

# RECLAMATION

*Managing Water in the West*

## **Zebra/Quagga Mussel Monitoring in the Pacific Northwest**

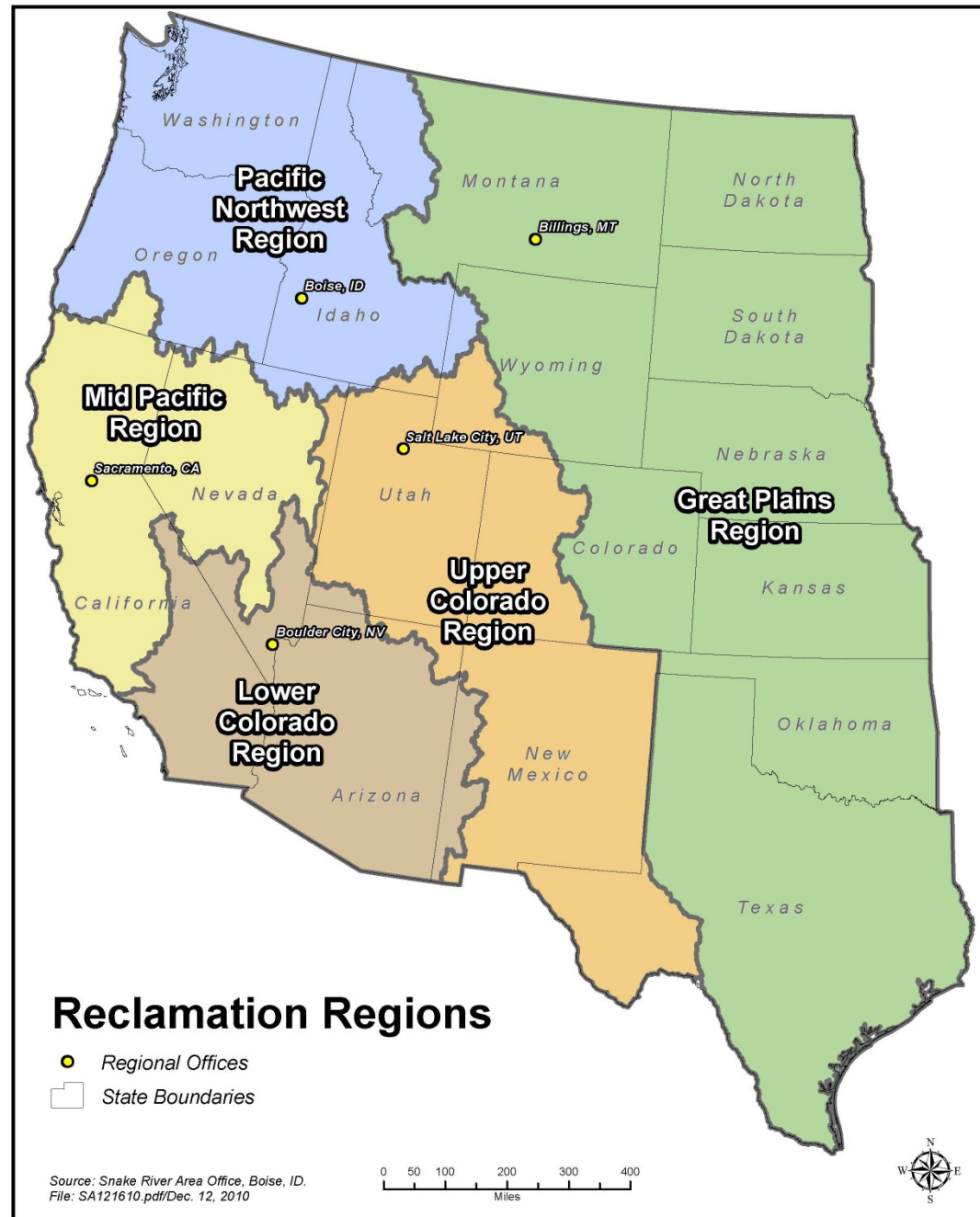
*Anthony Prisciandaro  
Fisheries Biologist/AIS Coordinator*

*Kristina Lawcynell  
PN Soil and Water Laboratory Manager*

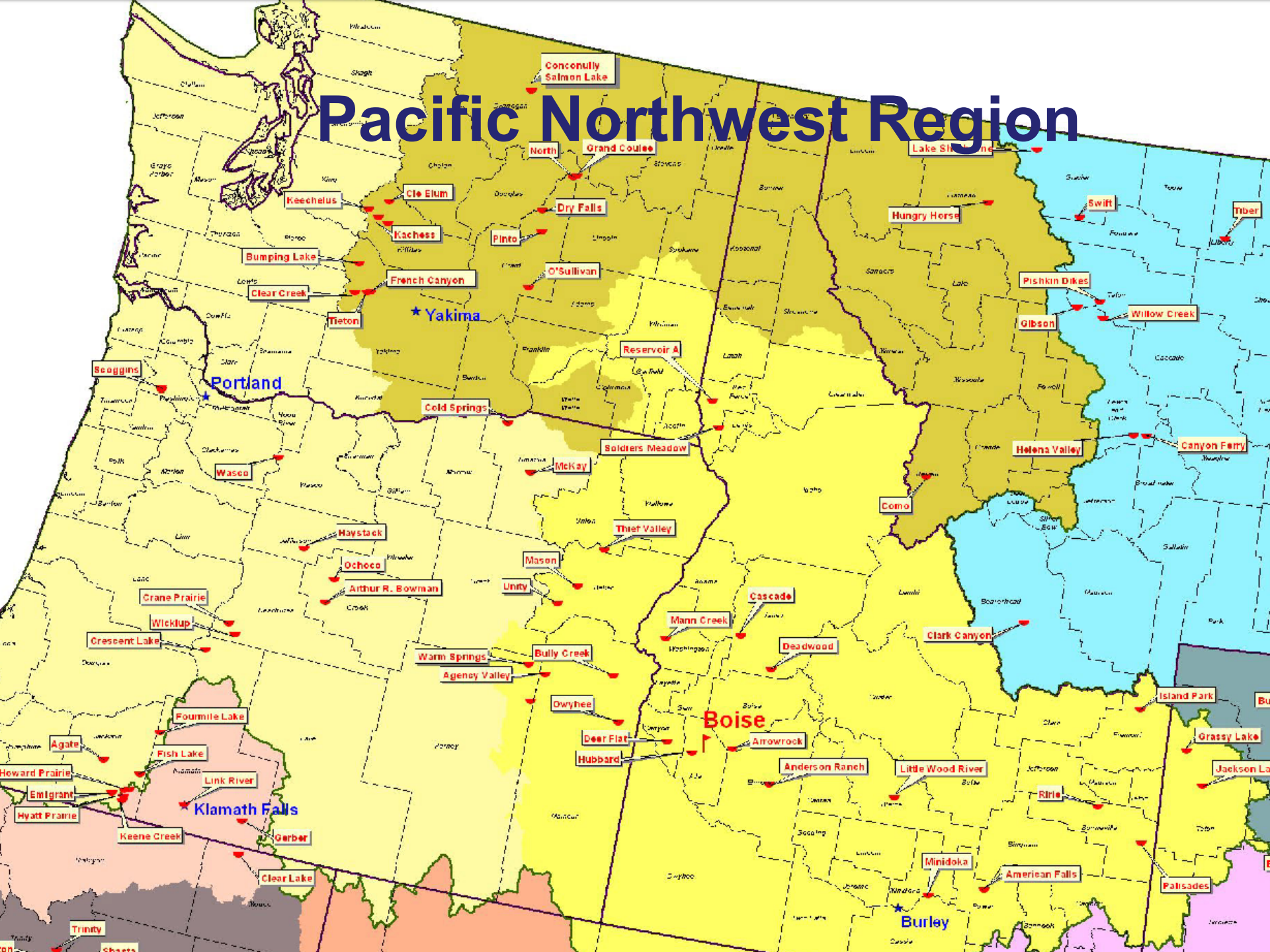


U.S. Department of the Interior  
Bureau of Reclamation

# Reclamation's Structure



# Pacific Northwest Region





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## Snake River Area Office

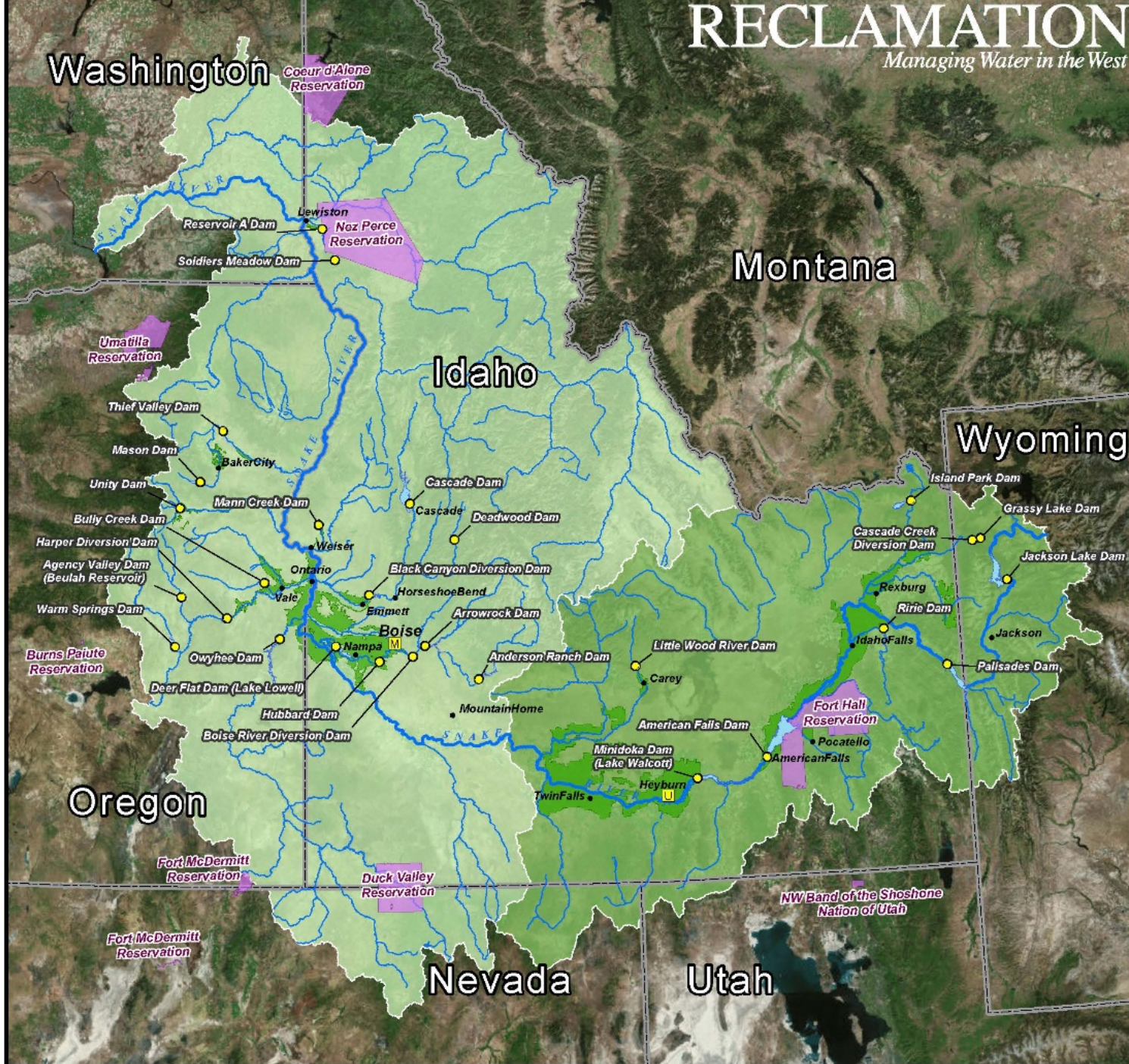
Office of the Area Manager  
230 Collins Road  
Boise, ID 83702  
208-383-2200



- Reclamation Dams
- M MSFO - Boise Office of Deputy Area Manager
- U USFO - Heyburn Office of Assistant Area Manager
- Reclamation Projects
- Cities

0 10 20 30 40 50 100  
Miles

Filename: SA022210.pdf  
Date: March 2, 2016  
Drawn by: J. Jones (MSFO)

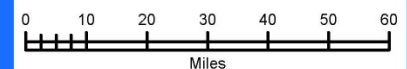




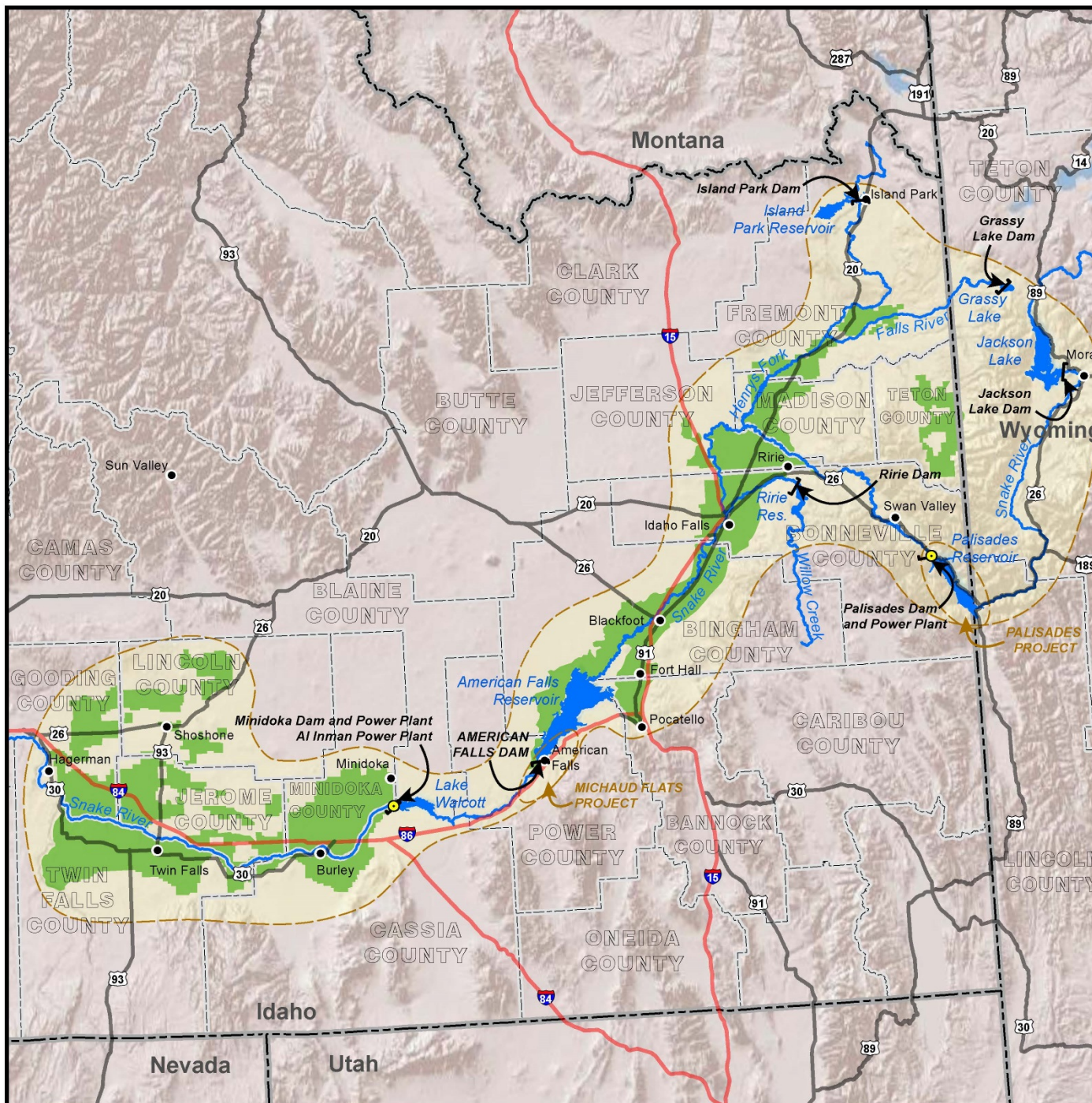


## Minidoka Project

- Reclamation Power Plant
- Reclamation Dam/Diversion
- Reclamation Reservoirs
- Areas Benefited by Project
- City
- Road - Interstate
- Road - U.S. Route
- Road - State Route
- River/Stream
- County Boundary
- State Boundary



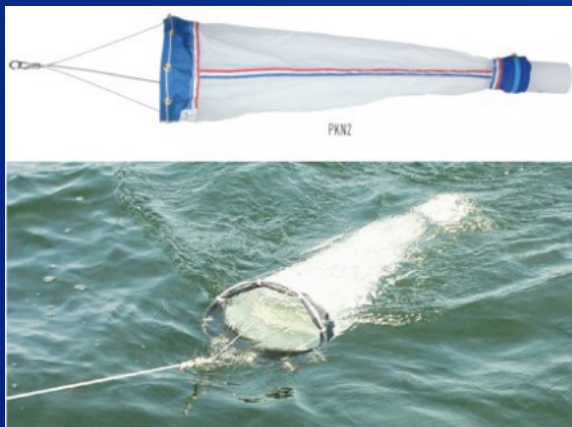
Date: 7/5/2012 MSFO GIS Dept.





# Veliger Tows

- Vertical tows
- 64 micron mesh
- Cross polarized light microscopy



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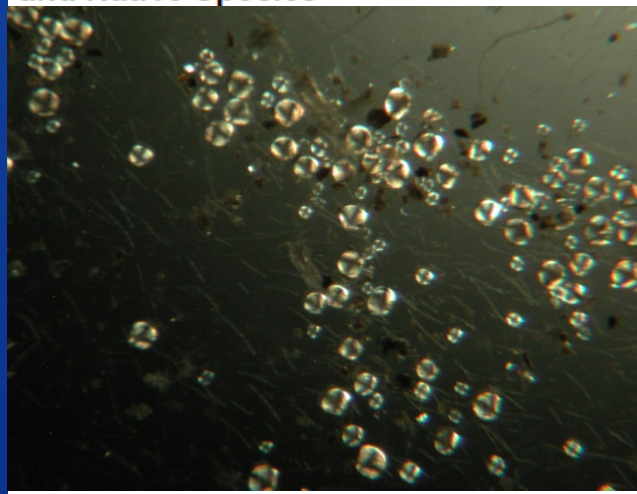
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Technical Memorandum No. 86-68220-13-01

## Field Protocol: Field Preparation of Water Samples for Dreissenid Veliger Detection

Field Standard Operating Procedure (Field SOP)  
Field SOP Version 4  
Date Revised: 2013

Bureau of Reclamation  
Technical Service Center  
Reclamation Detection Laboratory for Invasive  
and Native Species



Raw water sample collected  
using a 64 micron plankton tow



An aerial photograph of a large reservoir with greenish water. A yellow dot is placed in the upper-middle part of the water. To the left, a concrete boat dock extends into the water. A road runs along the bottom edge of the reservoir, with a residential neighborhood visible on the right. The image is framed by a blue border at the top and bottom.

(AFE009)  
Sampling Site

(AFE010)  
Boat Dock

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# Sampling

- Sampling started as an add on to existing water quality monitoring
- Rotating schedule
- Every reservoir hit once every three years at a minimum
- Risk Category [Ca<sup>2+</sup>] (mg/L)
  - High > 25
  - Medium > 15 - 25
  - Low 12 - 15
  - Very Low < 12

Reservoir	State	2018 Sampling	Risk Category (Wells)
Ririe	Idaho	X	High
American Falls	Idaho	X	High
Walcott	Idaho	X	High
Palisades	Idaho	X	High
Little Wood	Idaho	X	Medium
Lake Lowell	Idaho	X	Medium
Island Park	Idaho	X	Medium
Anderson Ranch	Idaho	X	Very Low
Arrowrock	Idaho	X	Very Low
Black Canyon	Idaho	X	Very Low
Deadwood	Idaho		Very Low
Cascade	Idaho	X	Very Low
Mann Creek	Idaho		Medium
Henrys Lake	Idaho	X	High
Hungry Horse	Montana	X	Medium
Bully Creek	Oregon	X	High
Thief Valley	Oregon	X	Medium
Owyhee	Oregon	X	Medium
Prineville	Oregon	X	Medium
Unity	Oregon	X	Medium
Emmigrant	Oregon	X	Very Low
Agate	Oregon	X	Very Low
Hyatt Prairie	Oregon		Very Low
Howard Prairie	Oregon		Very Low
Henry Hagg	Oregon	X	Very Low
Haystack	Oregon		Very Low
McKay	Oregon	X	Very Low
Cold Springs	Oregon		Low
Phillips	Oregon		Very Low
Crane Prairie	Oregon		Very Low
Warm Springs	Oregon		Medium
Beulah	Oregon		Very Low
Wickiup	Oregon		Very Low
Wasco	Oregon		Very Low
Banks Lake	Washington	X	Medium
FDR	Washington	X	Medium
Rimrock	Washington		Very Low
Cle Elum	Washington		Very Low
Bumping	Washington	X	Very Low
Kachess	Washington	X	Very Low
Keechelus	Washington		Very Low
Jackson	Wyoming	X	Low
Grassy	Wyoming		Very Low



# Reclamation Zebra/Quagga Mussel Monitoring

- 27 reservoirs were sampled in 2018
- Of the 27 Reservoirs
  - 10 Very Low Risk
  - 1 Low Risk
  - 10 Medium Risk
  - 6 High Risk
- 30 reservoirs will be sampled in 2019



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# Laboratory Analysis

Nutrients	Wet Chemistry	Microbiology	Minerals	Metals	Additional
NO3/NO2	Alkalinity	Fecal Coliform	FI	As	TOC
Ortho-Phosphorous	Chlorophyll A (V)	E. coli	SO4	Se	TSS
Total Phosphorous	Pheophytin-A (V)		Cl	Cd	ZQ Mussels
Ammonia-Dissolved	Lab pH		Ca	Cr	* Field parameters
TKN	Lab Electrical Conductivity		Mg	Cu	
	Turbidity		Na	Pb	
			K	Fe	
			SiO2	Mn	
				Zn	
				Mtl	
* Field Parameters include:				Digest	
Temperature					
Barometric Pressure					
DO					
Electrical Conductivity					
pH					
Turbidity					
ORP					
Sample Depth					
Secchi Disc					
Stream Flow					
TDG					

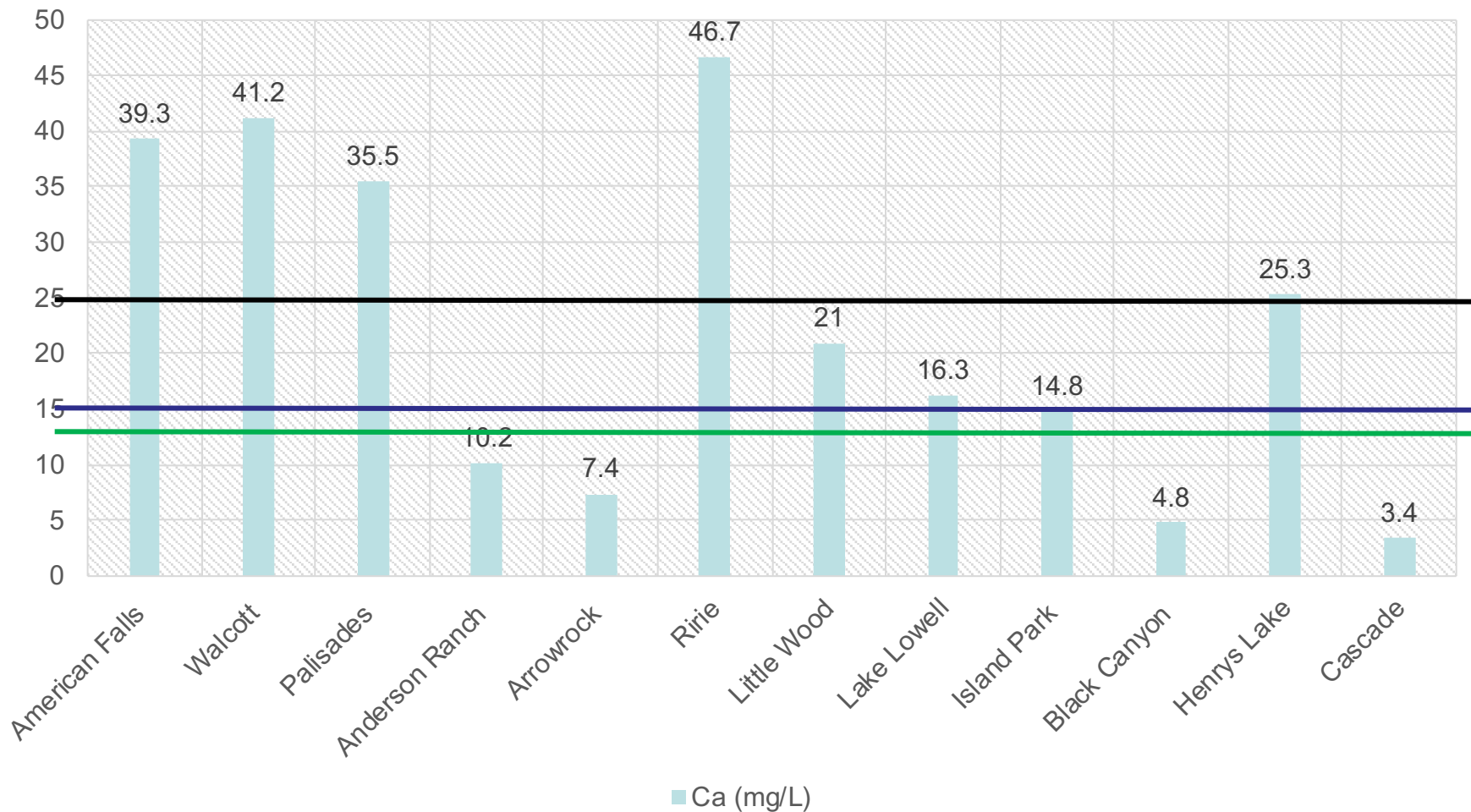


# Idaho

Reservoir	Risk Category (Wells)	2018 Sampling Events	Ca (mg/L)	pH S.U.	2019 Sampling Events
American Falls	High	5	39.3	8.1	4
Walcott	High	5	41.2	8.2	4
Palisades	High	2	35.5	8.3	3
Anderson Ranch	Very Low	1	10.2	8.4	1
Arrowrock	Very Low	1	7.4	7.7	1
Ririe	High	1	46.7	8.3	1
Little Wood	Medium	1	21.0	7.9	
Lake Lowell	Medium	5	16.3	8.0	3
Island Park	Medium	1	14.8	8.3	
Black Canyon	Very Low	1	4.8	6.8	
Henrys Lake	High	1	25.3		
Cascade	Very Low	2	3.4	8.7	1

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# Idaho



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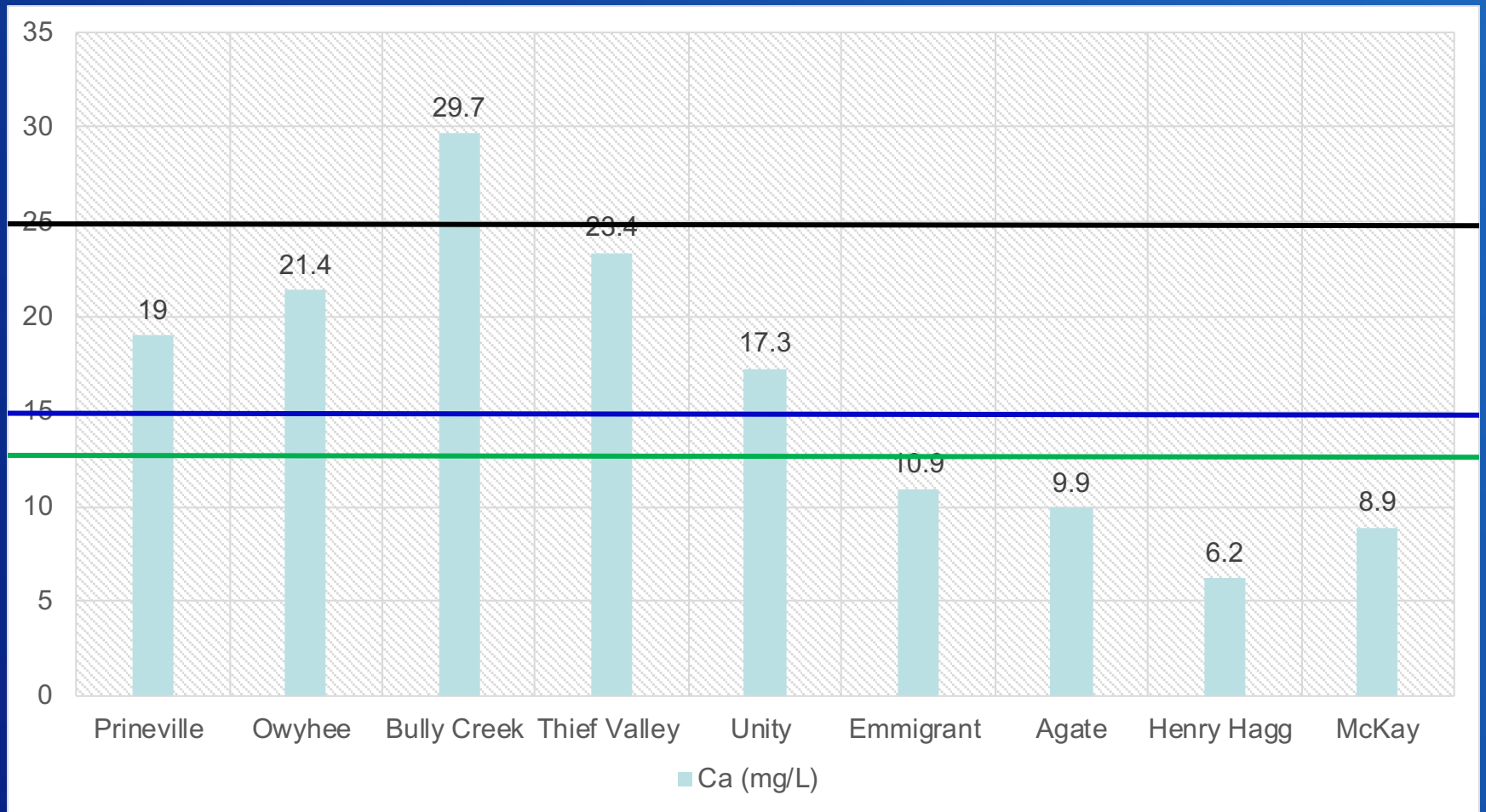


# Oregon

Reservoir	Risk Category (Wells)	2018 Sampling Events	Ca (mg/L)	pH S.U.	2019 Sampling Events
Prineville	Medium	3	19.0	8.3	4
Owyhee	Medium	5	21.4	8.5	4
Bully Creek	High	4	29.7	8.5	4
Thief Valley	Medium	3	23.4	8.5	3
Unity	Medium	3	17.3	8.9	3
Emmigrant	Very Low	1	10.9	8.0	
Agate	Very Low	1	9.9	8.3	
Hyatt Prairie	Very Low		9.49		1
Howard Prairie	Very Low		6.44		1
Henry Hagg	Very Low	1	6.2	7.7	1
Warm Springs	Medium		15.7		1
Beulah	Very Low		10.6		1
Phillips	Very Low		10.4		1
McKay	Very Low	1	8.9	8.2	
Haystack	Very Low		7		1
Wickiup	Very Low		3.7		1
Crane Prairie	Very Low		2.85		1

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# Oregon



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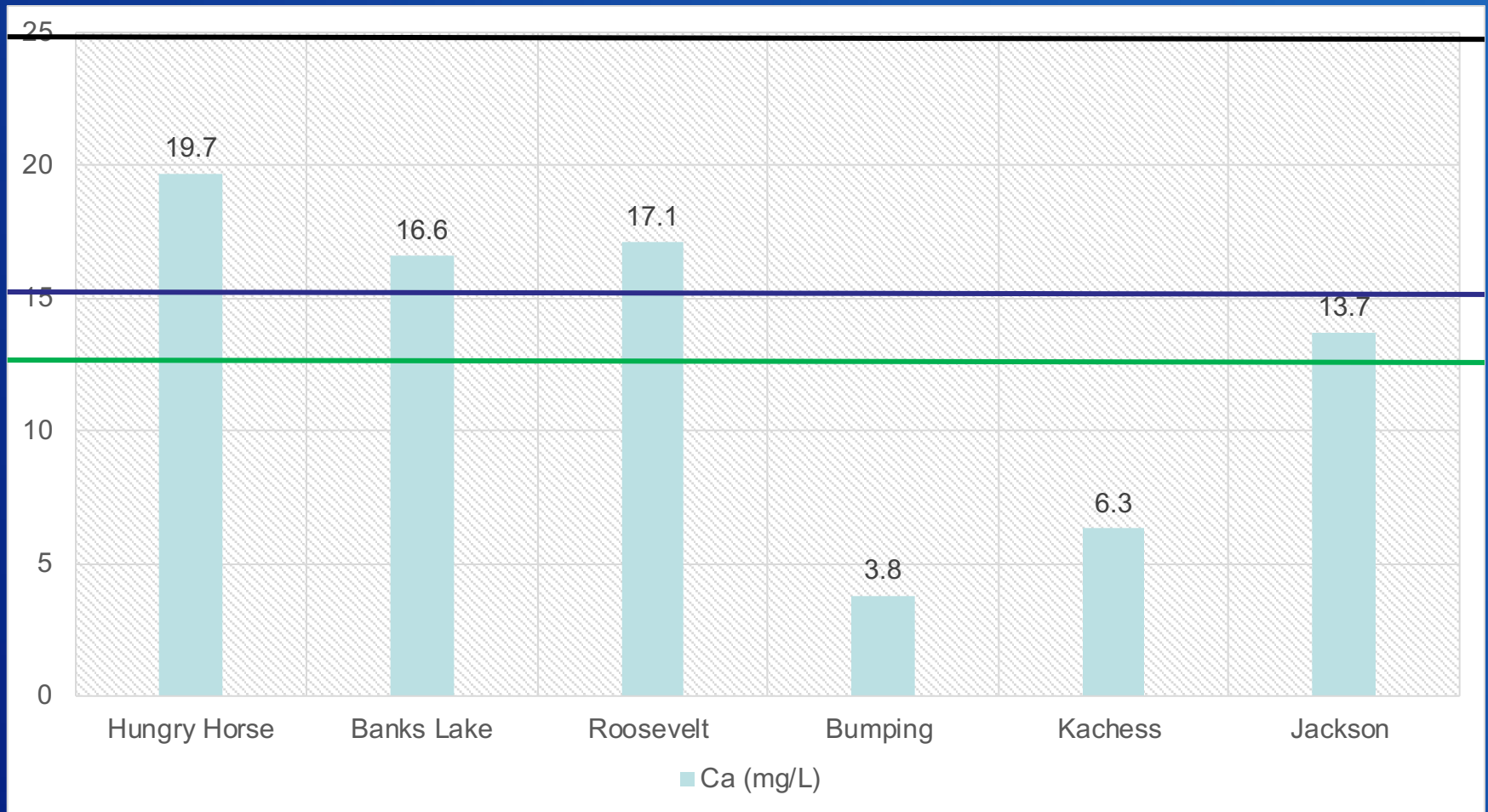


# Montana, Washington, and Wyoming

Reservoir	Risk Category (Wells)	2018 Sampling Events	Ca (mg/L)	pH S.U.	2019 Sampling Events
Hungry Horse	Medium	2	19.7	8.1	2
Banks Lake	Medium	4	16.6	7.7	3
Roosevelt	Medium	8	17.1	7.9	6
Rimrock	Very Low		7.3		1
Cle Elum	Very Low		4.7		1
Bumping	Very Low	1	3.8	7.7	
Kachess	Very Low	1	6.3	7.8	1
Keechelus	Very Low		3.8		1
Jackson	Low	3	13.7	8.0	3

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# Montana, Washington, and Wyoming



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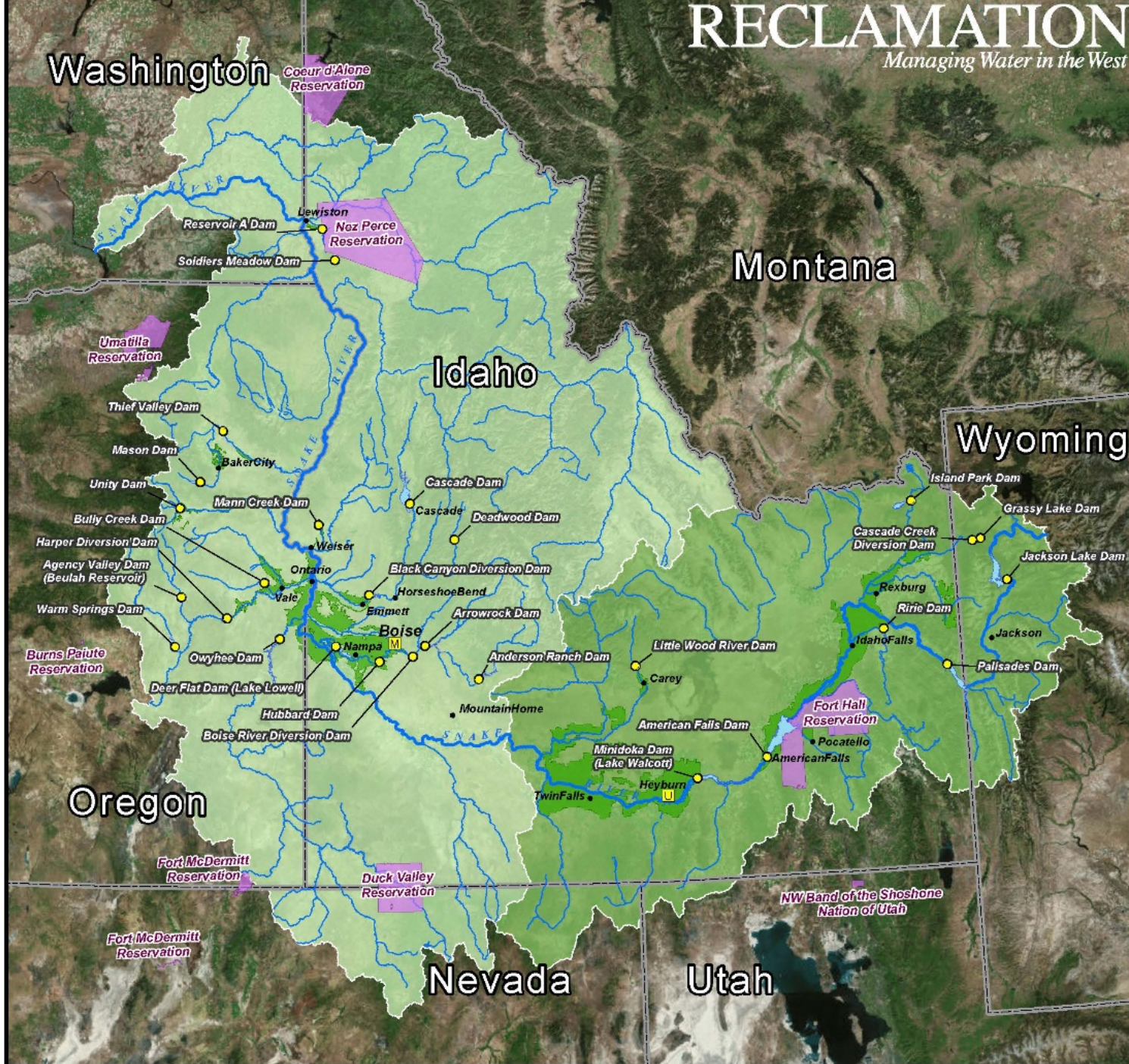
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# Settling Plates

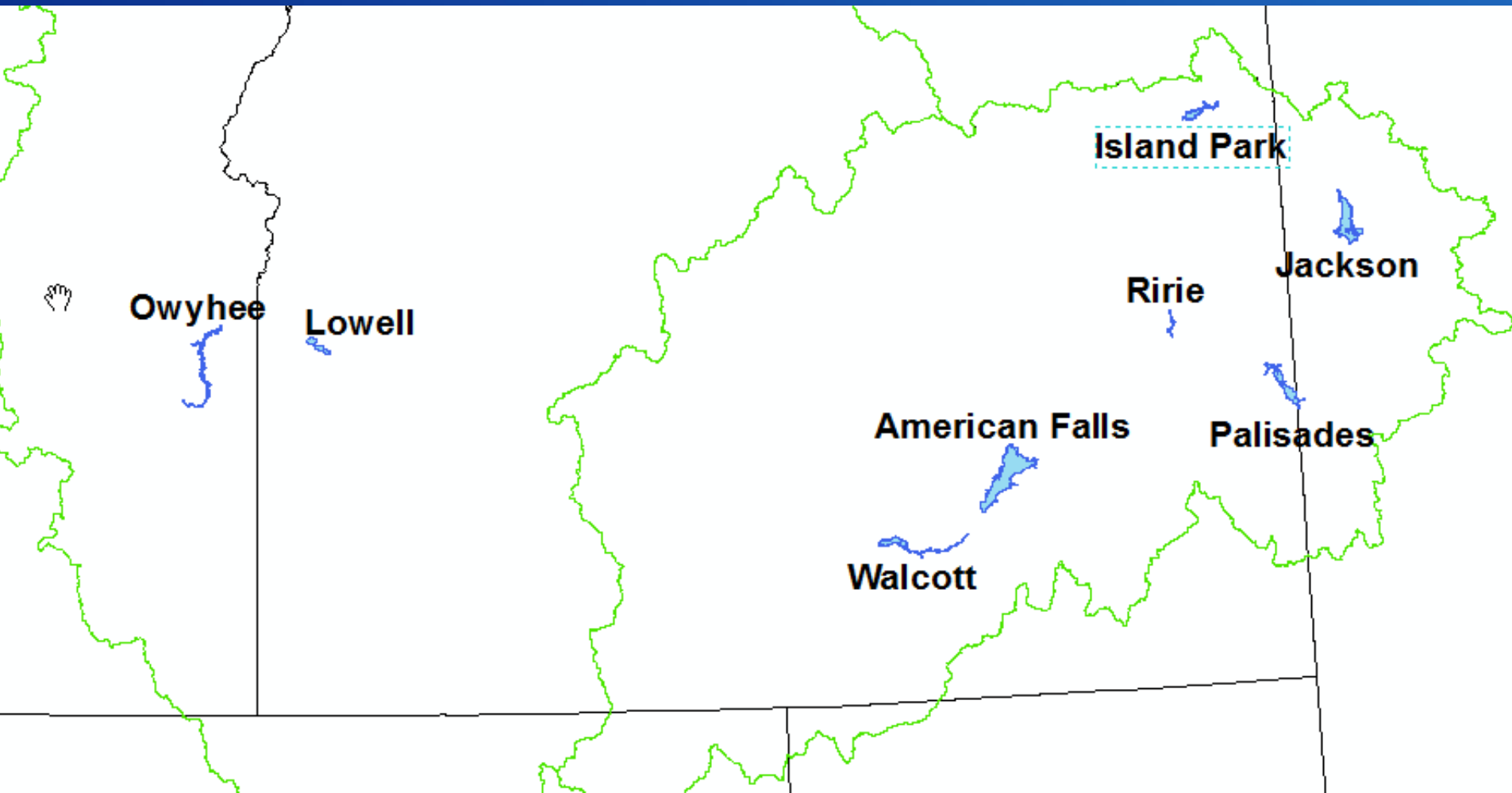
- PVC and Plexiglas
- Surface, 3 and up to 15 meters
- Multiple locations on existing buoys or new buoys
- Visual/tactile analysis at least twice a year





# Settling Plate Reservoirs

- All SRAO medium and high risk reservoirs that don't frequently empty completely

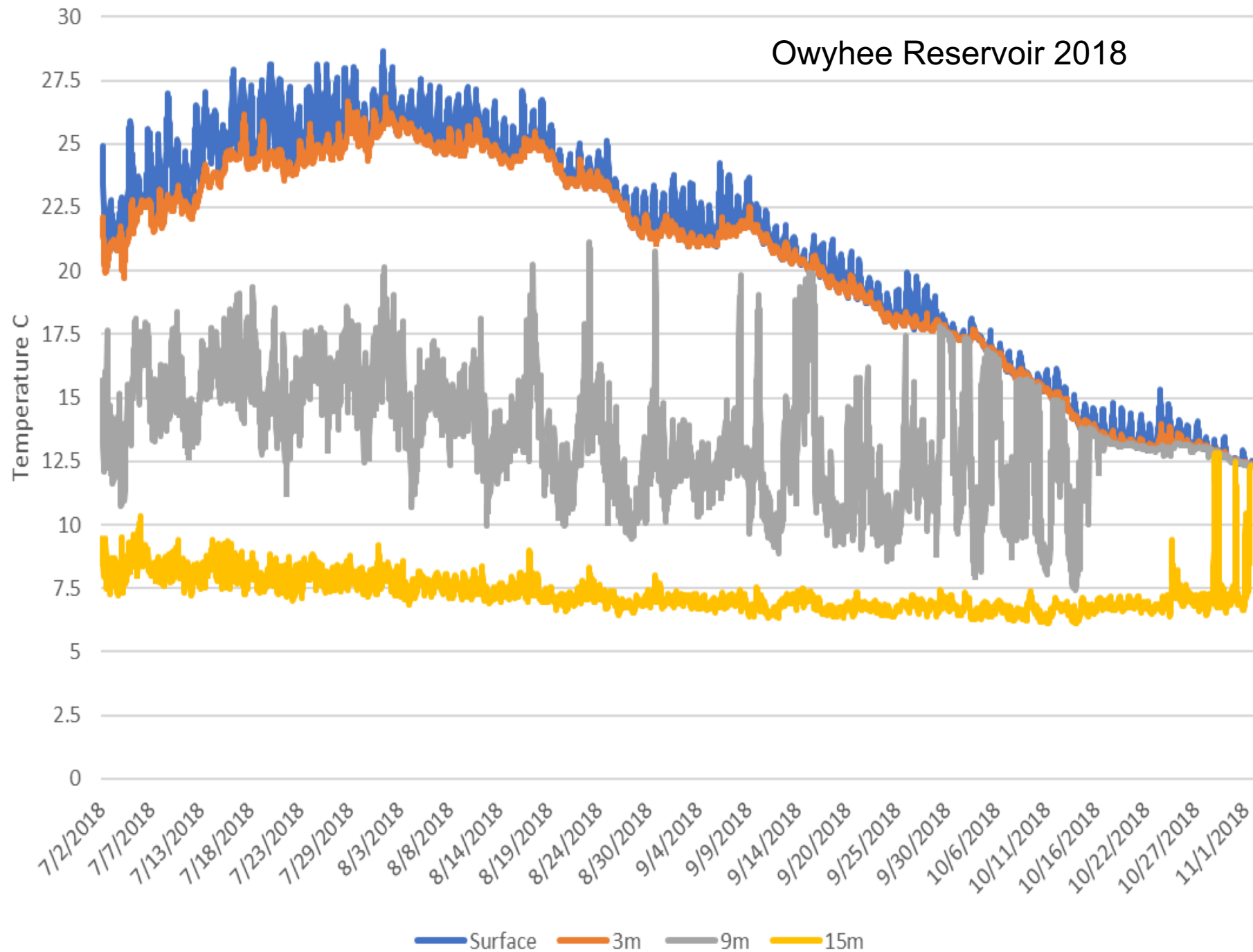


# Temperature Monitoring

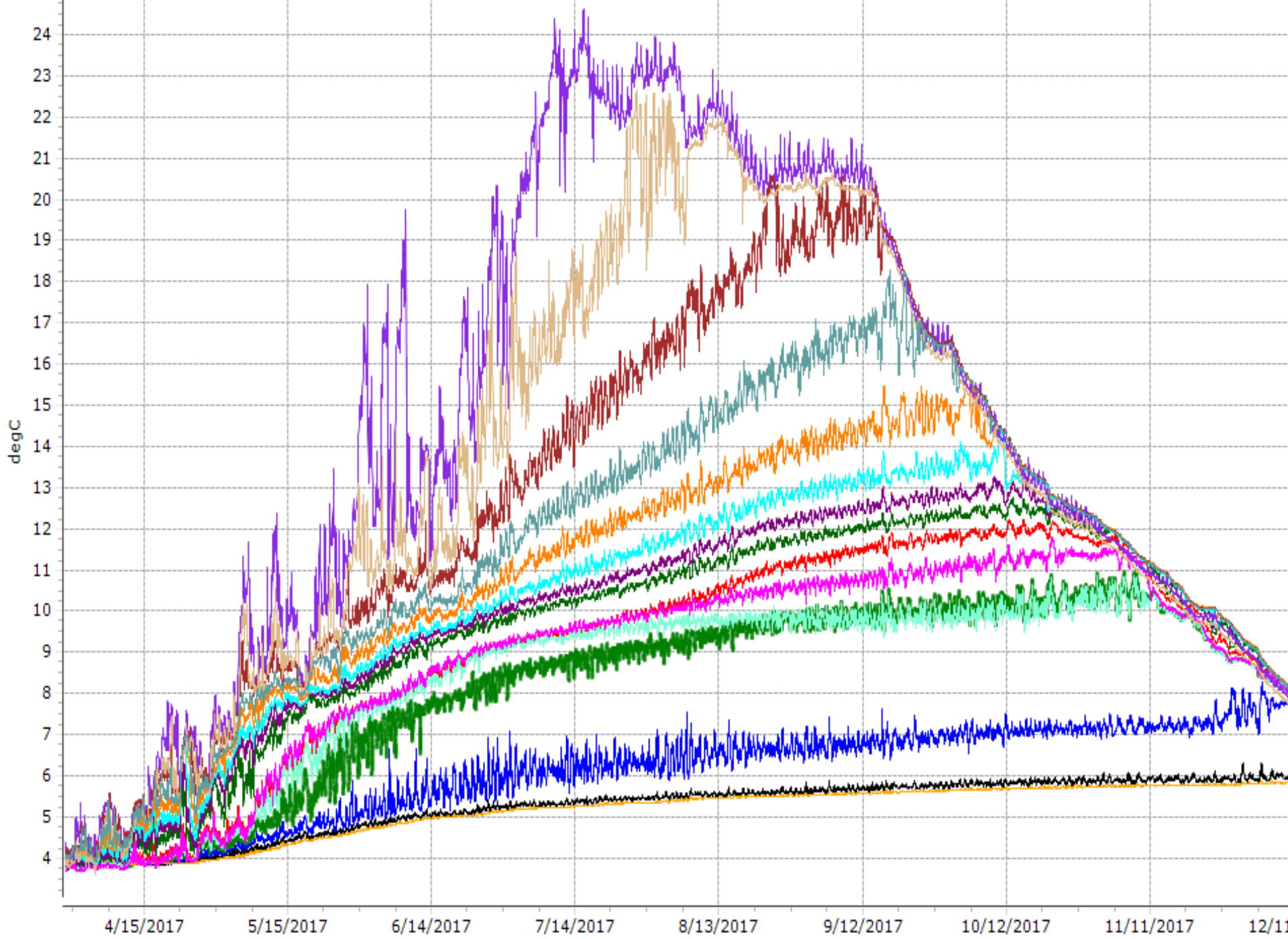
- Deployed with settling plates at surface and deepest plate up to 15 meters
- Used to help determine spawning timeframe

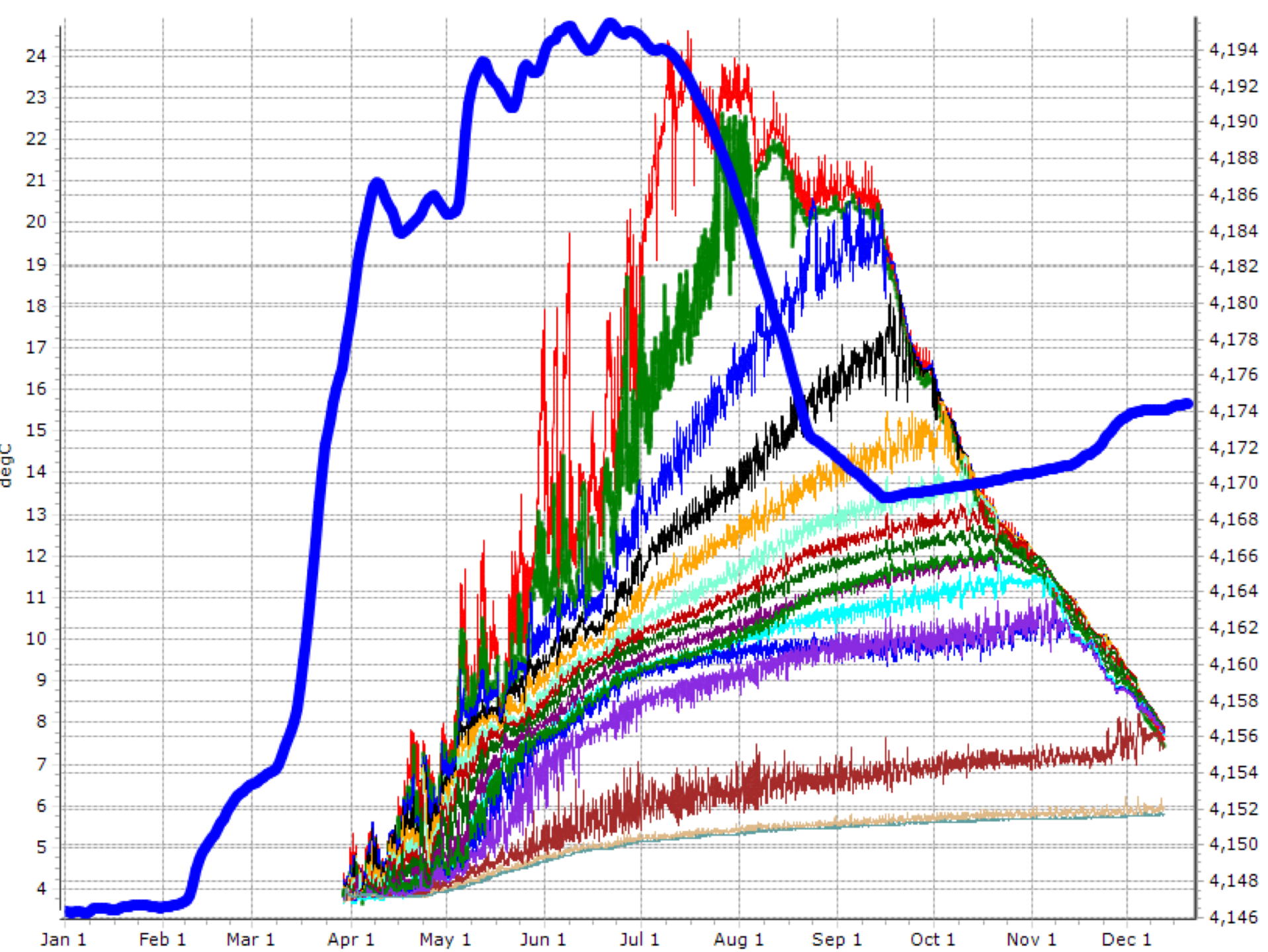


# Owyhee Reservoir 2018











# Dive Surveys



# Shoreline Surveys



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# eDNA

- **Interagency Agreement with USGS**
  - Sample at existing USGS gauging stations
  - Determine feasibility of adding eDNA to current work



# Other Activities

- Vulnerability Assessments
- Boat ramp mapping and managing partner identification
- Aided National Parks Service with additional testing on Roosevelt

