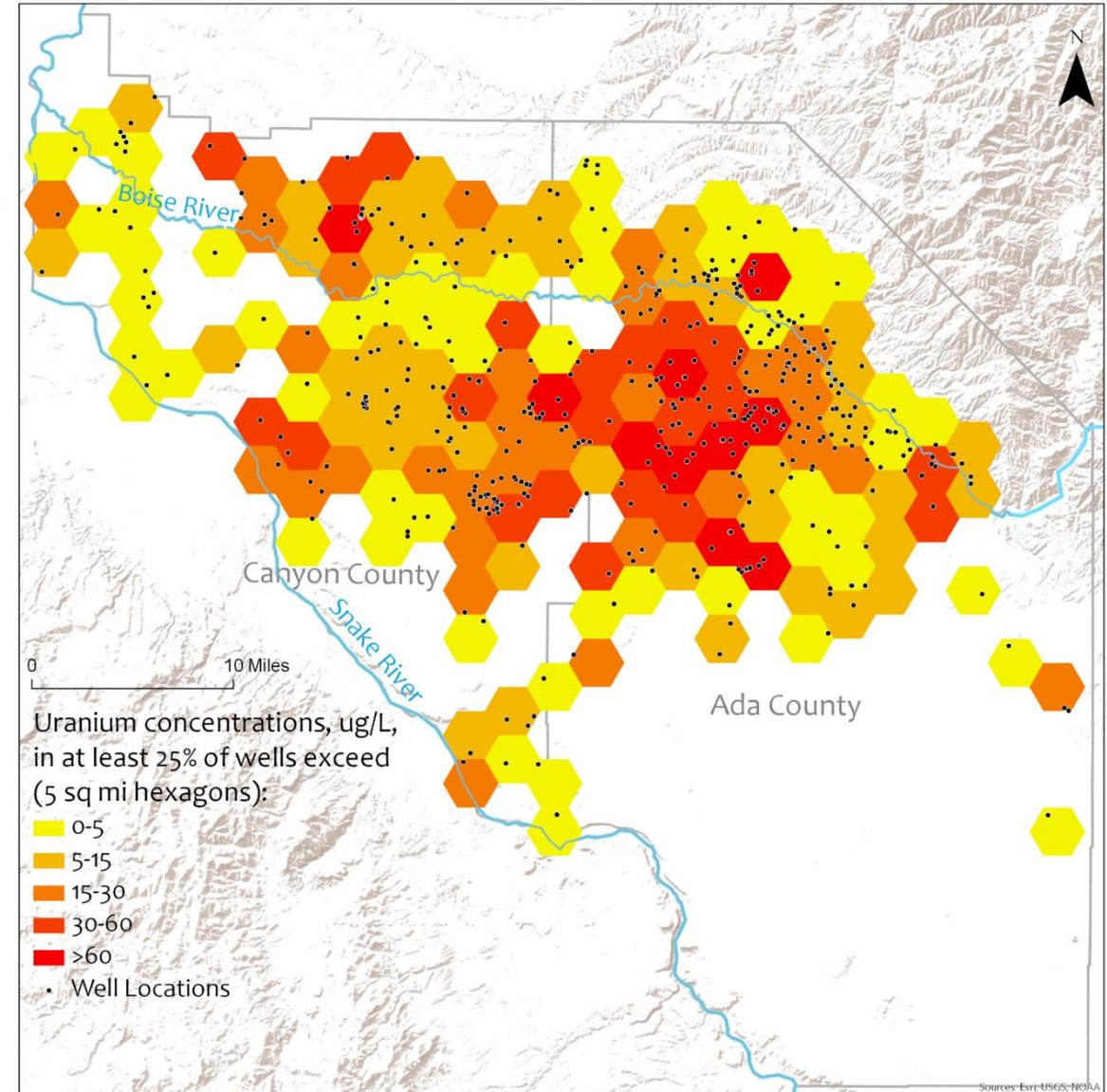
## Study Area

- Large historic dataset compiled
- Data sources:



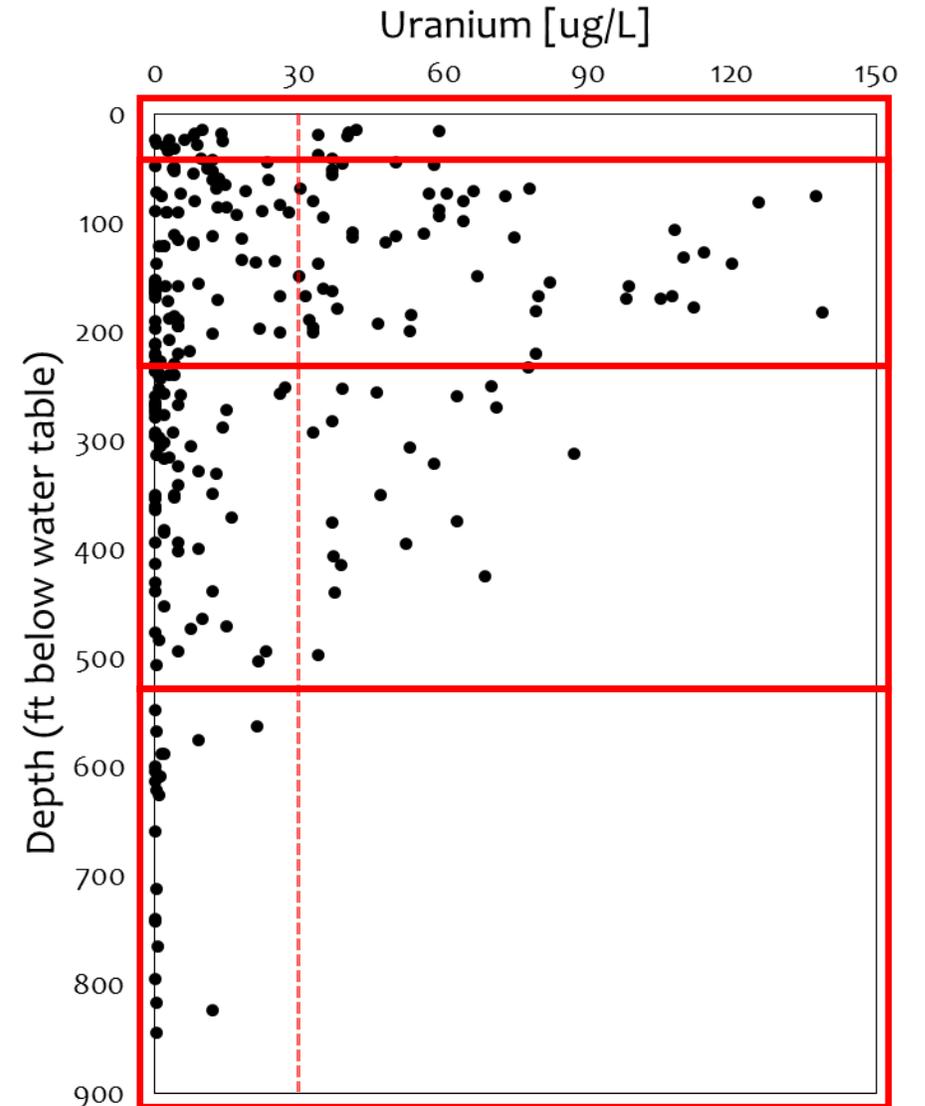
## High Levels, Highly Variable

- Elevated uranium found throughout Ada, Canyon Counties
- Interspersed with low uranium levels

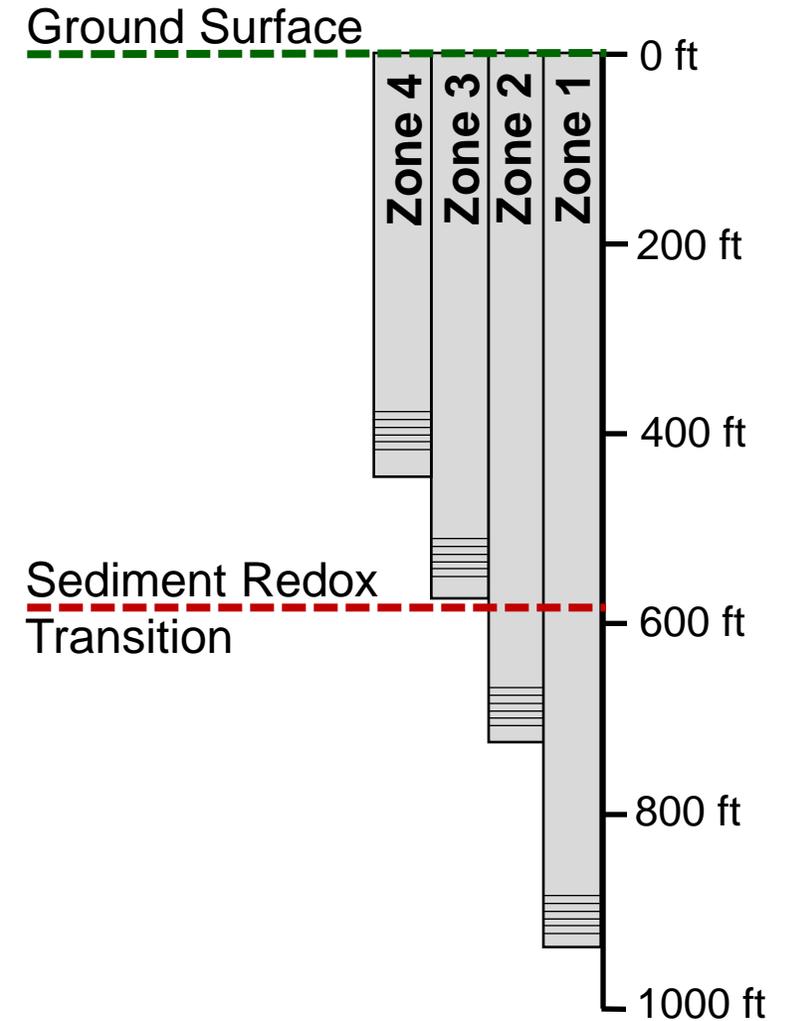


# Highest Levels in Shallow System

- Elevated Uranium:
  - <500 ft below water table (bwt)
  - Highest 100-200 ft bwt
- Need depth-discrete data!

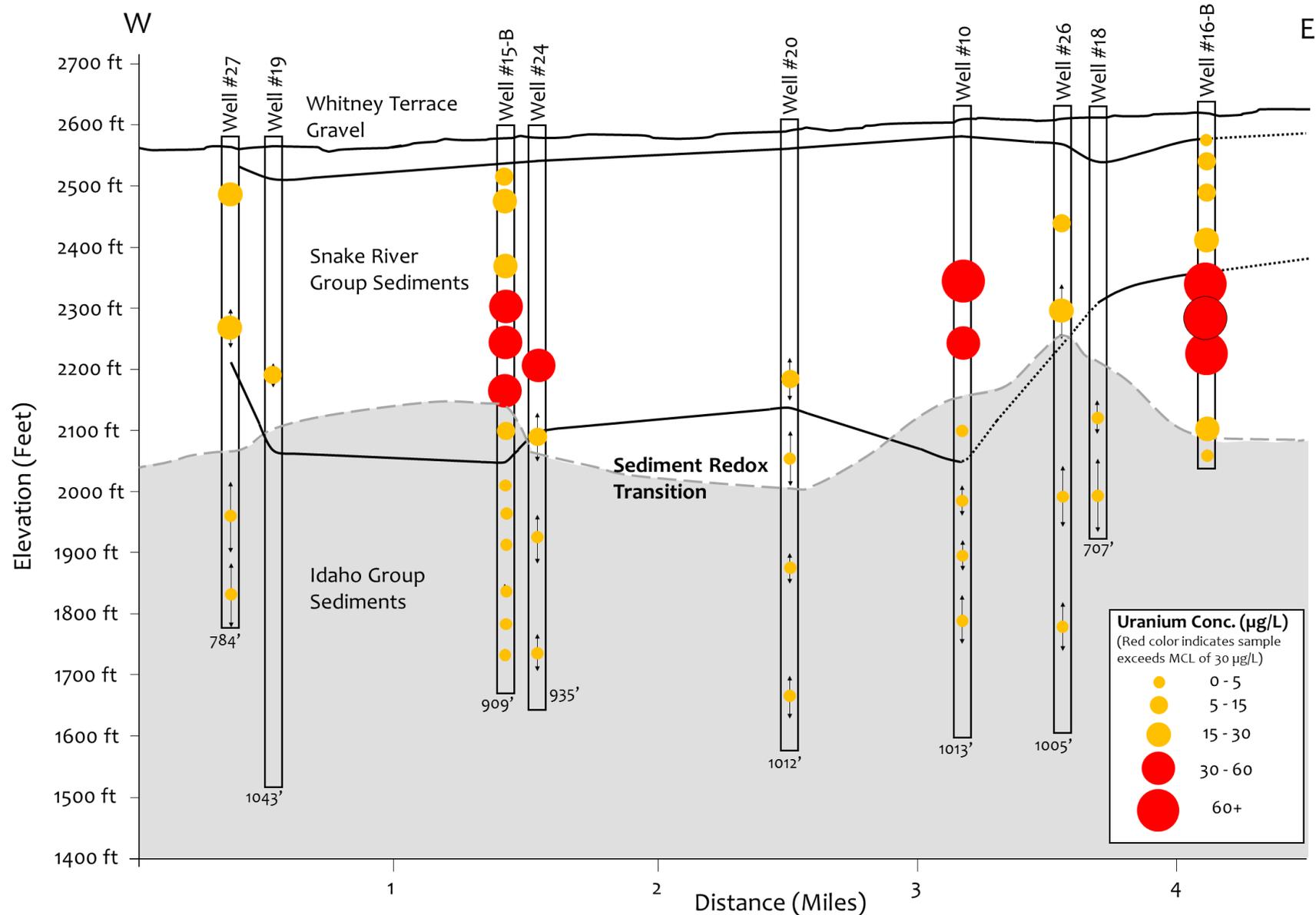


# Meridian Sampling Campaign



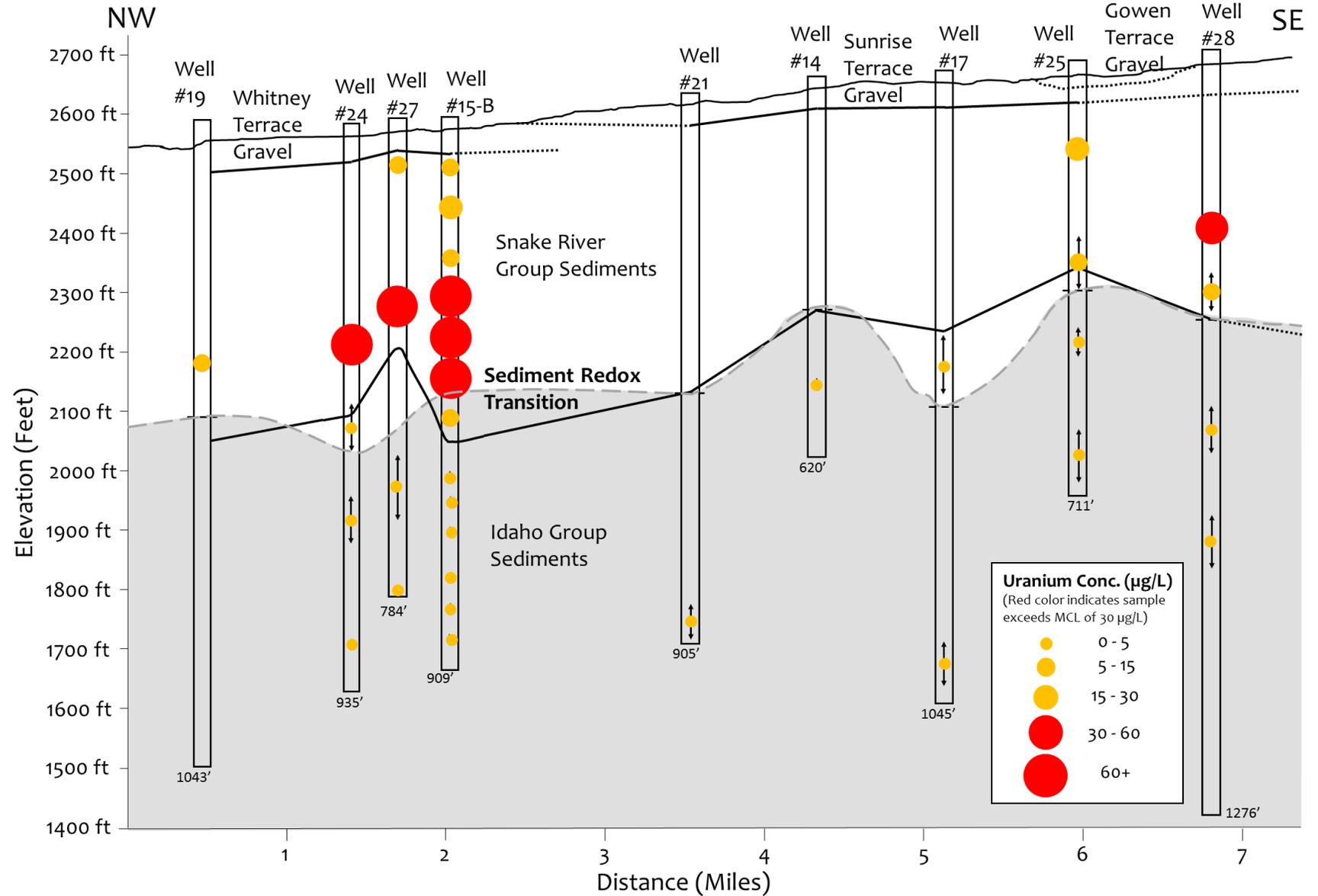
## W to E

- Elevated U
  - Oxygen-rich waters
- Vertical trend
  - ↓ with depth



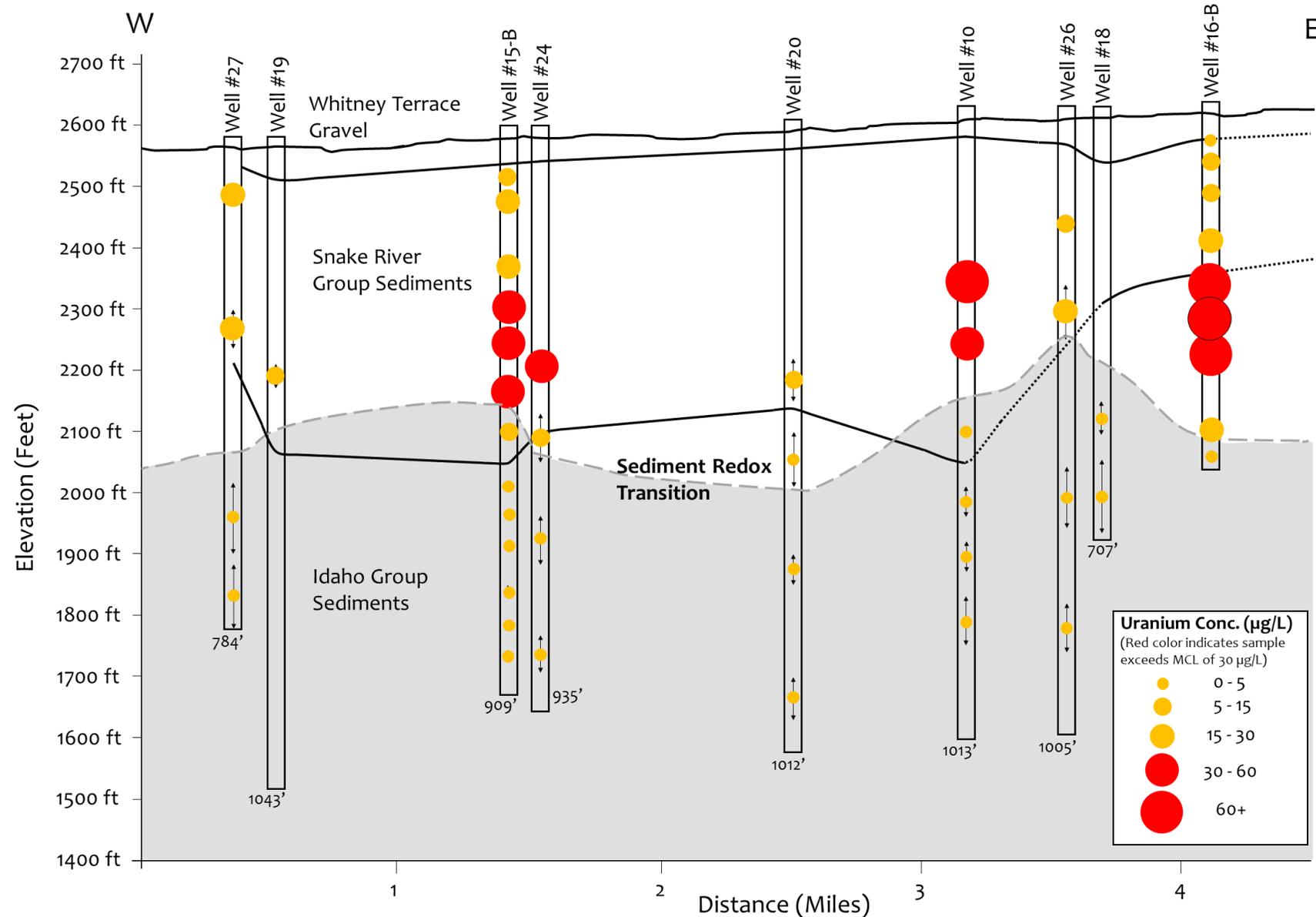
# NW to SE

- Elevated U
  - Oxygen-rich waters
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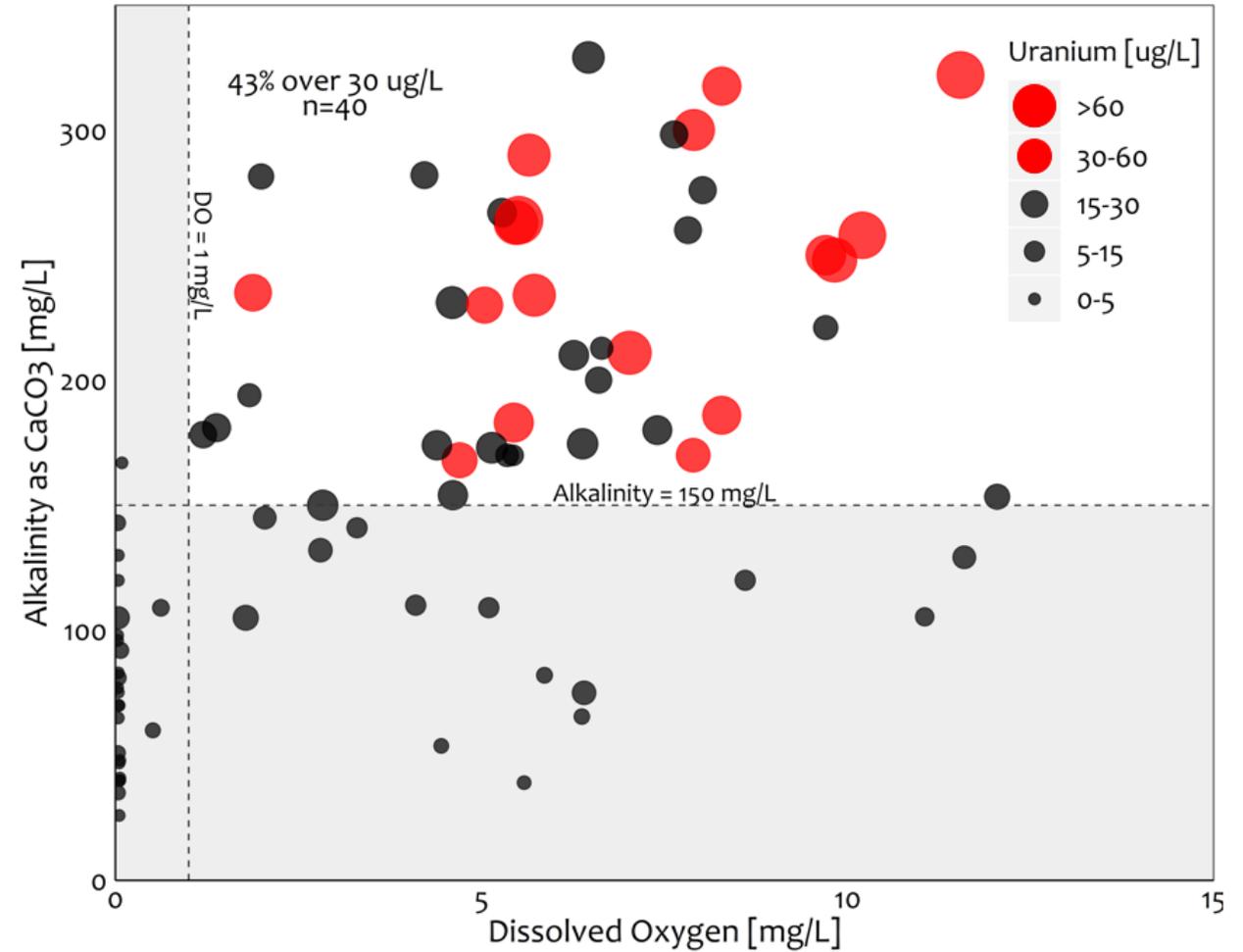
# Uranium Source

- Naturally-sourced
- Diffuse source likely
  - Not restricted to specific geologic unit, surficial sediments



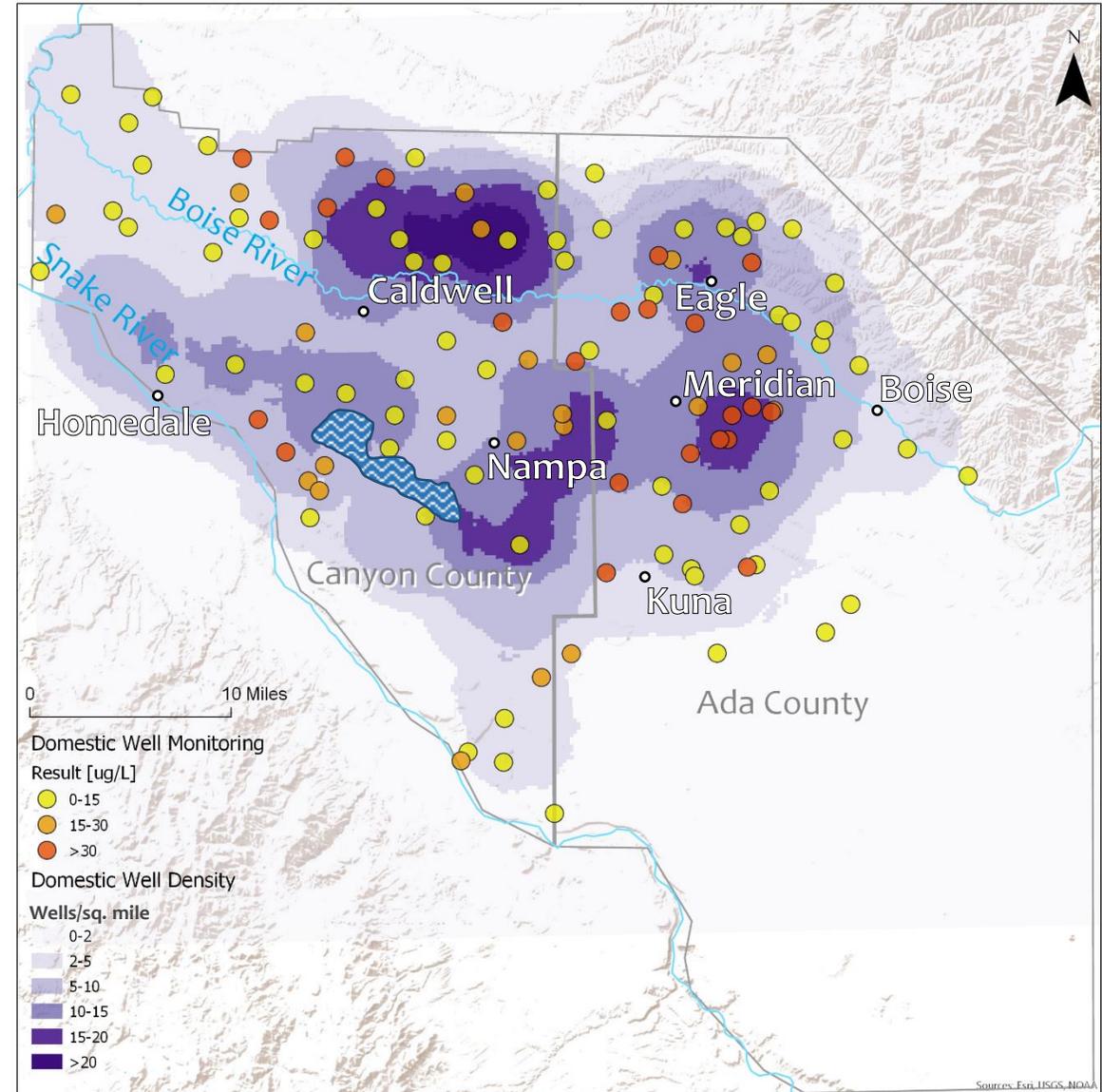
# Uranium Correlations

- High Uranium associated with:
  - Dissolved Oxygen
  - Alkalinity



# Agency Domestic Wells

- More Uranium monitoring
  - Elevated U, ↑ well density
- Ada Uranium:
  - 30% exceed MCL
  - <2% domestic wells monitored
- Canyon Uranium:
  - 16% exceed MCL
  - <1% domestic wells monitored



# Management Recommendations

1. Maintain low uranium in deep system
  - Prevent mixing of deep and shallow flow systems
  - Quality well drilling requirements
2. Increase Treasure Valley uranium monitoring
  - Spatially and temporally
  - Alkalinity and Dissolved Oxygen (screening)
  - Lower uranium testing cost
3. Protect Domestic Users
  - Health information campaign
  - Promote domestic well testing
  - Expand municipal services to areas of new growth



# Report Location

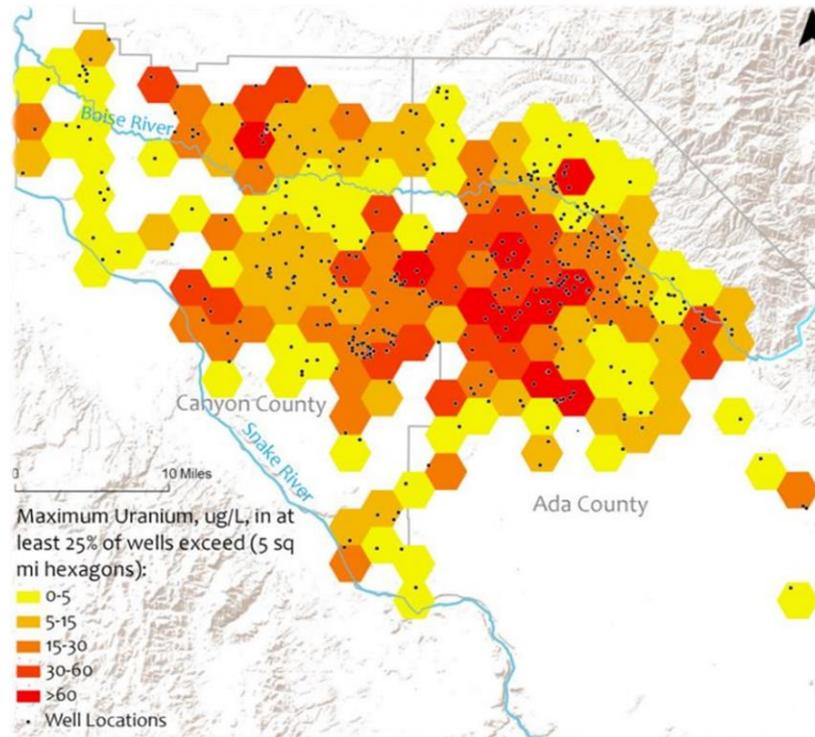
- IDWR Website

<https://idwr.idaho.gov/press/technical-publications.html>

The Spatial Distribution of Elevated Uranium in the  
Treasure Valley Aquifer System, Southwest Idaho  
Year 3, 2019

by  
Gus Womeldorph  
October 2019





**Questions?**

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