IDWR Statewide Program Monitoring: 2022 Season Update

Amy Steimke, P.G.

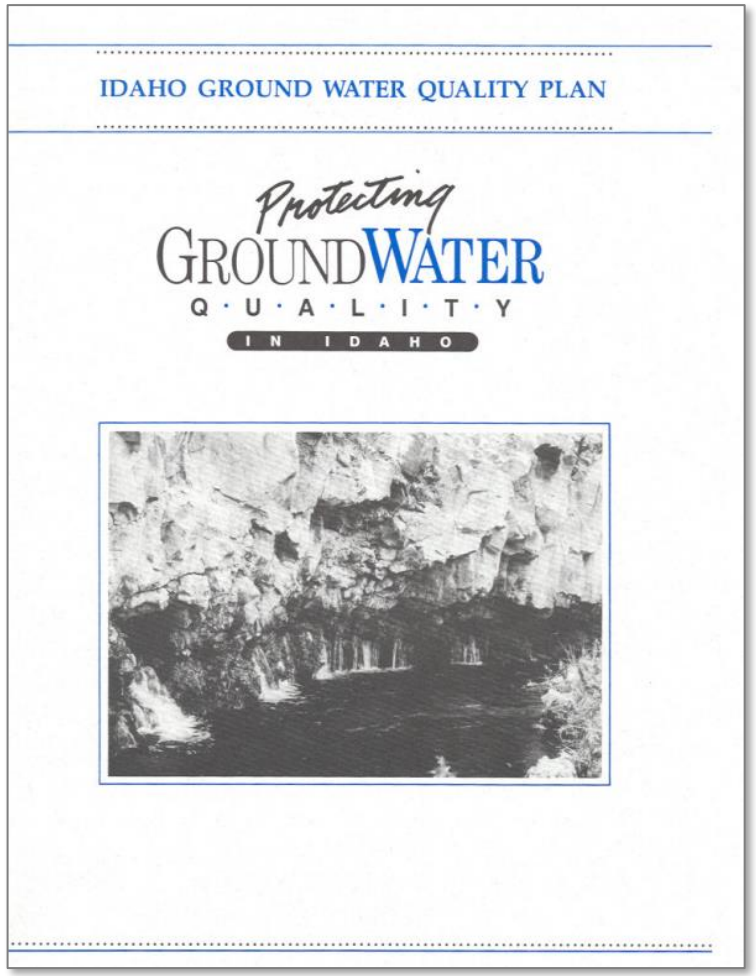
GWMTC Meeting
January 12, 2023

IDAHO DEPARTMENT OF
WATER RESOURCES

Presentation Outline

- Statewide Program Overview
- 2022 Sampling
- PFAS Sampling
- Orthophosphate Project
- Immunoassay Testing

Groundwater Monitoring in Idaho



Statewide Program Goals

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

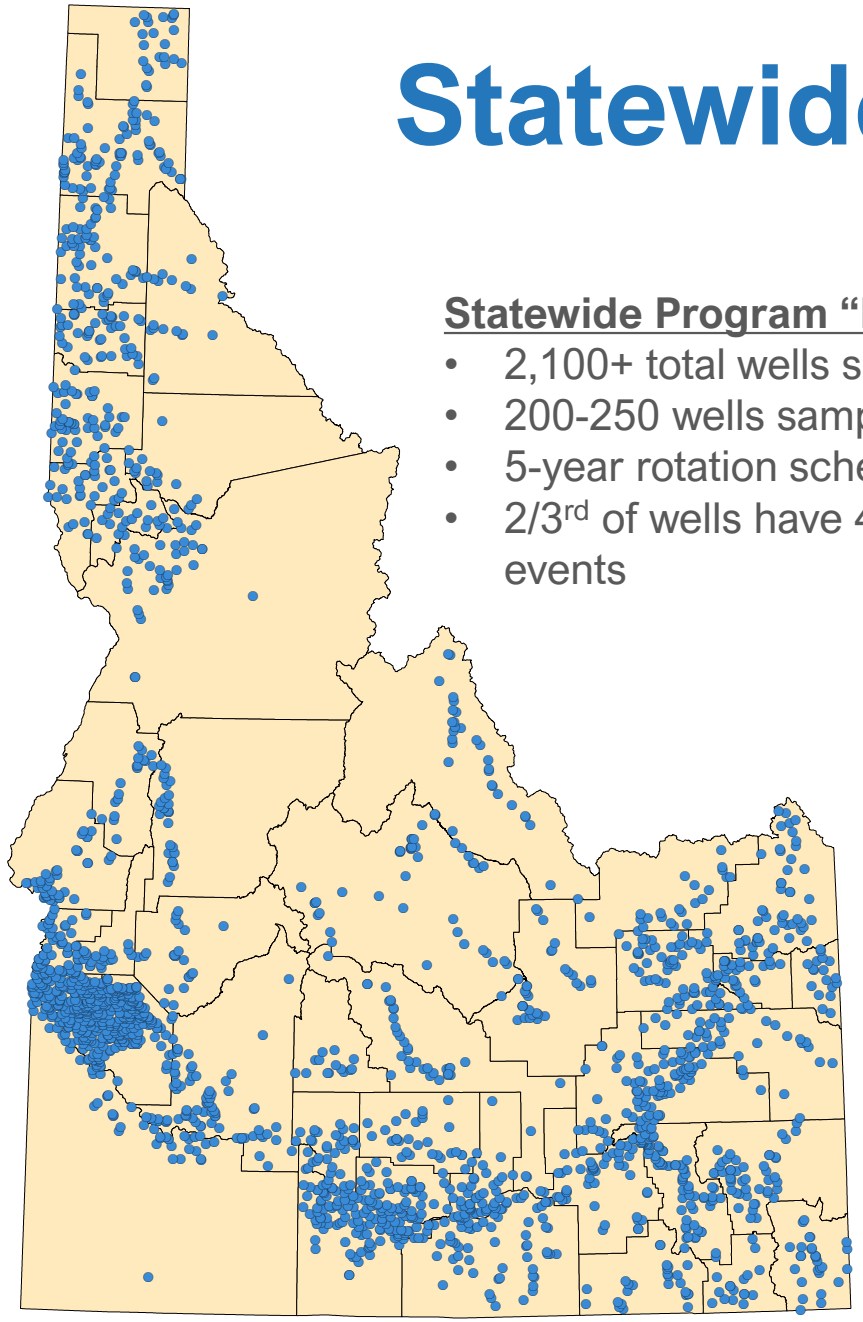
Idaho's Ground Water Quality Monitoring Programs

Statewide
Idaho Department of Water Resources

Regional
Department of Environmental Quality
&
Idaho Department of Agriculture

Local

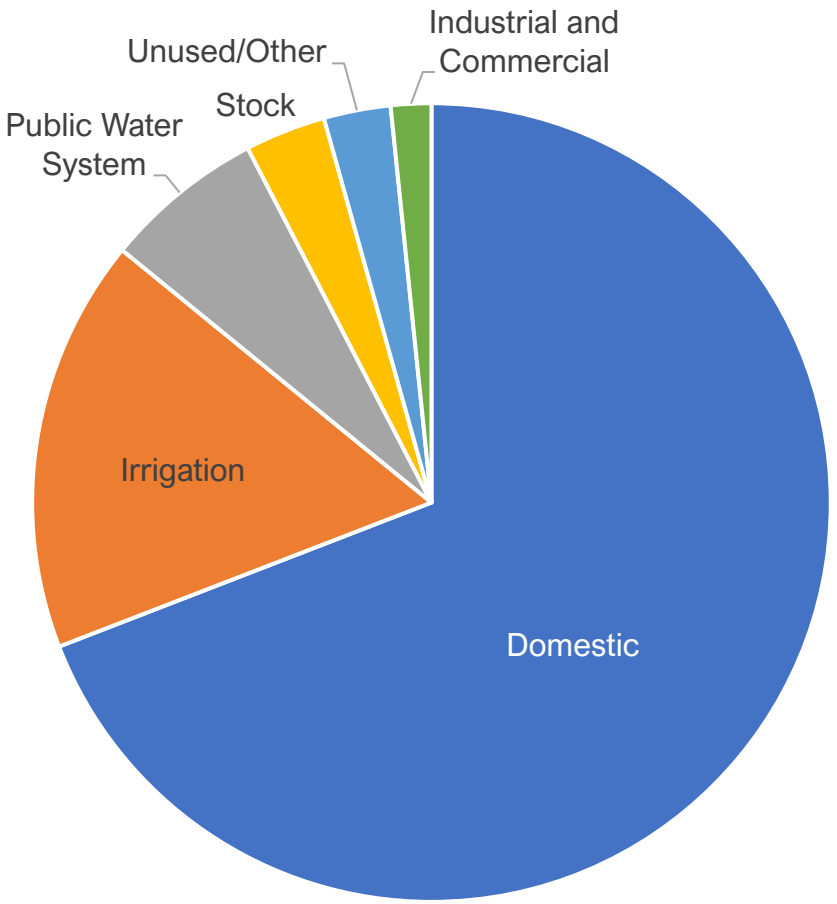
Statewide Program Network

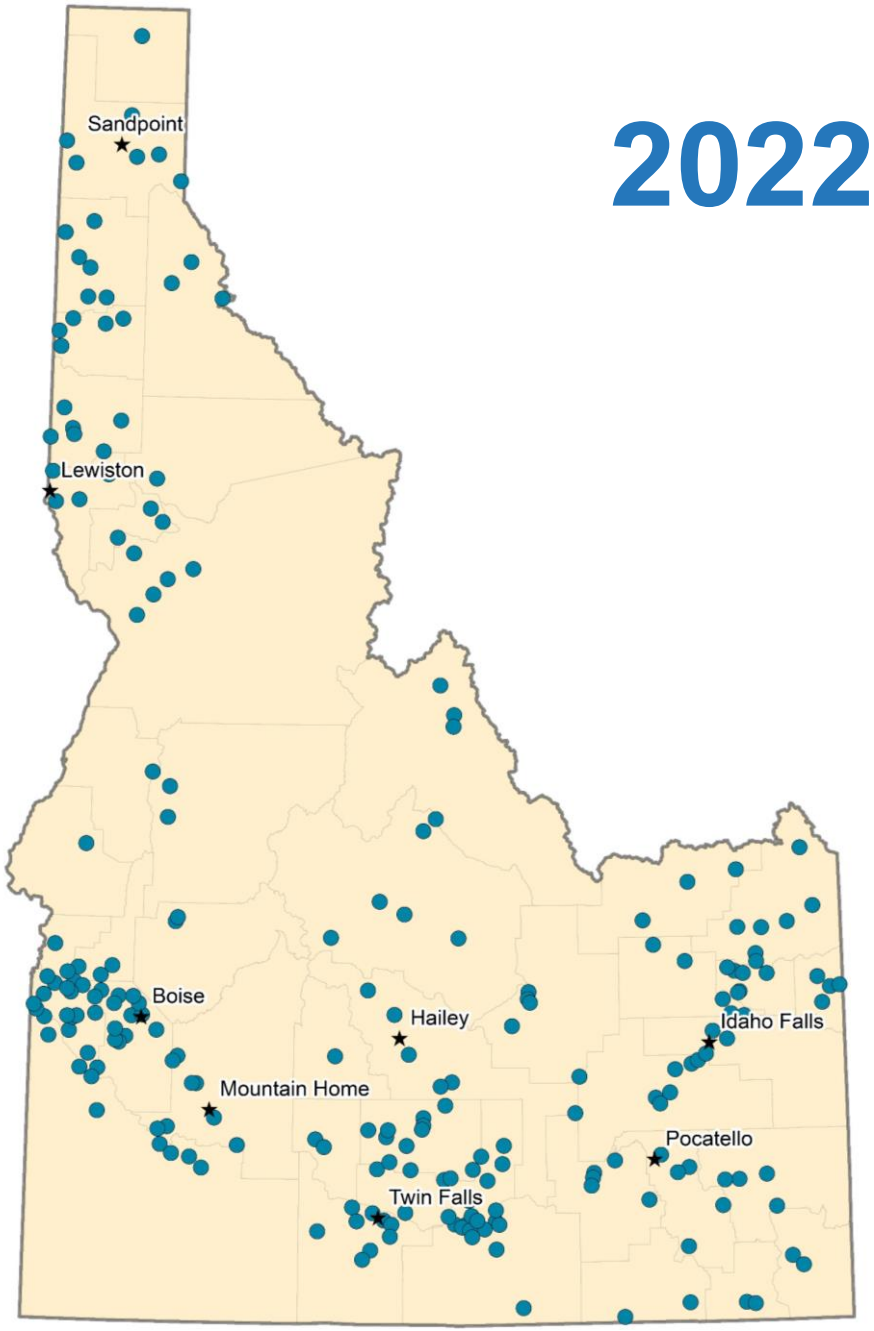


Statewide Program "by the numbers"

- 2,100+ total wells sampled
- 200-250 wells sampled annually
- 5-year rotation schedule
- 2/3rd of wells have 4+ sampling events

Types of wells sampled





2022 Sampling

- Sampled 217 wells
- 3 new wells were added
- All 44 counties were sampled
- Sampling occurred June-August

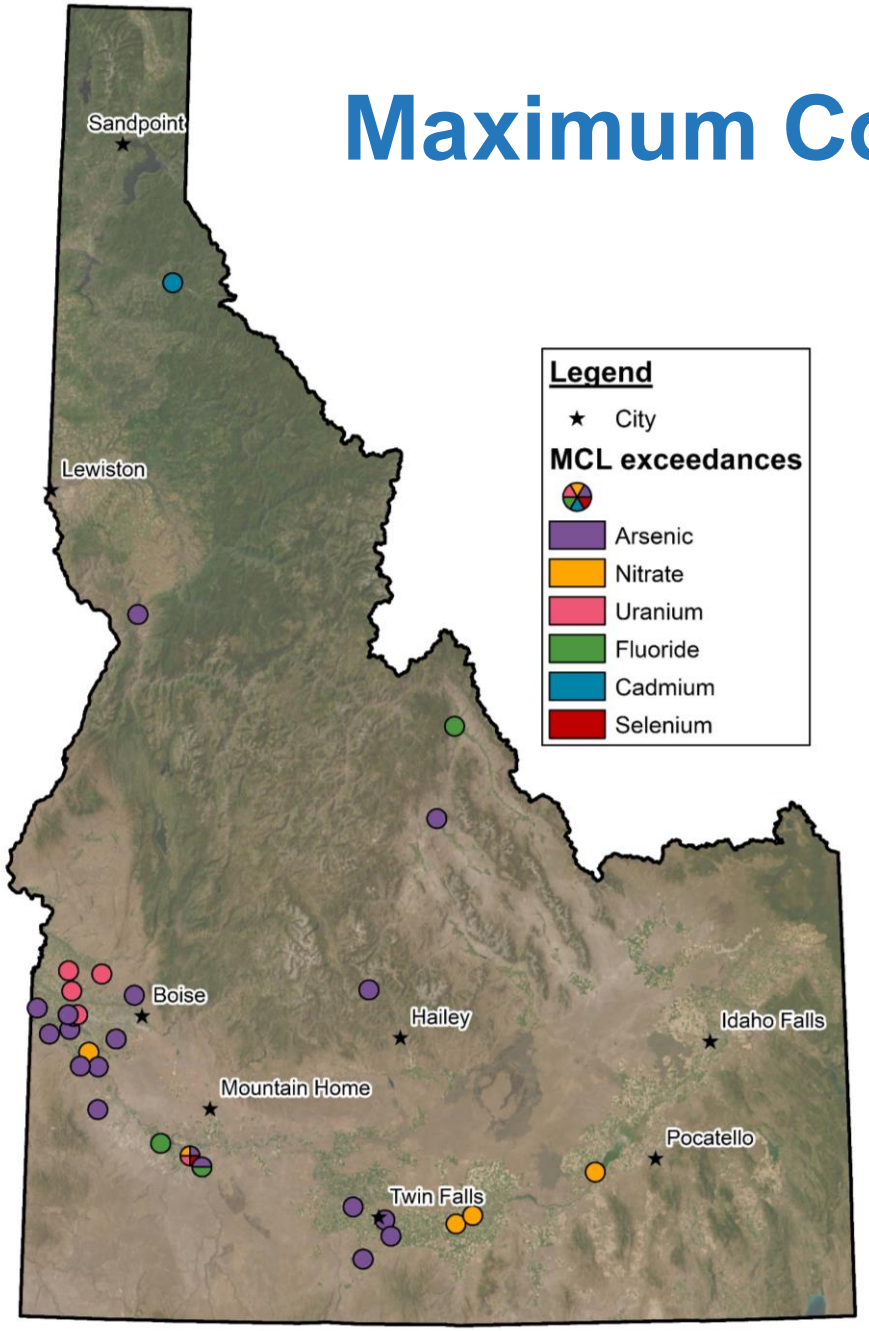
IDAHO DEPARTMENT OF WATER RESOURCES

Sampling Staff

IDAHO DEPARTMENT OF
WATER RESOURCES

2022 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**
Nutrients	Silica	N-15 isotope
Ammonia	Sodium	Methane
Nitrate	Uranium	
Orthophosphate		
Total Phosphorus		

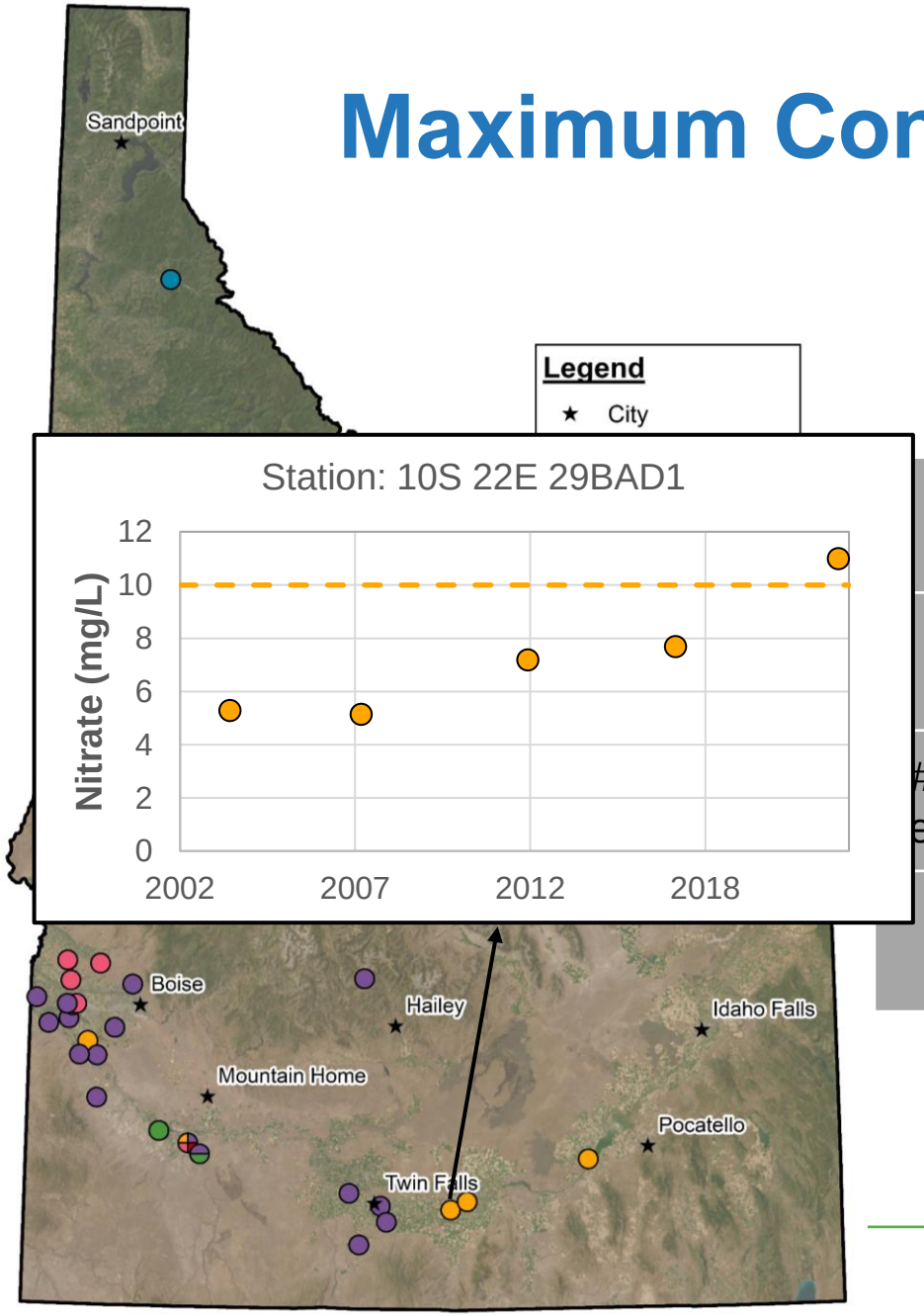
Maximum Contaminant Level (MCL) Exceedances



	Arsenic	Nitrate	Uranium	Fluoride	Cadmium	Selenium
MCL	10 µg/l	10 mg/l	30 µg/l	4 mg/l	5 µg/L	50 µg/L
# of wells > MCL	19	5	5	3	1	1
# of first-time exceedances	0	1	1	0	0	0
Max value	200 µg/L	35 mg/L	200 µg/L	8.3 mg/L	11 µg/L	300 µg/L

A total of 30 wells, or 14% of sites sampled, had at least one MCL exceedance

Maximum Contaminant Level (MCL) Exceedances



	Arsenic	Nitrate	Uranium	Fluoride	Cadmium	Selenium
MCL	10 µg/l	10 mg/l	30 µg/l	4 mg/l	5 µg/L	50 µg/L
# of wells > MCL	19	5	5	3	1	1
# of first-time exceedances	0	1	1	0	0	0
Max value	200 µg/L	35 mg/L	200 µg/L	8.3 mg/L	11 µg/L	300 µg/L

A total of 30 wells, or 14% of sites sampled, had at least one MCL exceedance

PFAS Sampling

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
- PFAS sampling in Idaho's has been limited
  - Military installations
  - DEQ public water systems

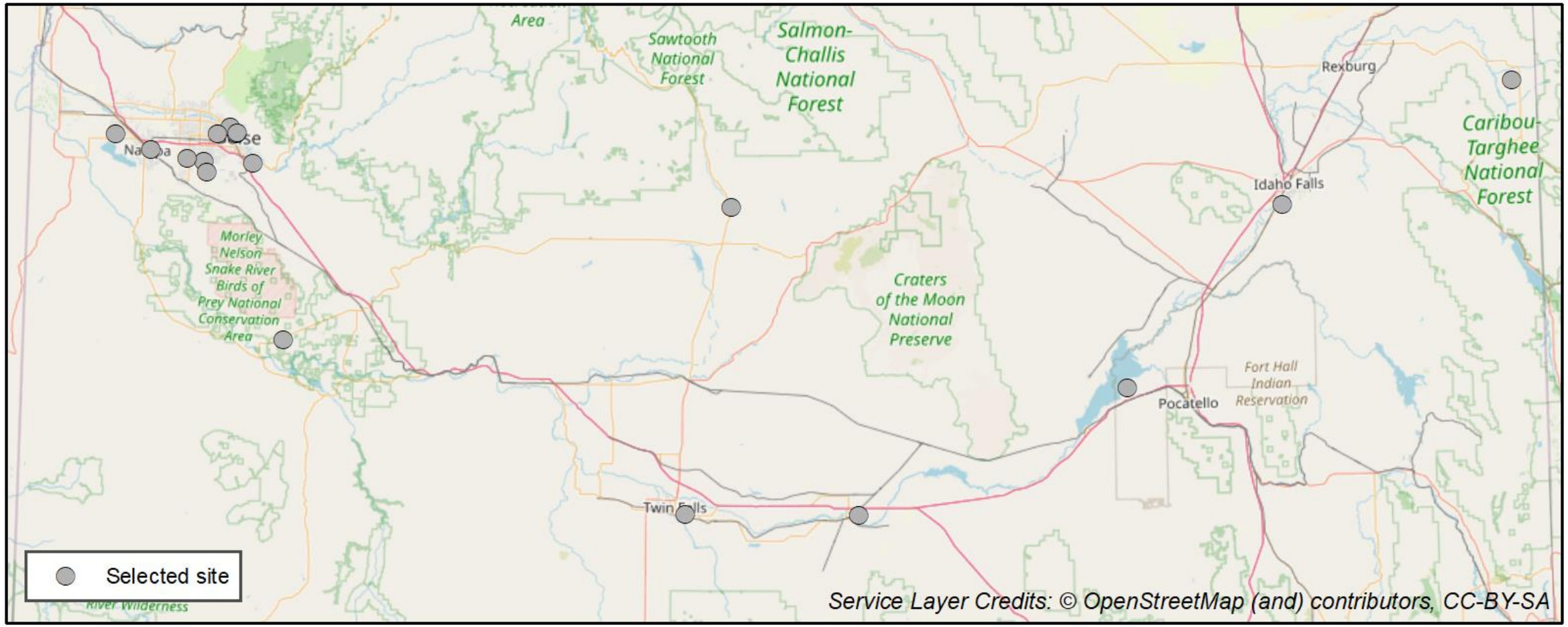
- No MCL set for PFAS chemicals; EPA released new HALs in June 2022

Analyte	Health Advisory Level (HAL)
PFOA	0.004 ppt
PFOS	0.02 ppt
HFPO-DA ("Gen-X")	10 ppt
PFBS	2000 ppt

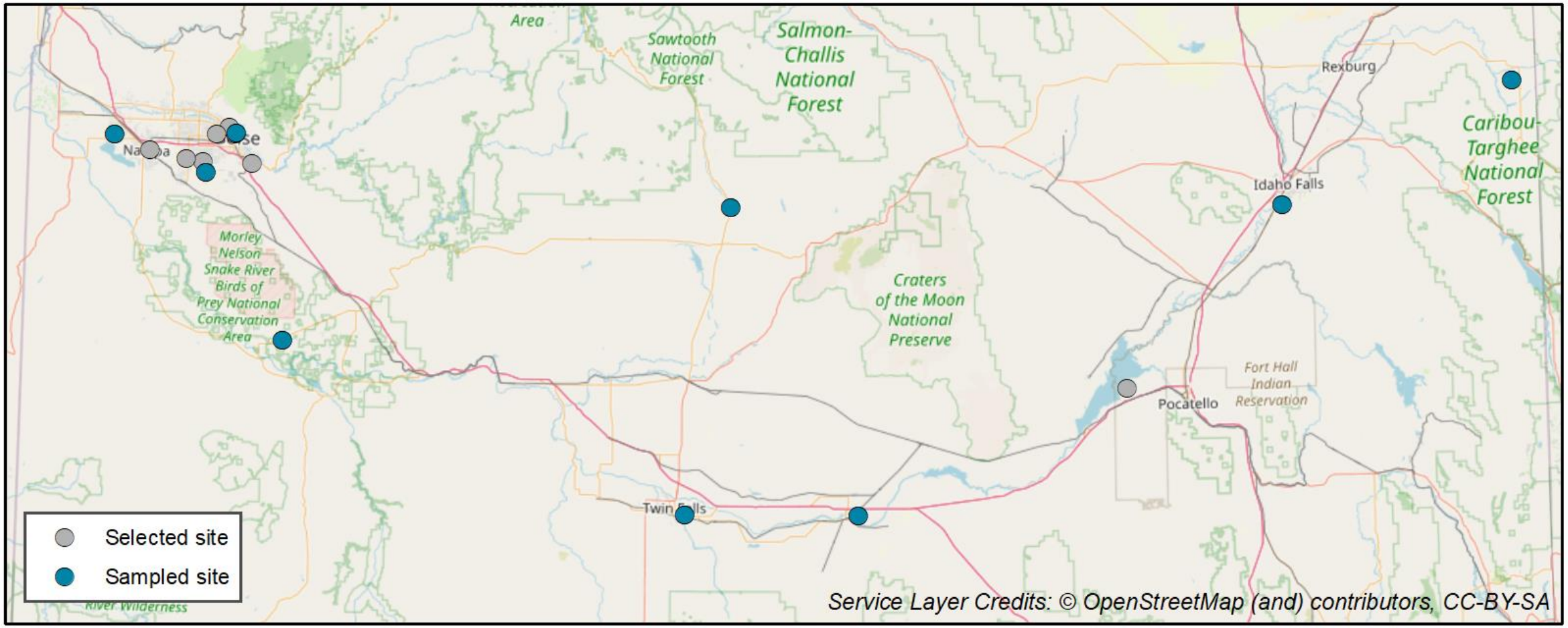
IDWR PFAS Sampling

- IDWR sampled 13 wells in 2021; had 2 detections
- Aimed to sample up to 15 wells in 2022 using the following:
    1) Wells already slated for sampling
    2) Wells near known or suspected PFAS contamination sites
    3) Wells near prior PFAS detections
    4) Domestic wells were preferentially selected
- Used EPA method 533 (25 PFAS chemicals)
- Samples analyzed at Anatek Labs

2022 Selected Sites



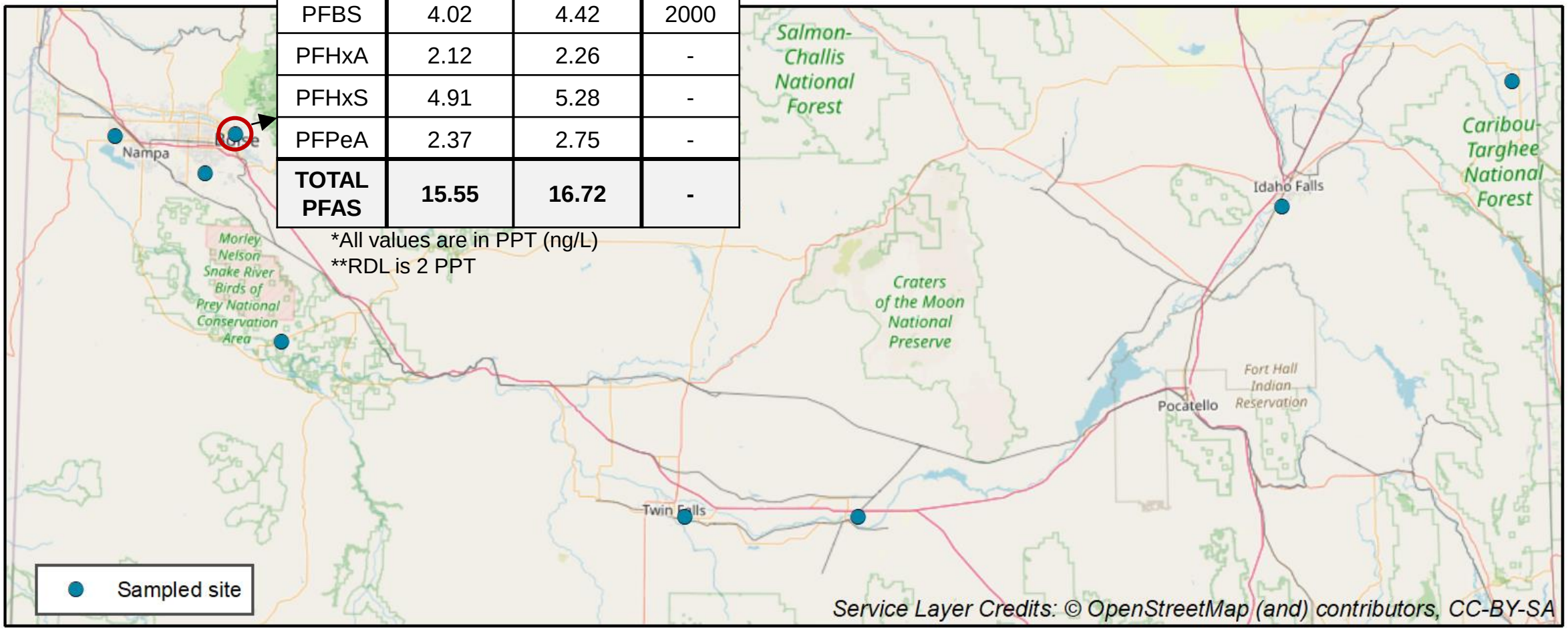
2022 Sampled Sites



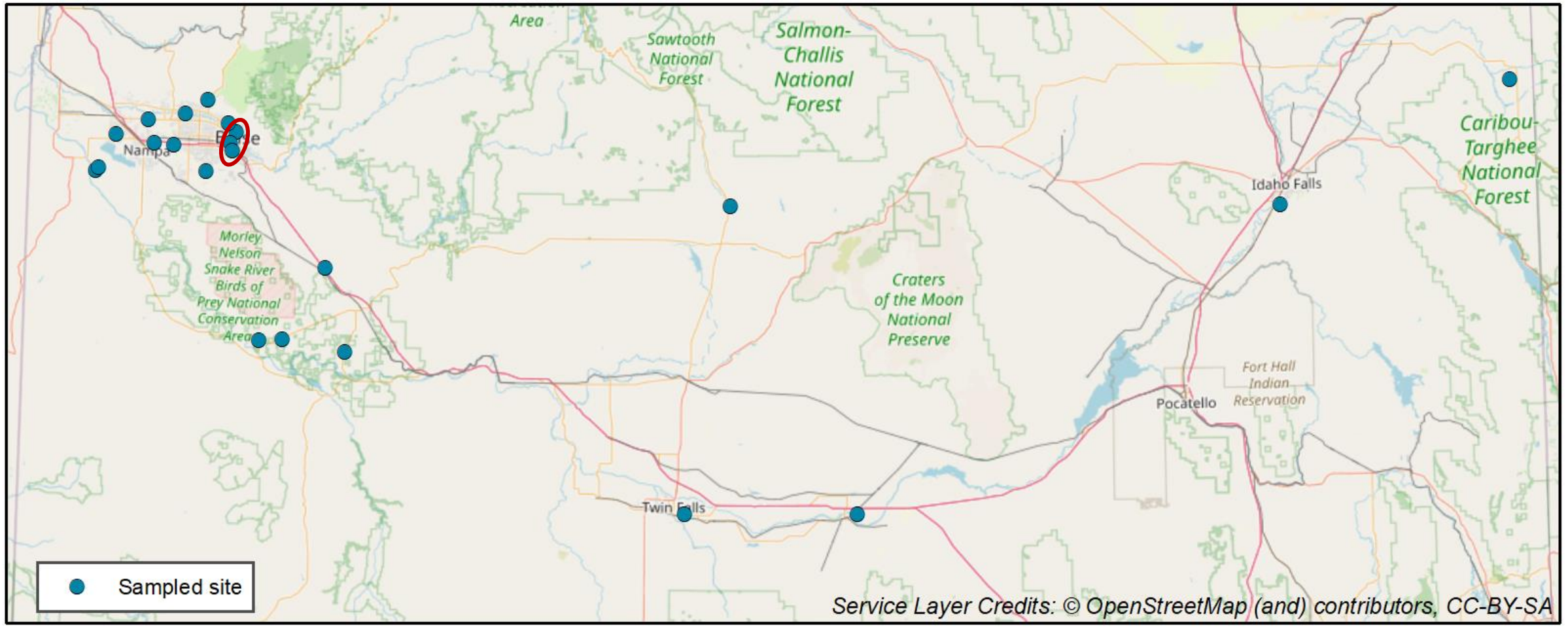
2022 PFAS Detections

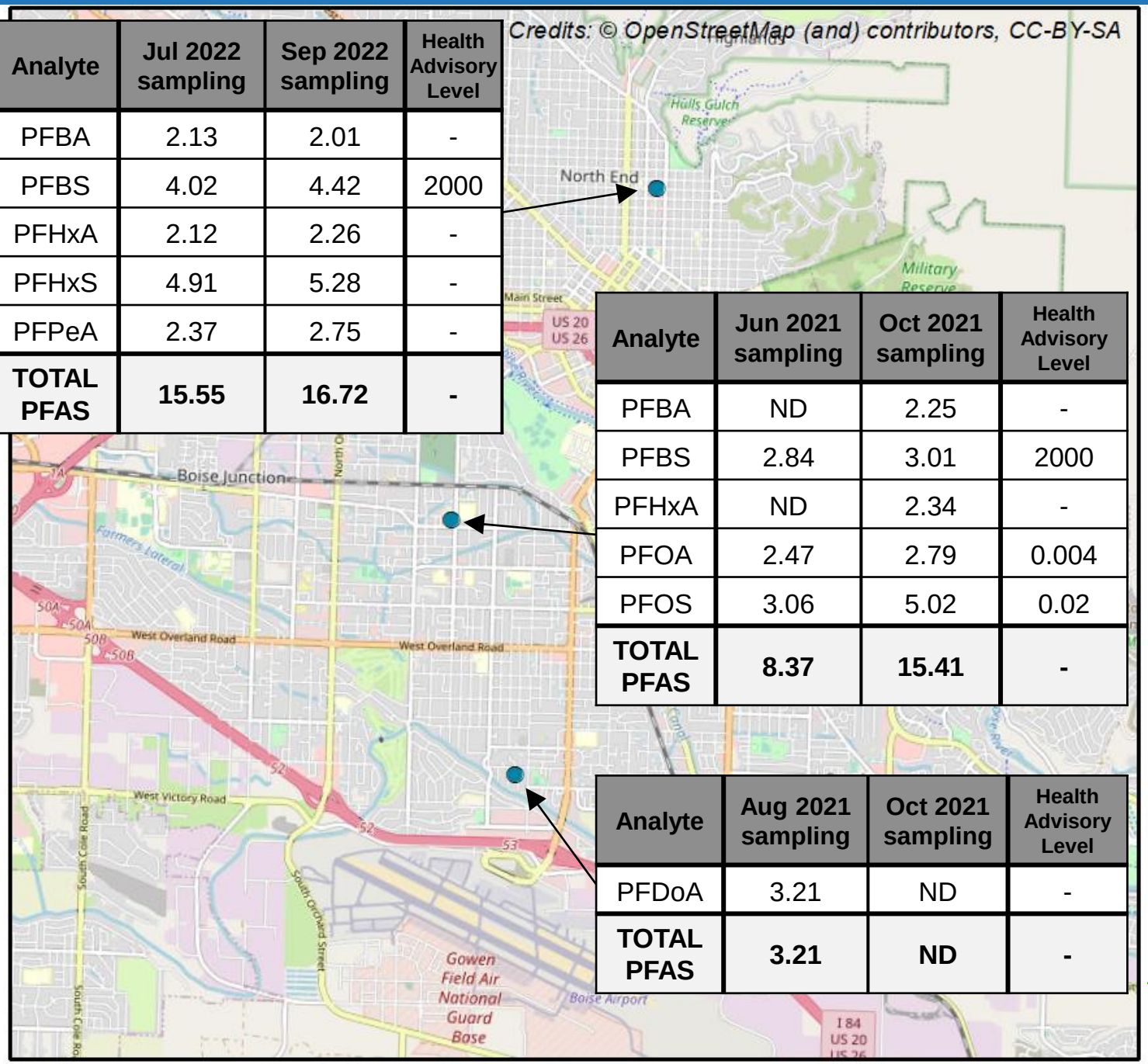
Analyte	Jul 2022 sampling	Sep 2022 sampling	Health Advisory Level
PFBA	2.13	2.01	-
PFBS	4.02	4.42	2000
PFHxA	2.12	2.26	-
PFHxS	4.91	5.28	-
PFPeA	2.37	2.75	-
TOTAL PFAS	**15.55**	**16.72**	**-**

*All values are in PPT (ng/L)
**RDL is 2 PPT



2021-2022 PFAS Samples





Analyte	Jul 2022 sampling	Sep 2022 sampling	Health Advisory Level
PFBA	2.13	2.01	-
PFBS	4.02	4.42	2000
PFHxA	2.12	2.26	-
PFHxS	4.91	5.28	-
PFPeA	2.37	2.75	-
TOTAL PFAS	**15.55**	**16.72**	**-**

Analyte	Jun 2021 sampling	Oct 2021 sampling	Health Advisory Level
PFBA	ND	2.25	-
PFBS	2.84	3.01	2000
PFHxA	ND	2.34	-
PFOA	2.47	2.79	0.004
PFOS	3.06	5.02	0.02
TOTAL PFAS	**8.37**	**15.41**	**-**

Analyte	Aug 2021 sampling	Oct 2021 sampling	Health Advisory Level
PFDoA	3.21	ND	-
TOTAL PFAS	**3.21**	**ND**	**-**

2021-2022 PFAS Detections

- All detections in Boise
- Shallow wells (<100 feet)
- Shallow depth to water (30-35 feet)

2023 Goals

- Continue PFAS sampling
- Coordinate with DEQ on site selection

*All values are in PPT (ng/L)
**RDL is 2 PPT

Orthophosphate Project

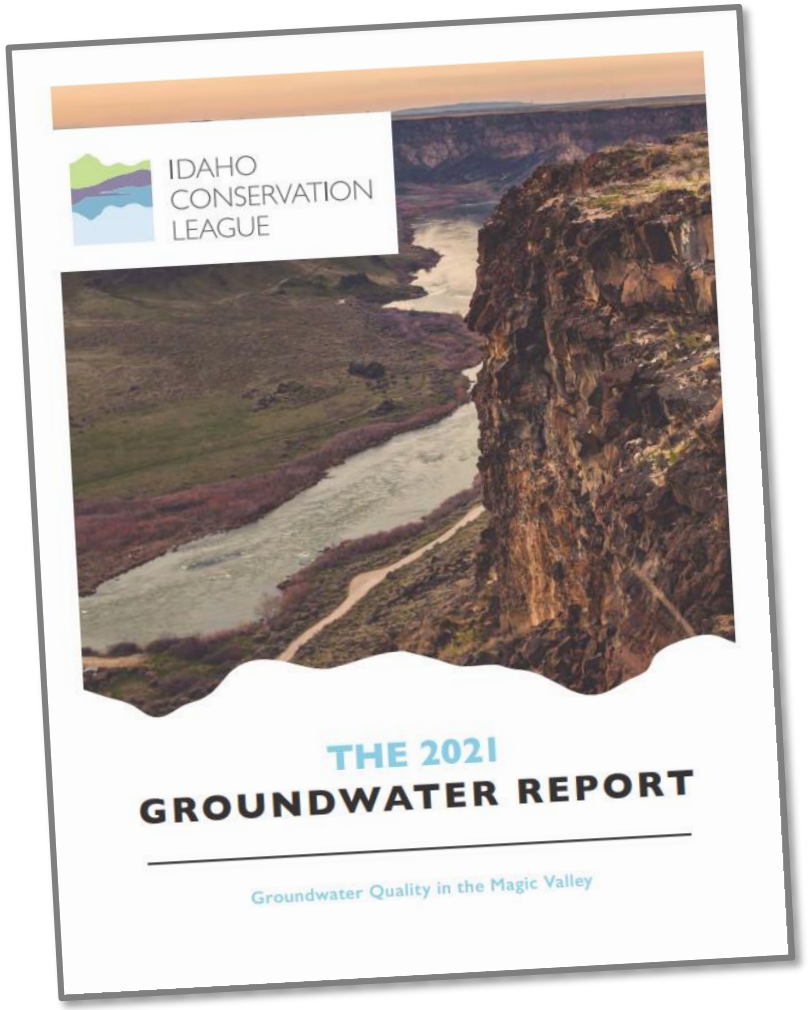
Statewide Program Phosphorus Sampling

Parameter	1990 - 1999	2000 - 2009	2010 - 2019	2020 - 2022
Orthophosphate				
Total Phosphorus				

- Orthophosphate is the dissolved portion of phosphorus
- In groundwater systems, dissolved phosphorus is usually the same (or believed to be similar) as total phosphorus
  - Can we confirm the above statement to be able to look at trends in phosphorus concentrations?

Callie Story, BS Biology

Relevance



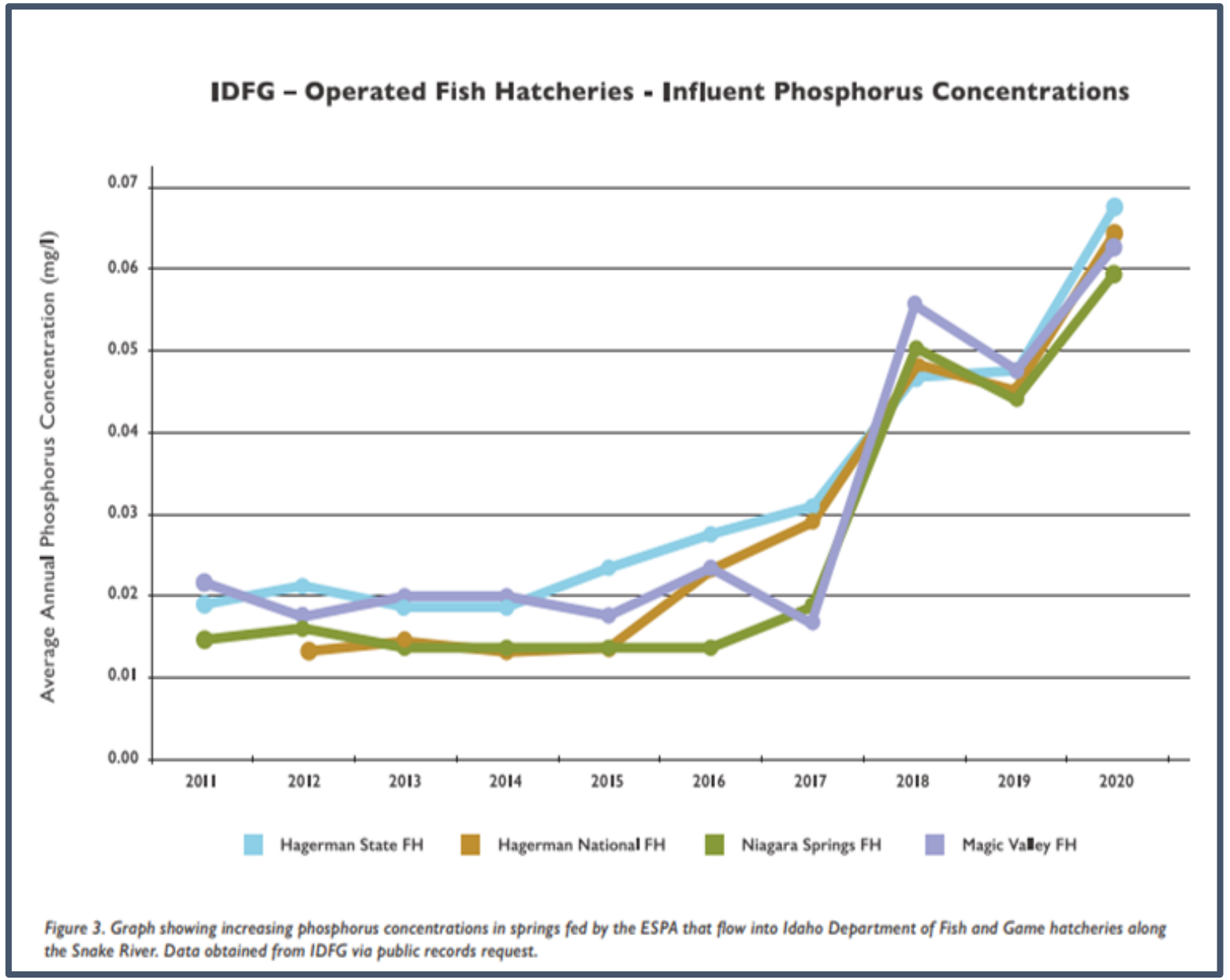


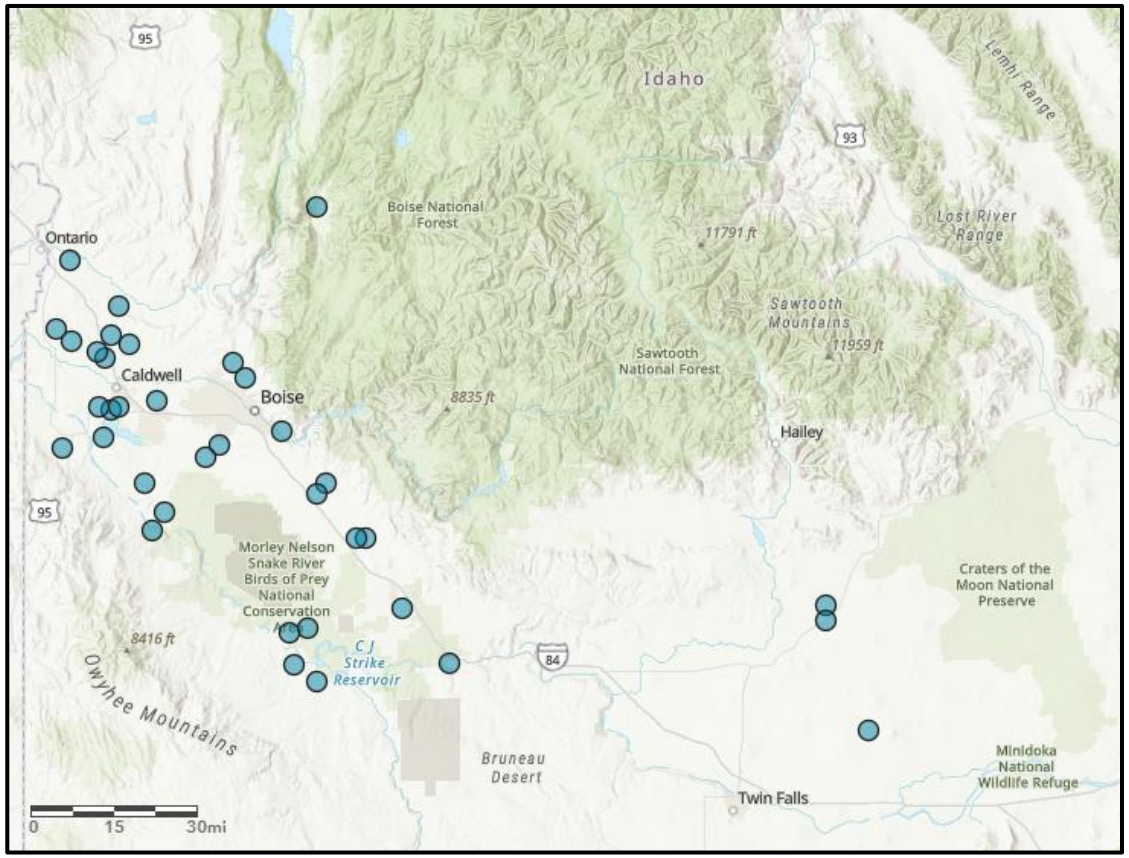
Figure 3. Graph showing increasing phosphorus concentrations in springs fed by the ESPA that flow into Idaho Department of Fish and Game hatcheries along the Snake River. Data obtained from IDFG via public records request.

2022 Orthophosphate Sampling

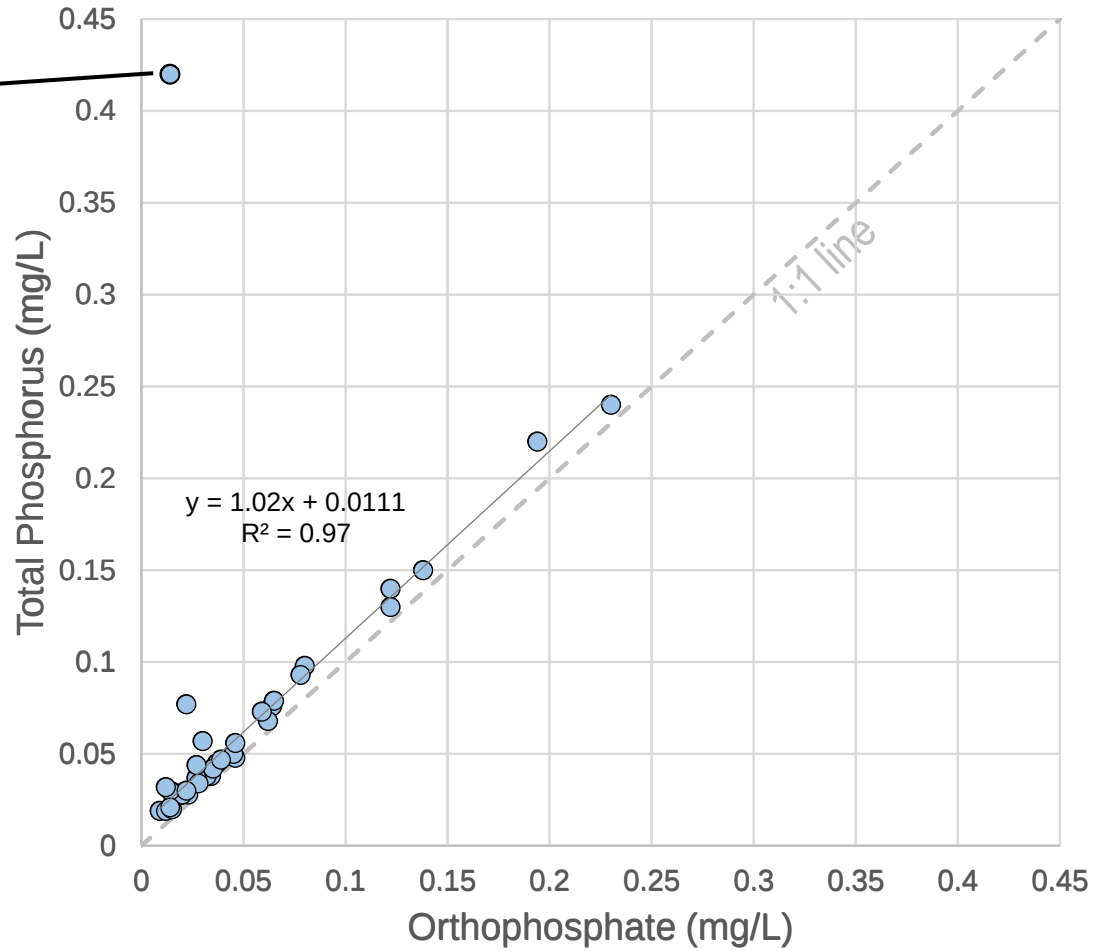
Sampled a subset of sites for both total phosphorus and orthophosphate using the following criteria:

- Can be delivered to lab day of collection
- No collection on Friday
- Has a historical record (3+ years)

	Orthophosphate	Total Phosphorus
Method	EPA 365.1	EPA 365.1
Hold time	48 hours	28 days
Cost	$20	$28
Years analyzed	1992-2011	1990-1991; 2019-2021



Preliminary Results



Additional Questions

- Can total phosphorus be used as a surrogate to predict orthophosphate levels?
- Can we develop a statistical relationship to look at overall nutrient changes in Statewide Program wells?
- What are potential factors that lead to a greater difference in total phosphorus and orthophosphate concentrations?
  - i.e., well depth & construction, land use, concentrations of other parameters

Callie Story
BS Biology

Dr. Frank Wilhelm
Professor, Biology

University of Idaho

Immunoassay Testing

IDWR Immunoassay Sampling

	2015	2016	2017	2018	2019	2020	2021	2022
Emerging Contaminants								
17-Beta Estradiol								
Bisphenol A (BPA)	26	14	8	42	4	4	4	7
Caffeine	23	14						
Triclosan	21	40	16	7	1			
Pesticides								
2,4-D								
Alachlor								
Atrazine		1	1	1			1	
Glyphosate	3	4	2	12		1	2	
Imidacloprid			2					
Metolachlor		1	1				1	2

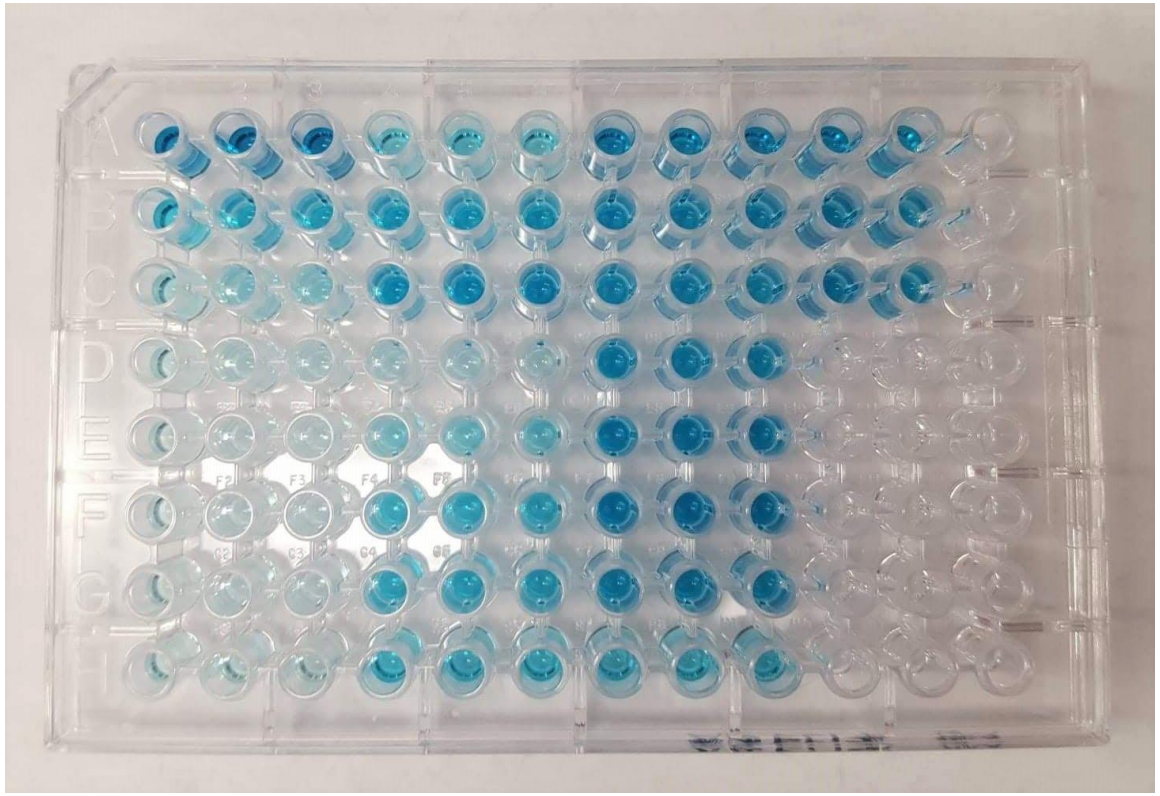
Shading indicates test was run that year; value indicates number of detections

Is immunoassay testing the best path to continue?

Immunoassay Pros/Cons

Pros

- Historical record
- Cost effective (historically)
- Can target specific analyte
- Low detection limit
- Long holding time (6 months)



Cons

- Supply issues (minimum order)
- Limited analytes
- Changes in detection limits
- Increasing costs (2022: ~$21 per analyte)
- Can’t be used for regulatory purposes (i.e., SDWA)

Looking ahead to 2023

- **Is it beneficial to continue immunoassay testing as is?**
- **Should the program transition to more robust methods (e.g., 525.2)?**
- **Or utilize a hybrid approach?**
- **How have others used this data historically?**

	Immunoassay sampling (2021 numbers)	**EPA 525.2 (semi-VOCs)**
Analytes	BPA, Triclosan, Atrazine, Glyphosate, Metolachlor	103 analytes; includes Alachlor, Atrazine, and Metolachlor
Cost per sample	$106	$225
Holding time	6 months	14 days

Thanks! Questions?

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

IDAHO DEPARTMENT OF
WATER RESOURCES