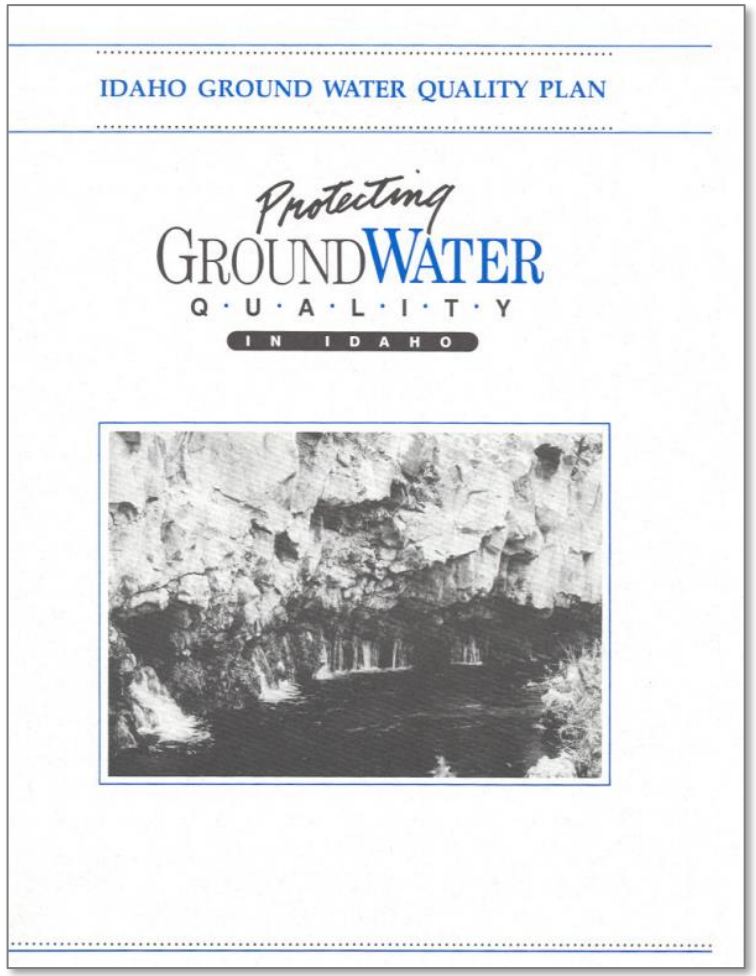
IDWR Statewide Program Monitoring: 2021 Update

Amy Steimke & Blake Burkard, 1/20/2022

IDAHO DEPARTMENT OF
WATER RESOURCES

Groundwater Monitoring in Idaho



Idaho Ground Water Quality Plan

- Authorized by Ground Water Quality Protection Act of 1989
- Approved by legislature in 1992, revised in 1996
- Lays out roles/responsibilities of agencies in Idaho
  - Includes mandate for IDWR to manage geospatial data for the state

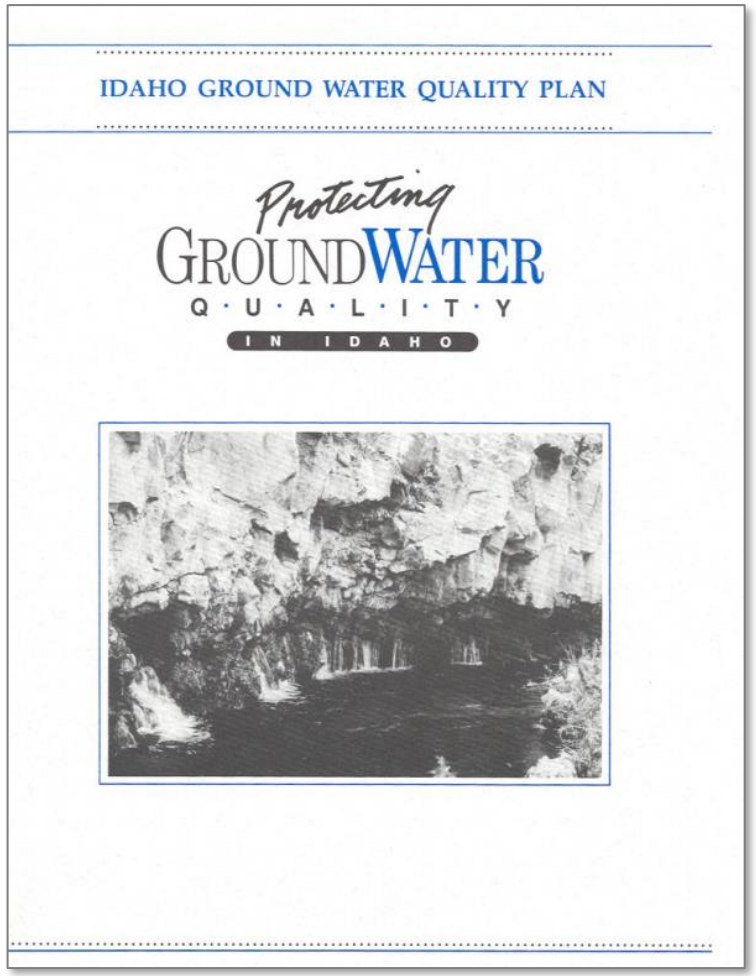
Idaho's Ground Water Quality Monitoring Programs

Statewide
Idaho Department of Water Resources

Regional
Department of Environmental Quality
&
Idaho Department of Agriculture

Local

Groundwater Monitoring in Idaho



Statewide Program Goals

- Determine quality of Idaho's groundwater
- Identify existing or emerging problems
- Determine changes in quality over time

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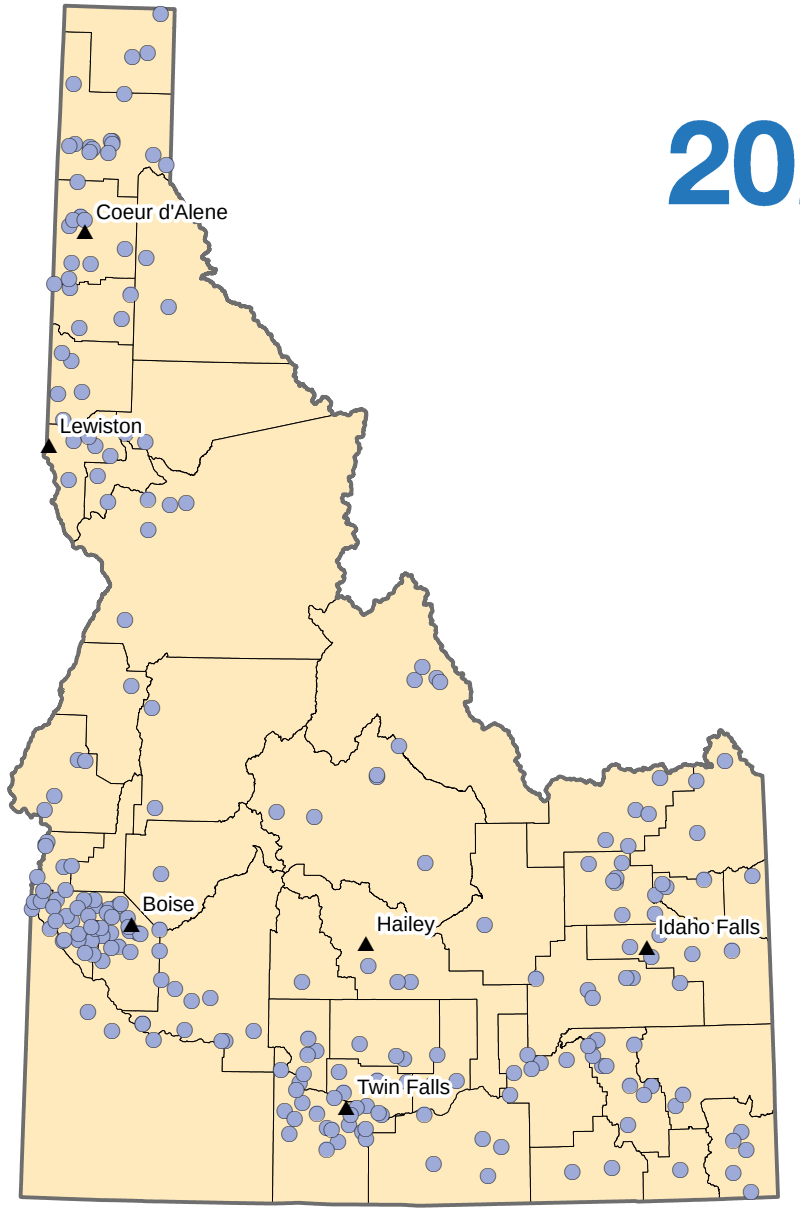


2021 Statewide Program

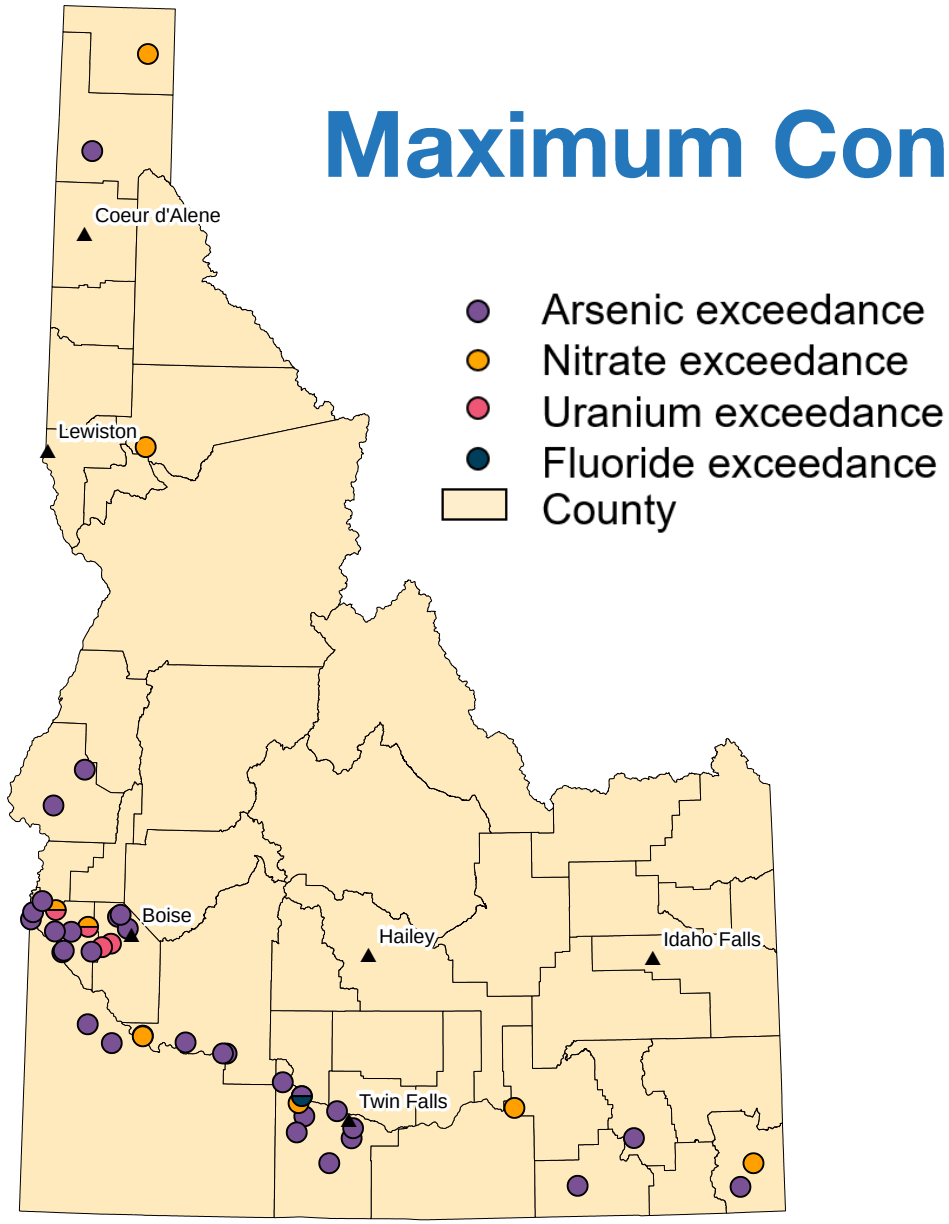
- Sampled 235 wells
  - 4 new wells were added
  - All 44 counties were sampled
  - New parameters were added
    - PFAS
    - Lithium
  - New data viewer released

Sampling Staff

2021 Parameter List

Field Parameters	Metals	Emerging Contaminants
pH	Arsenic	BPA
Conductivity	Cadmium	**PFAS**
Dissolved Oxygen	Calcium	Triclosan
Temperature	Iron	**Pesticides**
Alkalinity	**Lithium**	Atrazine
Common Ions	Magnesium	Glyphosate
Chloride	Manganese	Metolachlor
Fluoride	Potassium	
Sulfate	Selenium	**Collaborative Sampling**
Alkalinity	Silica	N-15 isotope
Nutrients	Sodium	Methane
Ammonia	Uranium	
Nitrate		
Total Phosphorus		

Maximum Contaminant Level (MCL) Exceedances



	Arsenic	Nitrate	Uranium	Fluoride
MCL	10 µg/l	10 mg/l	30 µg/l	4 mg/l
Number of wells > MCL	30	9	4	1
Percentage of wells > MCL	13%	4%	2%	<1%
Number of first time exceedances	2	2	1	0
Max value	94 µg/L	32 mg/L	40 µg/L	12.2 mg/L

A total of 41 wells, or 17% of sites sampled, had at least one MCL exceedance

PFAS Overview

- PFAS (per- and polyfluoroalkyl substances) are man-made chemicals found in a wide range of products
- Most PFAS chemicals do not break down & persist in the environment
- EPA has set a combined health advisory of 70 ppt

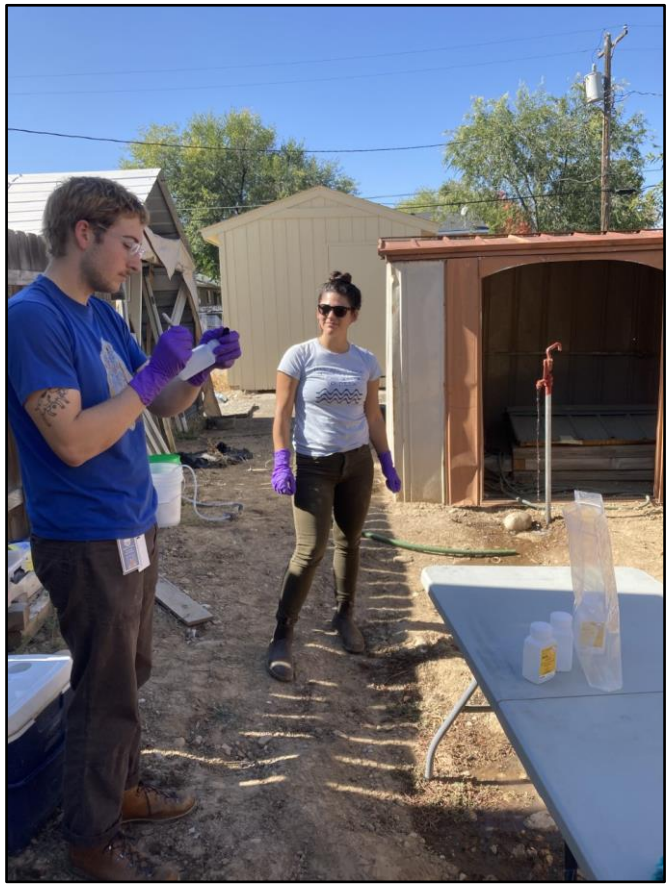
Major Sources of PFAS in the Environment

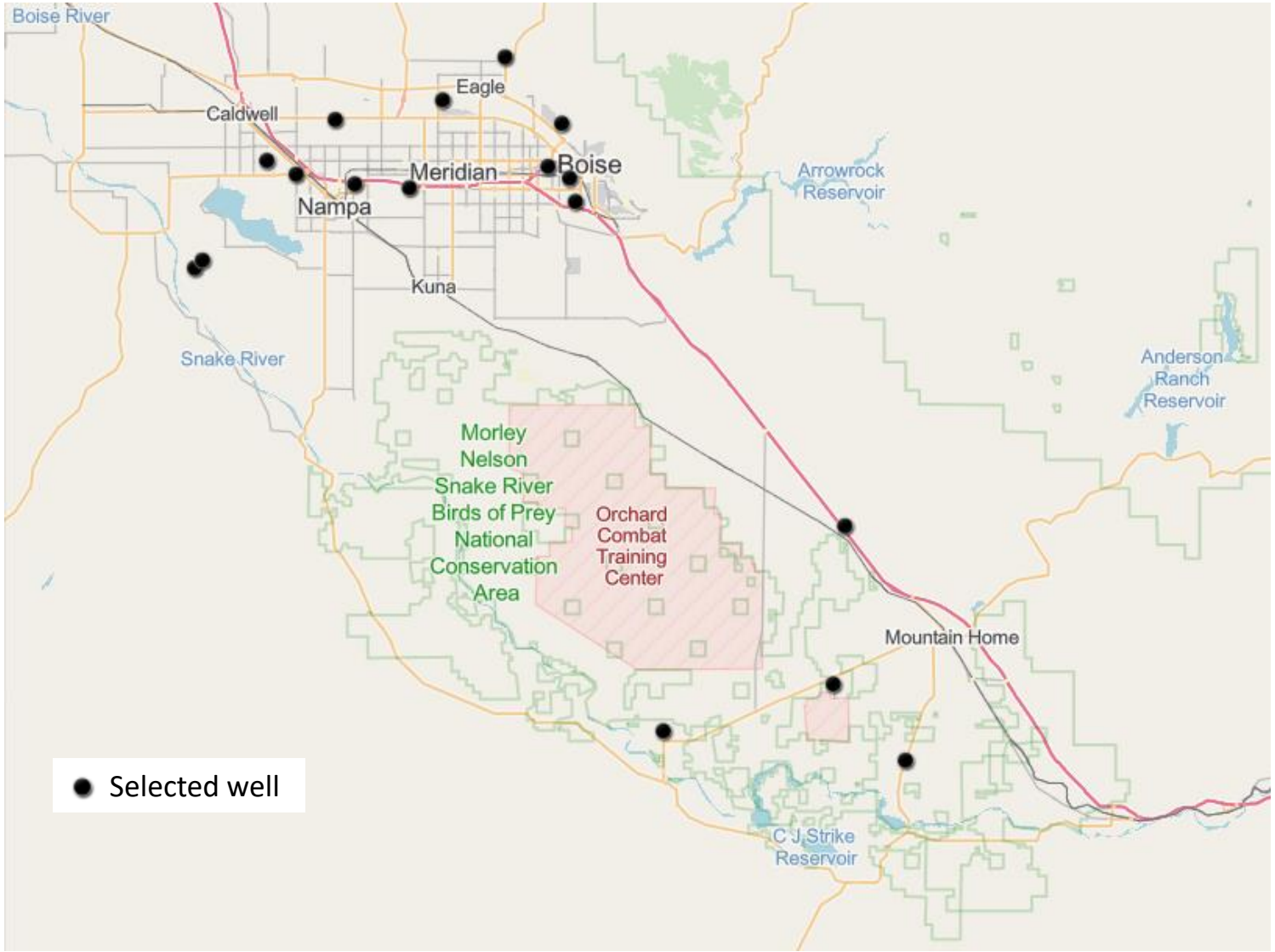
1) Production and Manufacturing Facilities
2) Fluorine-Containing Firefighting Foams
3) Waste Disposal
4) Wastewater Treatment
5) Commercial/Consumer Products
   - clothing and carpets
   - paper and packaging
   - non-stick cookware
   - fabric softeners
   - windshield wipers
   - personal care products
   - hydraulic fluids
   - ski/snowboard waxes

modified from https://pfas-1.itrcweb.org/

New for 2021: PFAS Pilot Project

- Goal was to sample 15 wells for PFAS
- Sites were selected using the following criteria:
  1) Wells slated for sampling in summer 2021
  2) Wells near known or suspected PFAS contamination sites
  3) Domestic wells were preferentially selected
- Sampling was conducted by one trained team
- Used EPA method 533; samples analyzed at Anatek Labs





Selected Sites

- 18 sites were identified and selected for sampling
- Sites were located near:
  - MHAFB
  - Boise & Nampa airports
  - Wastewater treatment plants
  - Landfills
- 17 domestic wells; 1 irrigation
- Well depths ranged from 32 to 600 feet

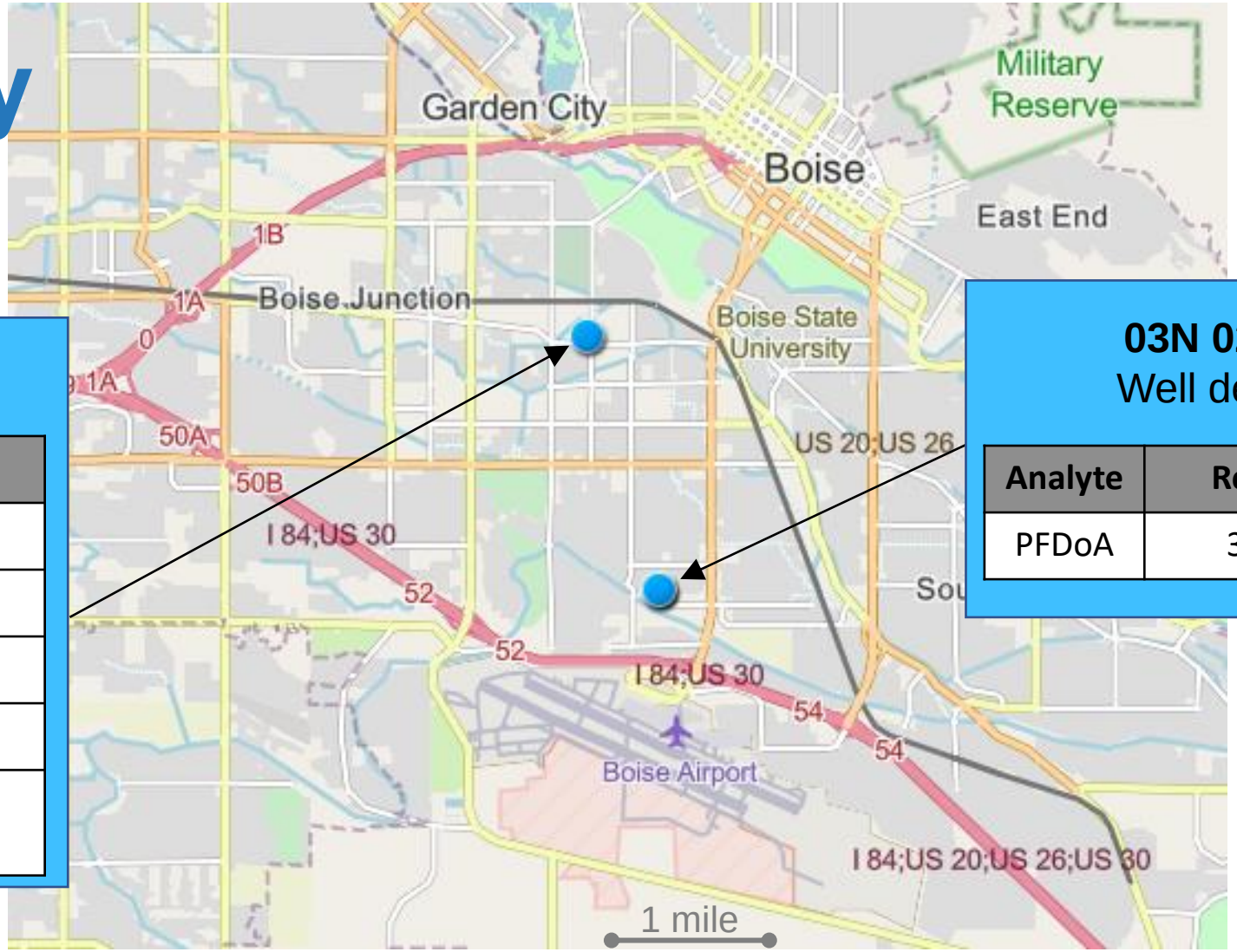
Sampled Sites

- 13 sites were sampled
- All sites were domestic wells
- Sampling occurred June-August
  - PFAS detection at two sites

Preliminary Results

03N 02E 16BBD1
Well depth: 87 feet

Analyte	Result	RDL
PFBS	2.84	1.75
PFHxA	1.82	1.75
PFOA	2.47	1.75
PFOS	3.06	1.75
TOTAL PFAS	**10.19 PPT**	

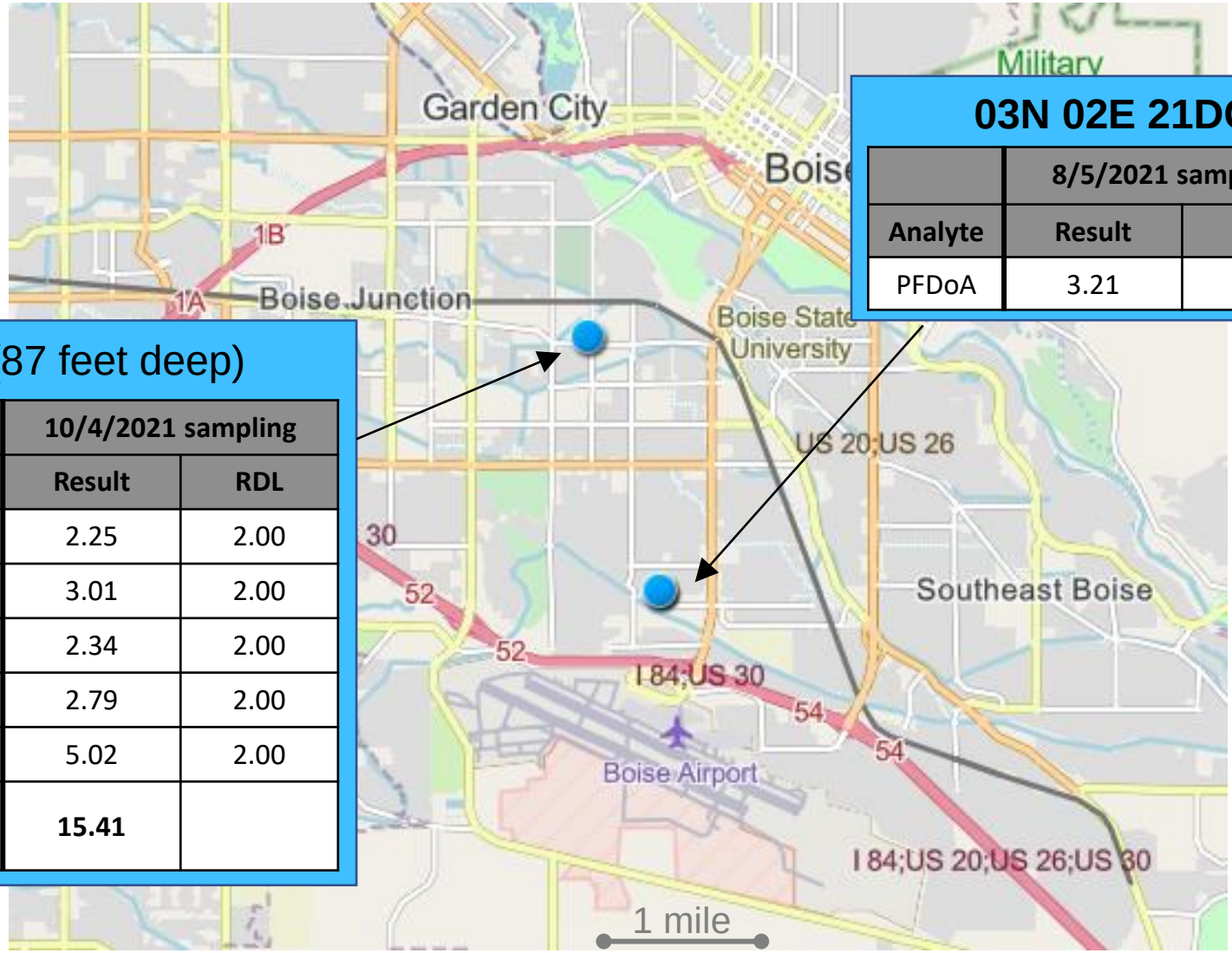


03N 02E 21DCA1
Well depth: 95 feet

Analyte	Result	RDL
PFDoA	3.21	2.0

*All values are in PPT (ng/L)
**RDL = Reporting Detection Limit

Final Results



03N 02E 16BBD1 (87 feet deep)

	6/22/2021 sampling		10/4/2021 sampling	
Analyte	**Result**	**RDL**	**Result**	**RDL**
PFBA	**ND**	1.75	2.25	2.00
PFBS	2.84	1.75	3.01	2.00
PFHxA	1.82	1.75	2.34	2.00
PFOA	2.47	1.75	2.79	2.00
PFOS	3.06	1.75	5.02	2.00
TOTAL PFAS	**10.19**		**15.41**	

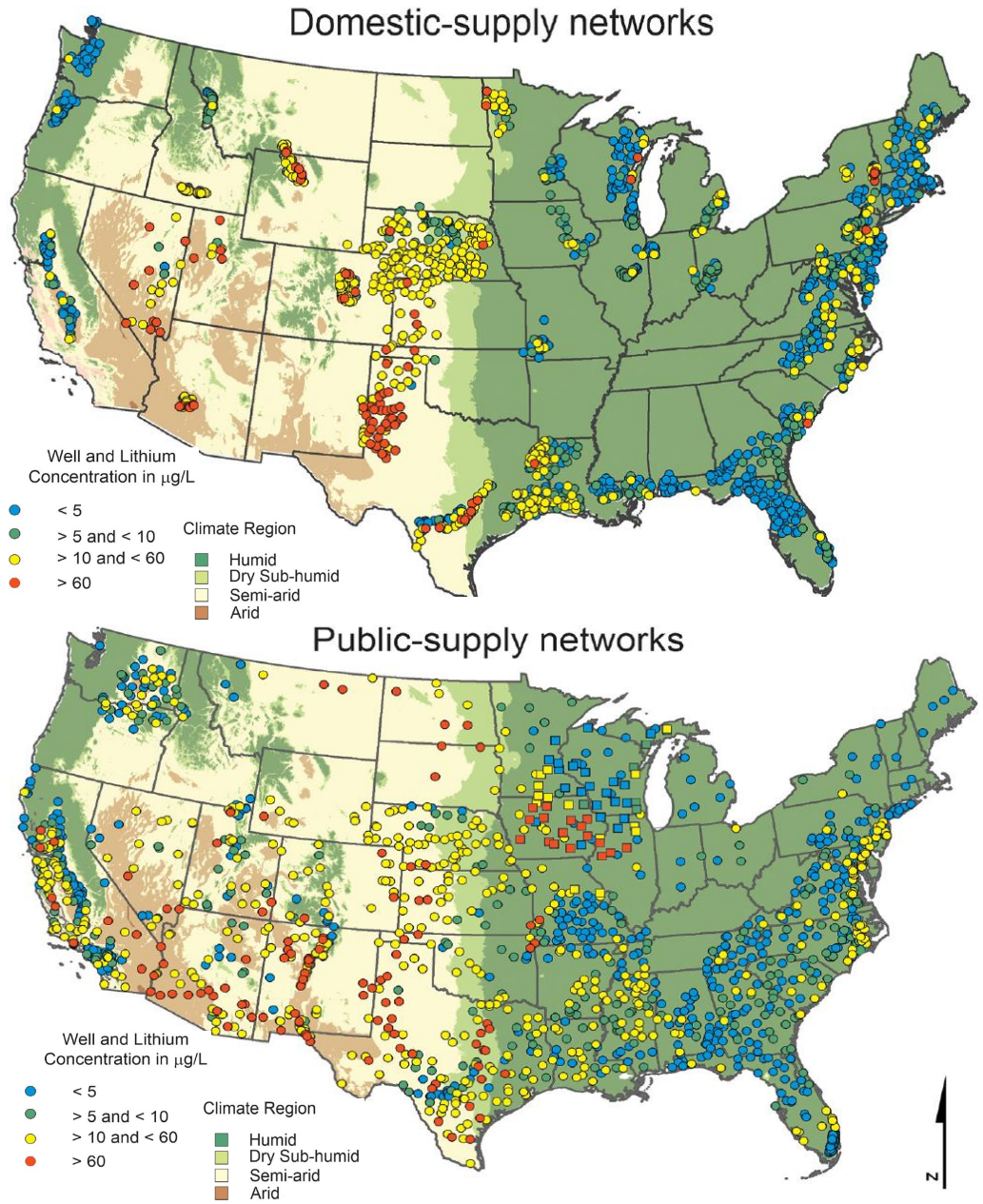
03N 02E 21DCA1 (95 feet deep)

	8/5/2021 sampling		10/4/2021 sampling	
Analyte	**Result**	**RDL**	**Result**	**RDL**
PFDoA	3.21	2.00	ND	2.00

*All values are in PPT (ng/L)
**RDL = Reporting Detection Limit

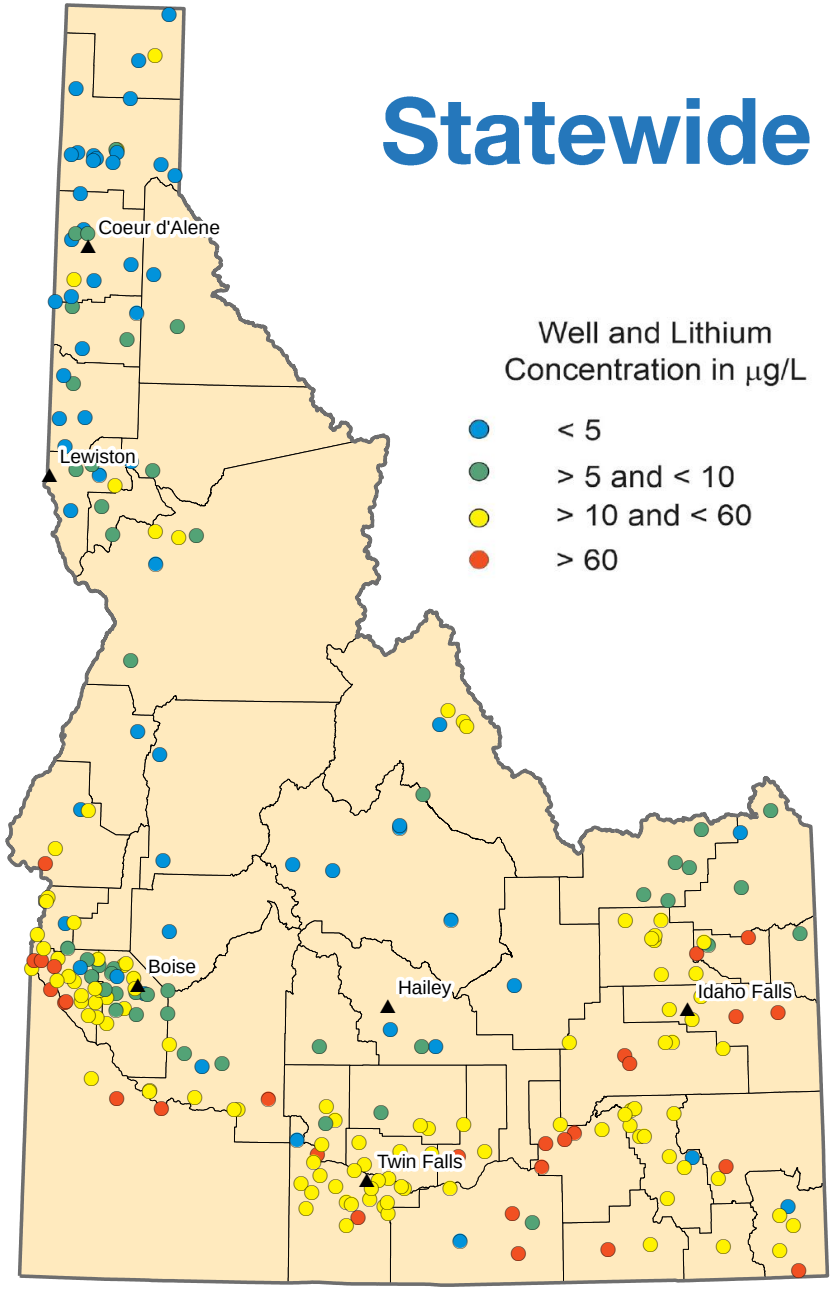
Lithium

- USGS study[1] evaluated lithium concentrations in the US; data is sparse and especially lacking in Idaho
- No regulatory value exists, but the paper used two human-health benchmarks for comparison
  - 10 µg/L: Health Based Screening Level (HBSL)
    - 41% of sites in the U.S. exceeded
  - 60 µg/L: Drinking water only threshold
    - 7% of sites in the U.S. exceeded
- Authors found highest concentrations in arid regions and older groundwater; found lowest concentrations in carbonate-rock aquifers



[1]Lindsey, Bruce D., et al. "Lithium in groundwater used for drinking-water supply in the United States." *Science of The Total Environment* 767 (2021): 144691.

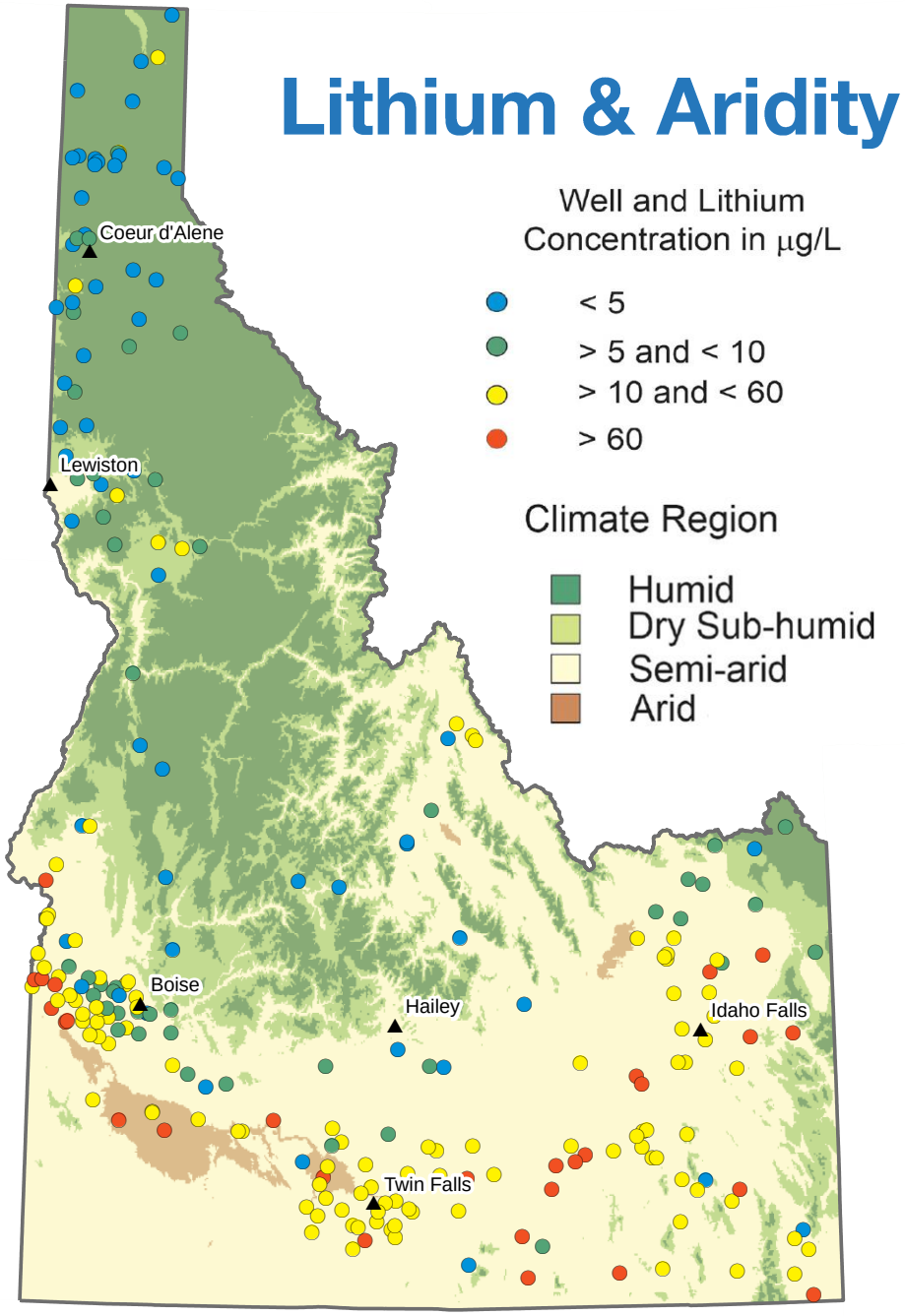
Statewide Program Lithium Results



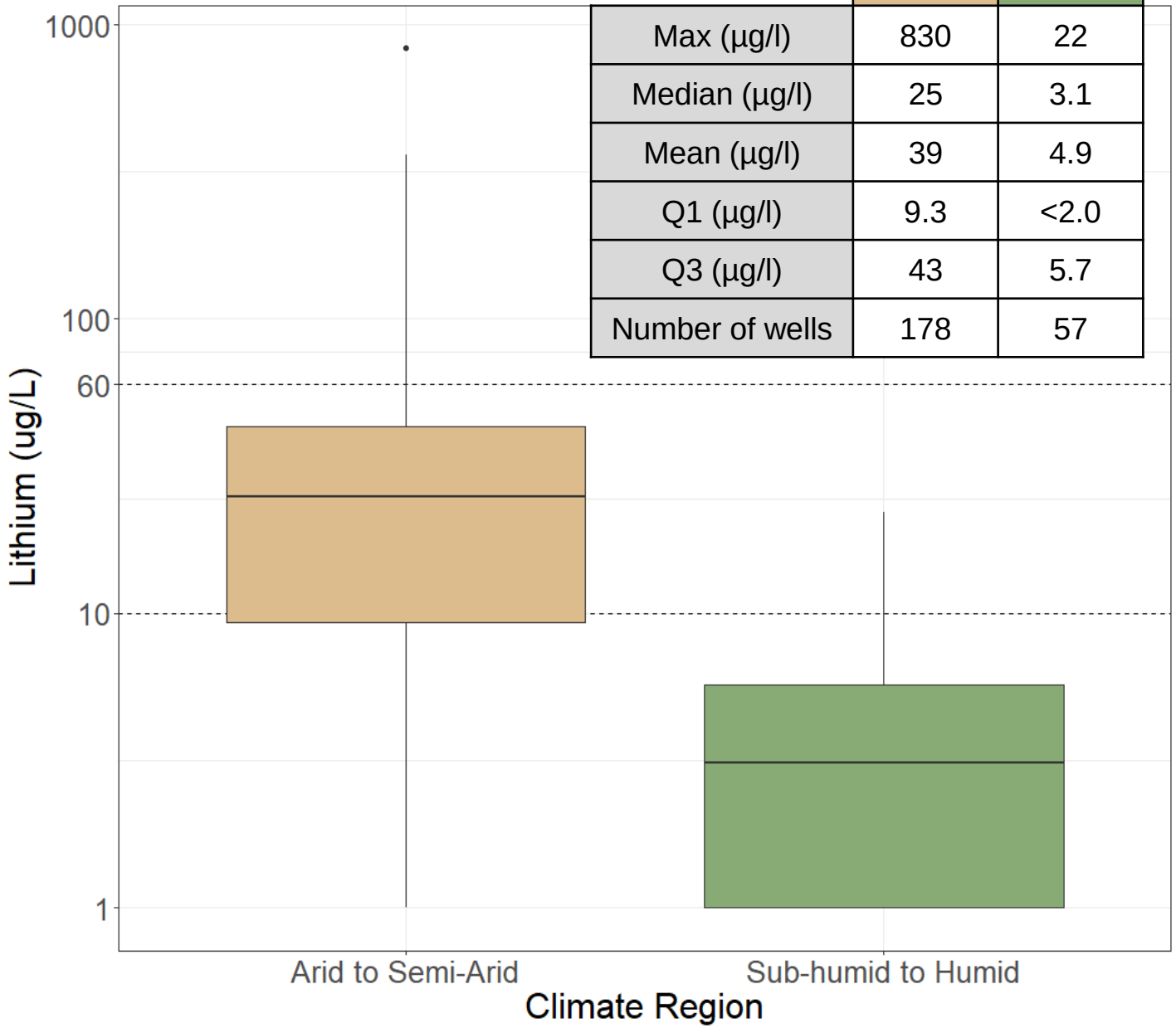
Lithium Statistics		Number of wells	Percentage of wells
Concentration range	0 - 5 µg/L	55	23%
	5.1 - 10 µg/L	45	19%
	10.1 - 60 µg/L	107	46%
	>60 µg/L	28	12%
Minimum value		0.15 µg/L (estimated)	
Median value		15 µg/L	
Mean value		31 µg/L	
Maximum value		830 µg/L	
Number of wells		235	

10 µg/L = Health Based Screening Level (HBSL)
60 µg/L = Drinking-water only threshold

Lithium & Aridity



	Arid	Humid
Max (µg/l)	830	22
Median (µg/l)	25	3.1
Mean (µg/l)	39	4.9
Q1 (µg/l)	9.3	<2.0
Q3 (µg/l)	43	5.7
Number of wells	178	57



Lithium Correlation with Other Parameters: Spearman's Correlation Coefficient

- Statistical test to measure the strength of a monotonic relationship between paired data
- Values of rho (ρ) vary from -1 to +1
  - A value of ρ near -1 or +1 means a strong inverse or direct relationship between two variables
  - A value of ρ closer to 0 demonstrates a weak relationship
- Ran a Spearman's correlation test between lithium and other parameters sampled this season

Parameter	Spearmans ρ
Chloride	0.72
Potassium	0.70
Sulfate	0.67
Sodium	0.64
Arsenic	0.58
Calcium	0.58
Alkalinity	0.56
Fluoride	0.54
Magnesium	0.49
Selenium	0.46
Uranium	0.36
Silica	0.35
Ammonia	0.22
Nitrate	0.20
Manganese	0.06
Phosphorus	0.02
Cadmium	0.02
Iron	0.02

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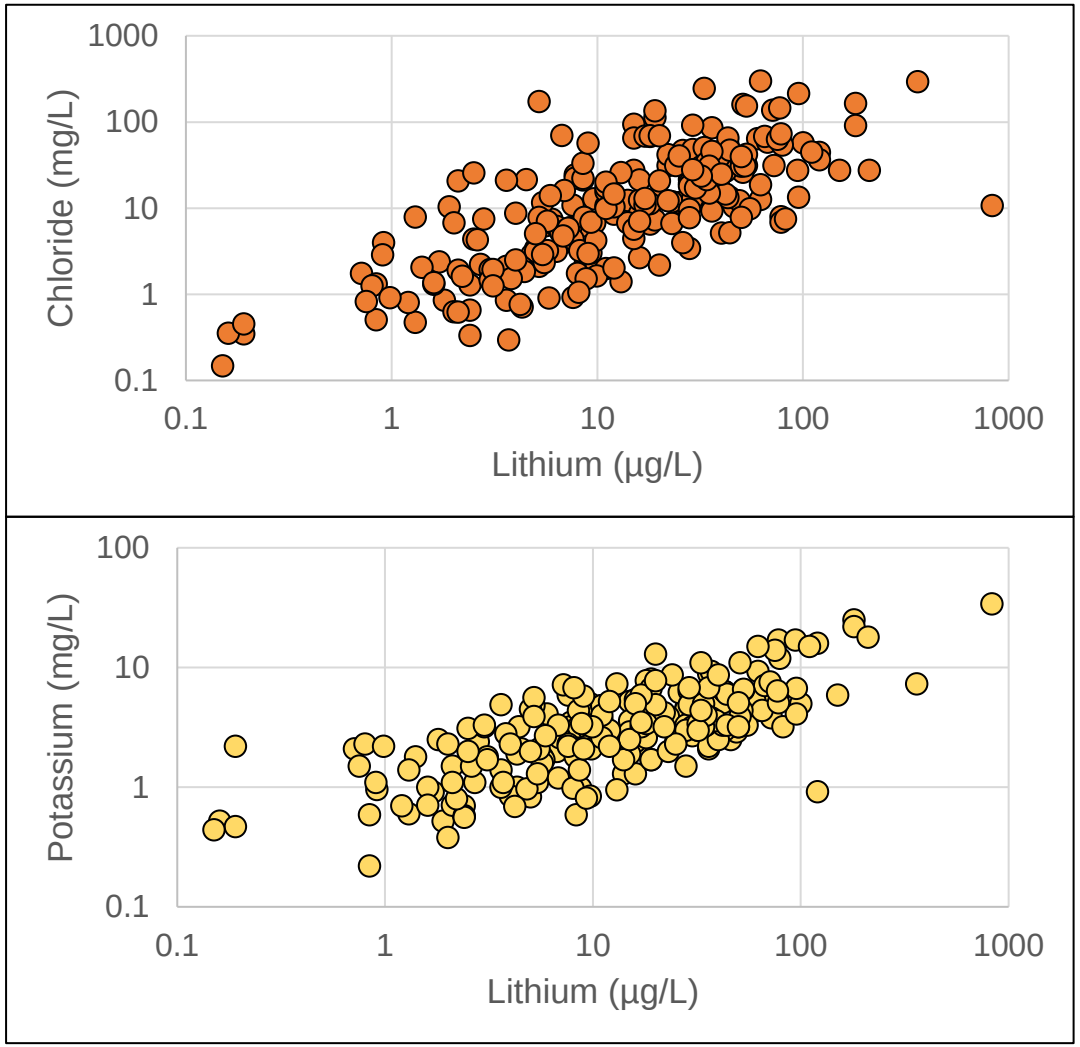

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Future IDWR Emerging Contaminant Monitoring

- Both Lithium and 29 PFAS chemicals added to EPA's 5th Unregulated Contaminant Monitoring Rule (UCMR5), published December 27, 2021

- IDWR plans to continue monitoring lithium at all Statewide sites and PFAS at a subset of sites to collect baseline data for the state

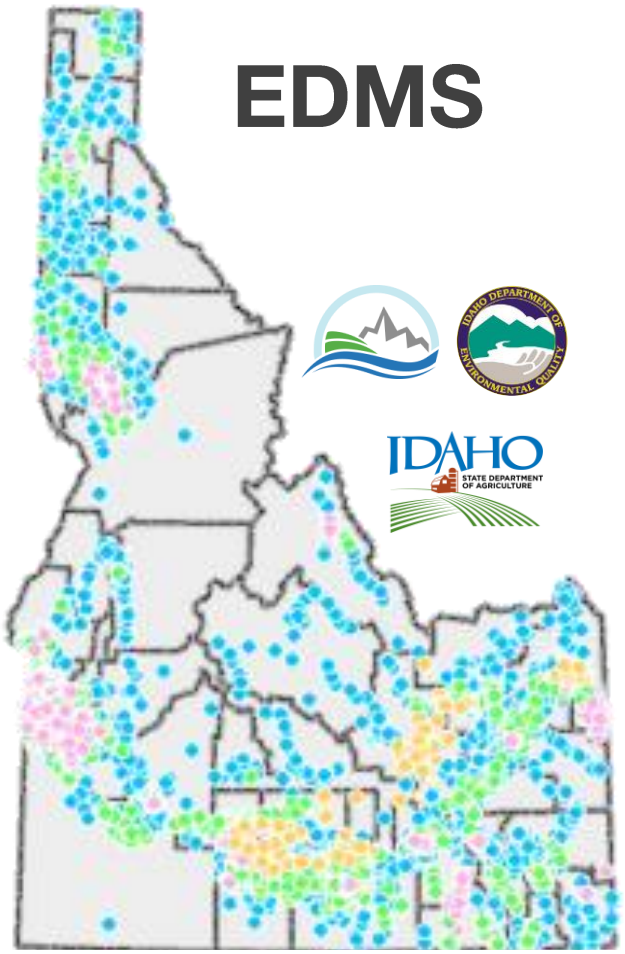
- We welcome input for other contaminants to add into our parameter list!

thelionelectric.com

riversideca.gov

Data Access

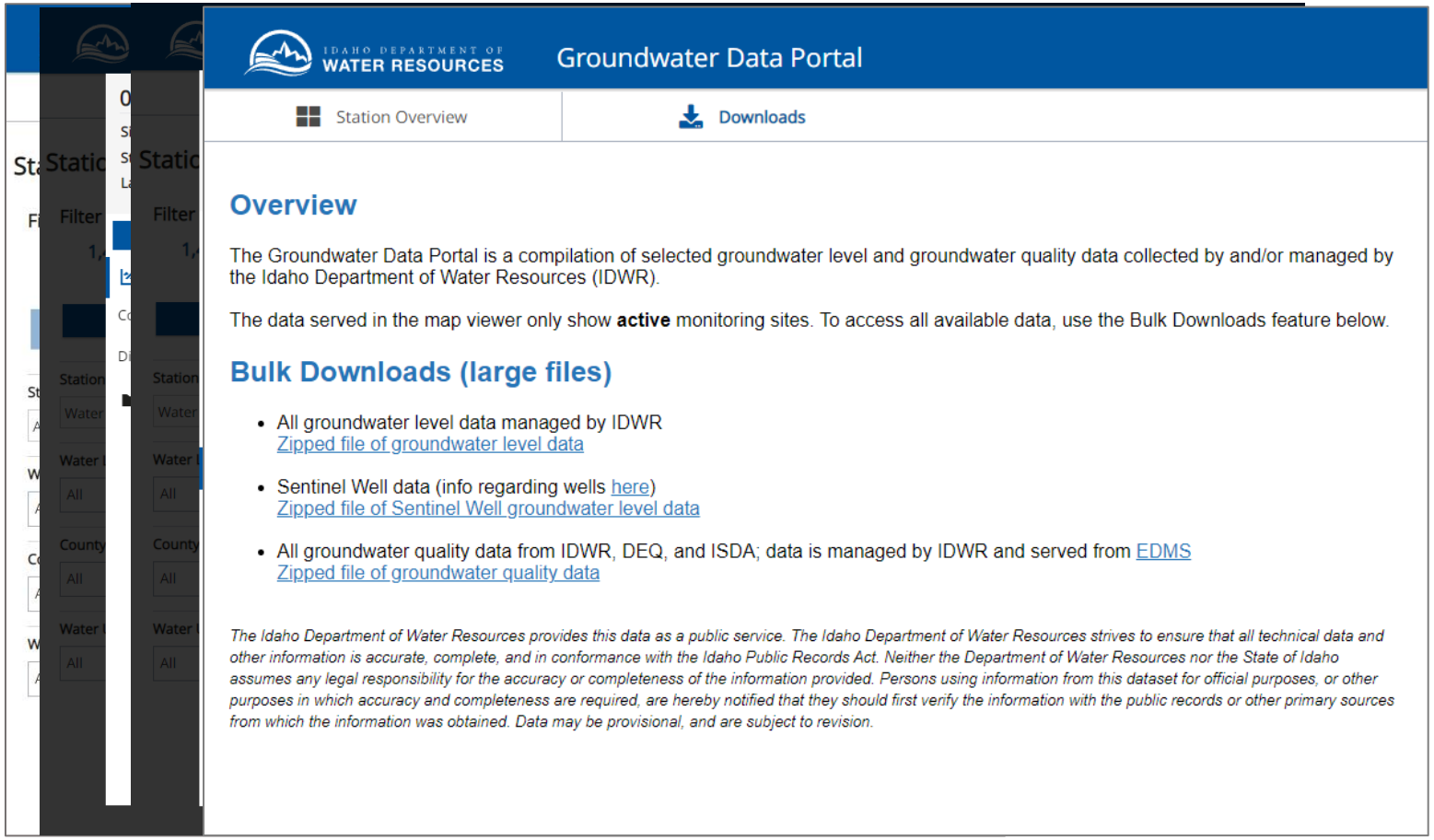
EDMS



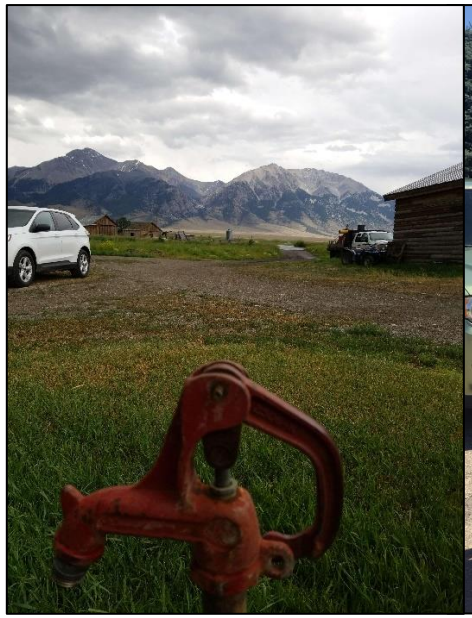
Bulk download of groundwater quality data

WISKI Web Portal

idwr-groundwater-data.idaho.gov



Thanks! Questions?




Amy Steimke
Amy.Steimke@idwr.idaho.gov
(208) 287-4833

Blake Burkard
Blake.Burkard@idwr.idaho.gov
(208) 287-4870

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