Washington Department of Fish and Wildlife

# Invasive Mussels: Risk, Prevention, and Response

Rody Seballos, Decontamination Biologist

February 29, 2024

Invasive Species & Exotic Pest Workshop

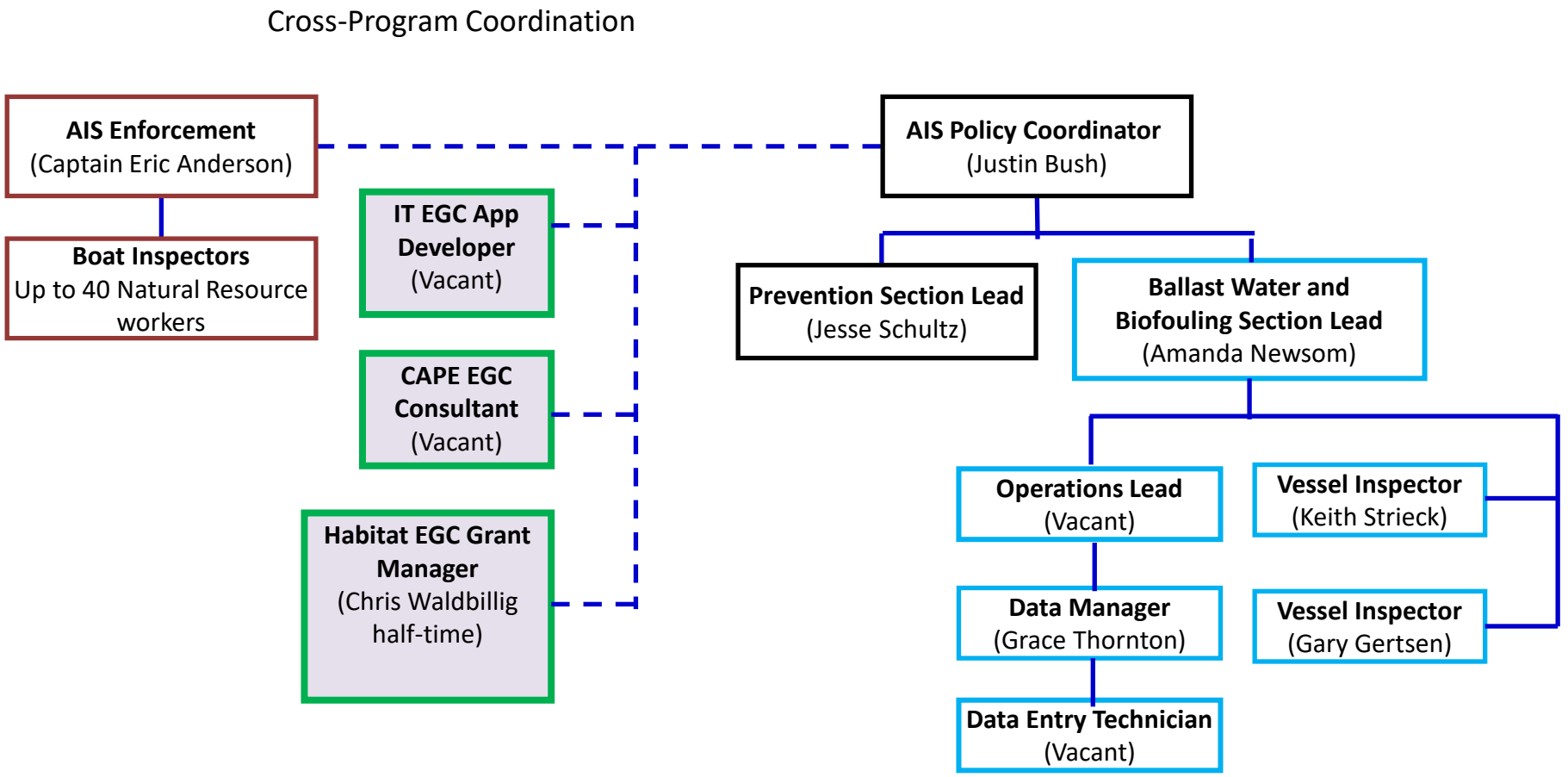
Washington Department of FISH and WILDLIFE

# Washington Department of Fish and Wildlife

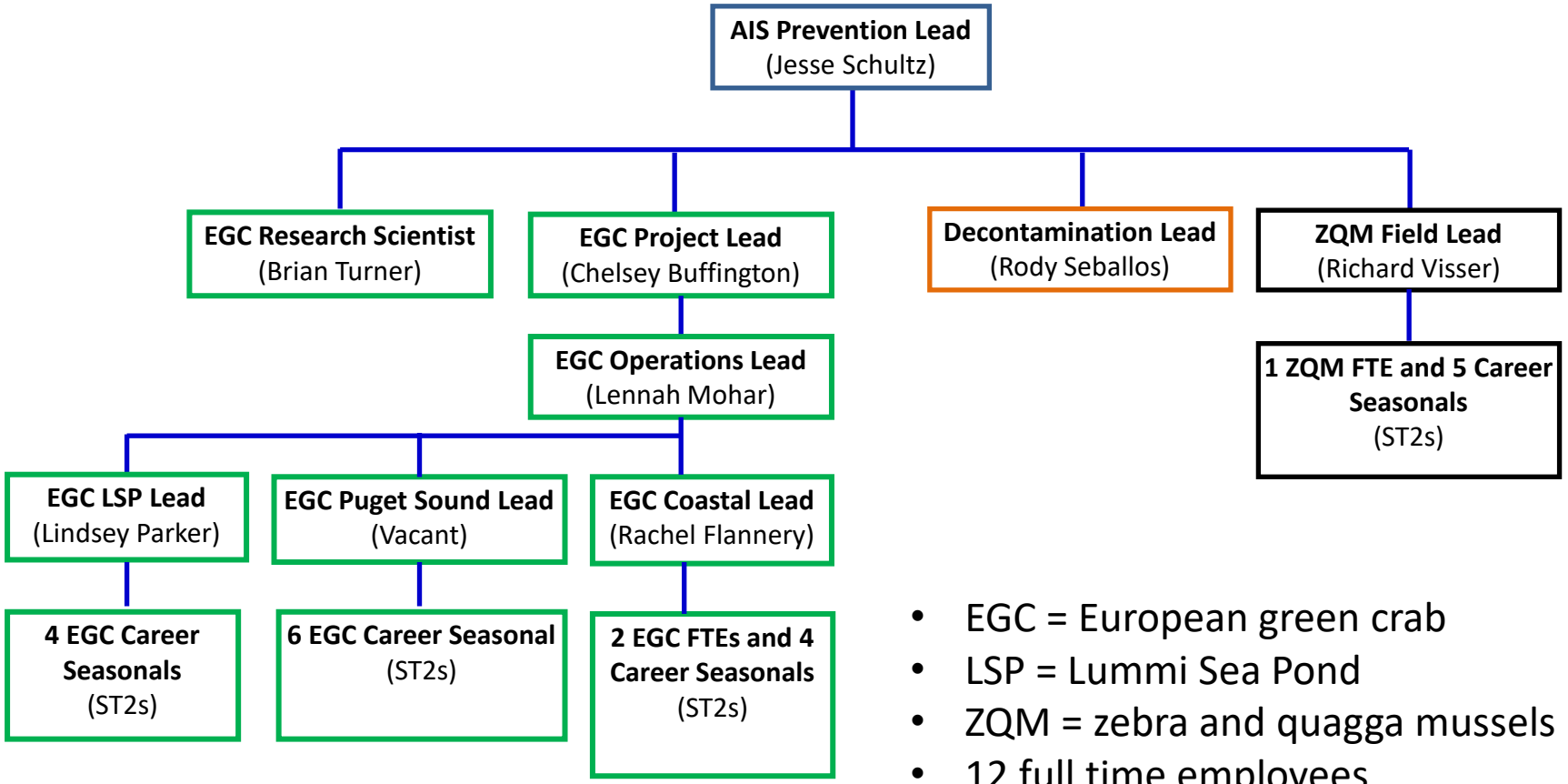
WDFW has over 2,000 full time employees (FTEs)

- Fish Program (most FTEs)
- Wildlife Program
- Habitat Program
- Enforcement Program
- Capital Asset and Management Program (CAMP)
- Directors Office
  - Communications and Public Engagement (CAPE)
  - Financial Services
  - Information Technology
  - Human Resources

# WDFW Aquatic Invasive Species



# Who is the Prevention Section




- EGC = European green crab
- LSP = Lummi Sea Pond
- ZQM = zebra and quagga mussels
- 12 full time employees
- 19 career seasonals

# What does the Prevention Section do

- European green crab project
- Zebra and quagga mussel early detection and monitoring project
- Northern Pike detection and monitoring
- Management and rapid response plans
- Decontamination certification project
- Aquatic invasive species hatchery inspections
- Permitting
  - Aquatic & Invasive Species Control General National Pollutant Discharge Elimination System and State Waste Discharge Permit
  - AIS permits
  - Finfish and shellfish stocking and transport permits

# WAC 220-640 and RCW 77.135.040 Prohibited and Regulated Species

## Regulated Species

- May not be introduced on or into a water body or property, without department authorization, a permit, or as otherwise provided by rule

Regulated Goldfish

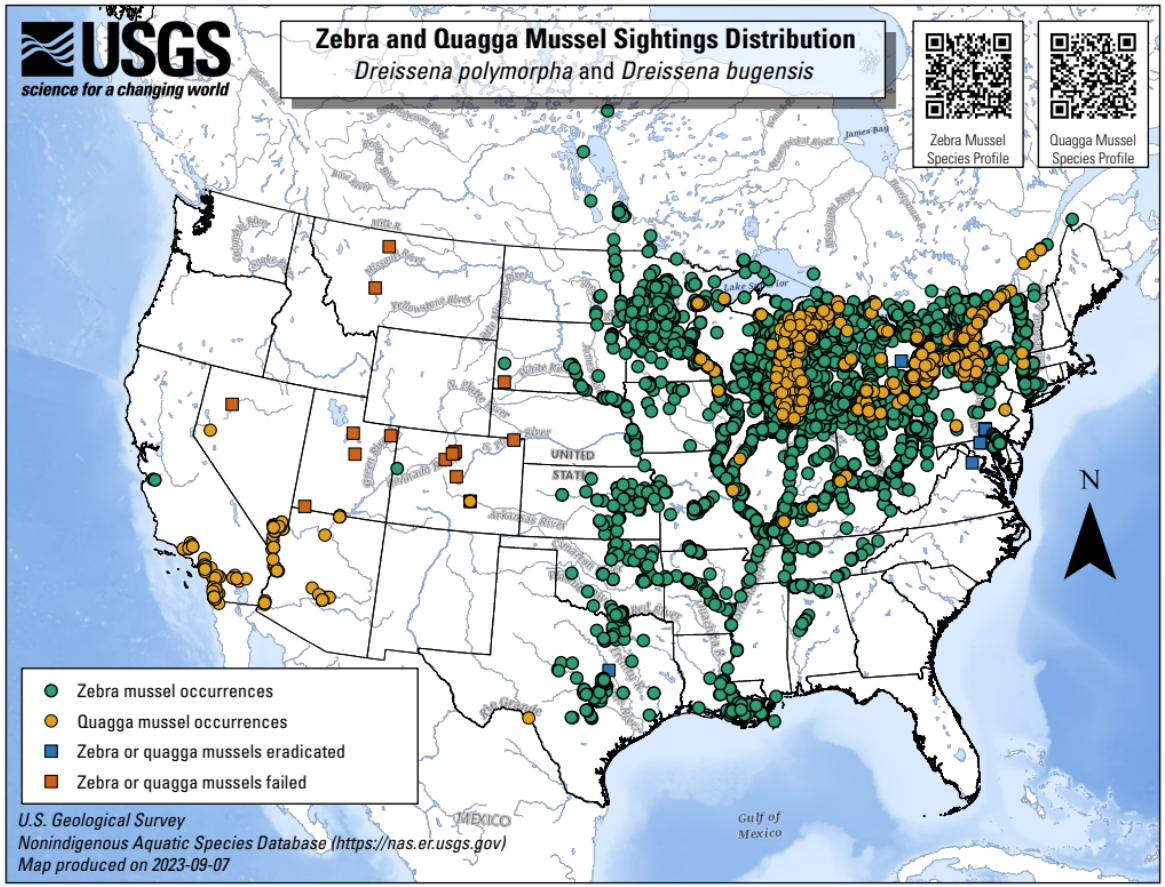
Photo Credit WDFW Randy Osborne

## Prohibited Species

- May not be possessed, introduced on or into a water body or property, or trafficked, without department authorization, a permit, or as otherwise provided by rule

Prohibited New Zealand Mudsnails

# Quagga and Zebra Mussels
# Prohibited Level 1 Invasive Species

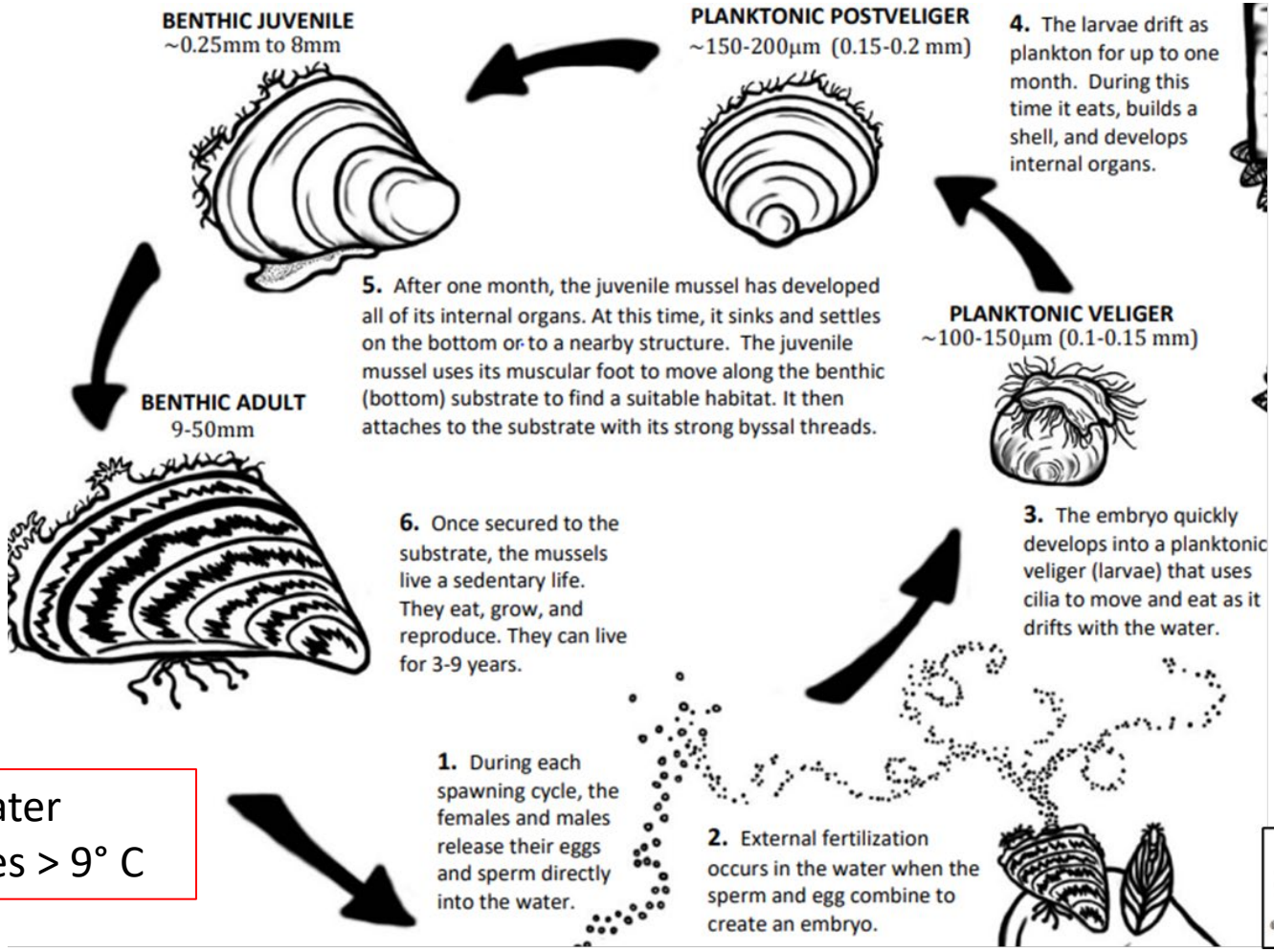



# Native Mussels = NO BYSSAL THREADS

**Native Mussels**

**Zebra and Quagga Mussels**

# Quagga Mussel Lifecycle




Spawn at water temperatures > 9° C

# Early Detection Zebra and Quagga Mussel Monitoring Program

(2-person team and a boat)

2024 May 1 – November 15

– Olympia (western)

– Spokane (eastern)

– Ephrata (central)

– Snake River (southeast)?

# Partners

| Partners | Water Body Common Name |
|---|---|
| Chelan County PUD | Lake Entiat |
| Chelan County Natural Resource Department | Lake Chelan |
| Confederated Tribes of the Colville Reservation | Lake Roosevelt, Rufus Woods Lake, and Kettle River |
| Douglas County PUD | Lake Pateros |
| Grant County PUD | Priest Rapids Lake and Wanapum Lake |
| Seattle City Light | Boundary Reservoir |
| Snohomish County PUD | Spada Lake |
| Spokane Tribe of Indians | Lake Roosevelt |
| U.S. Bureau of Reclamation | Lake Roosevelt |

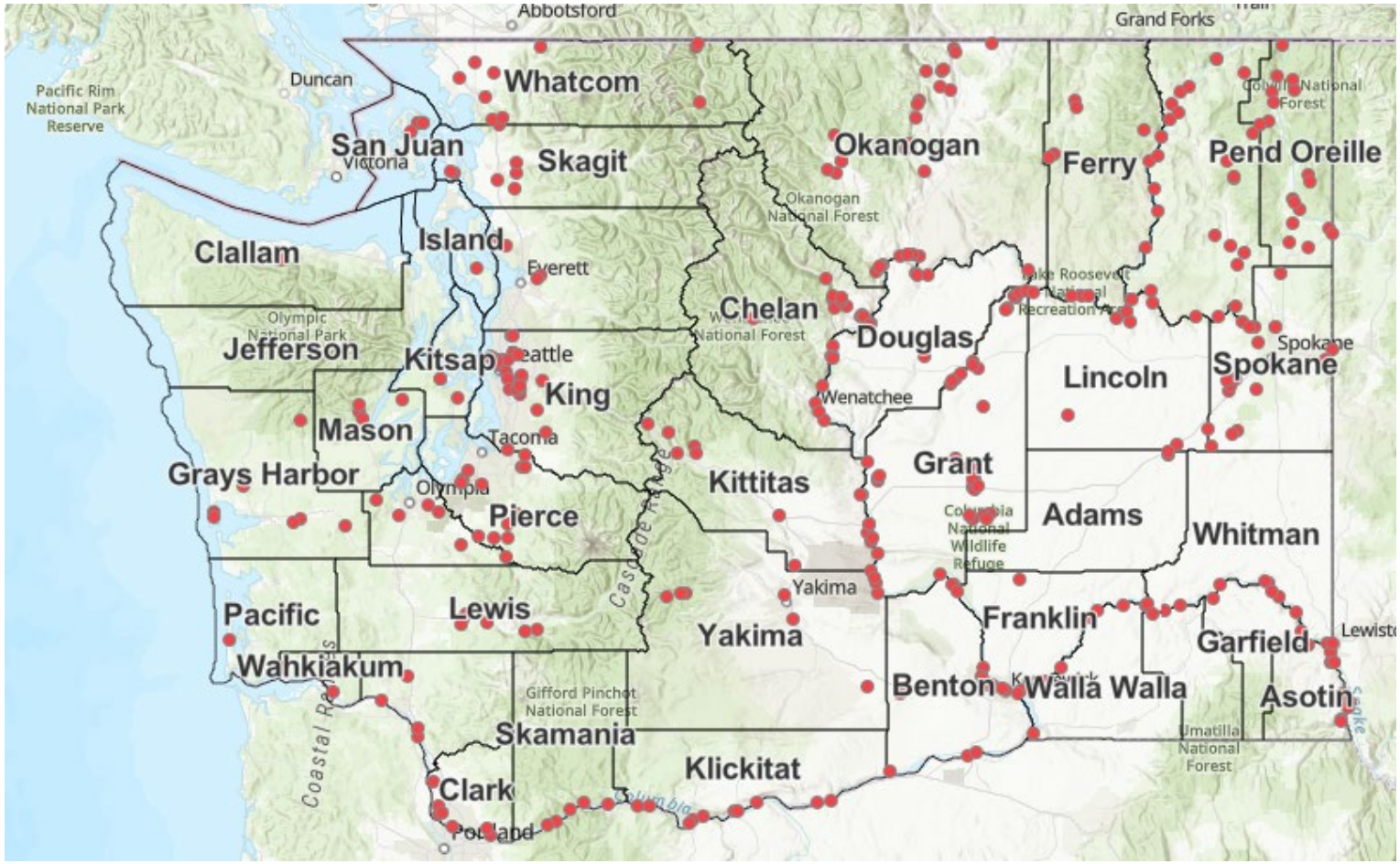
# Water Body Risk Assessment

## (added salinity for 2022)

| Scoring | 0 Point | 1 Point | 2 Point | 3 Point | 4 Point |
|---|---|---|---|---|---|
| **Establishment** | | | | | |
| Dissolved Calcium (mg/L) | 0-5 (no monitoring) | 6-11 | 12-15 | 16-24 | 25 or more |
| Salinity (ppt) | 10 or more (no monitoring) | | | | |
| **Introduction** | | | | | |
| Public | No (no monitoring) | | | | Yes |
| # Boat Ramps | 0 (no monitoring) | 1 | 2 | 3 | 4 or more |
| Boat Ramp Paved | No | | | | Yes |
| Boat Ramp w/Dock | No | Yes | | | |
| Motorized Watercraft Allowed | No | | | | Yes |
| Speed Limit > 10mph | No | | | | Yes |
| Moorage | No | | | | Yes |
| Private Docks | No | | | | Yes |
| Access Year Around | No | Yes | | | |
| Ease of Access | | Foot | Ferry | Gravel road | Paved road |
| In Columbia River Basin | No | Yes | | | |
| Water Body Size | | 0-10 | 11-49 | 50-99 | 100 or more |
| Fish Stocked | No | Yes | | | |
| Hatchery/Net Pens | No | | | | Yes |
| Fishing Tournaments | No | 1-2 | 3-4 | 5-6 | 7 or more |
| Motorized Watersports Tournaments | No | | | | 1 or more |
| Boatyard | No | | | | Yes |
| Hydropower/Flood Control | No | | | | Yes |
| Irrigation | No | | | | Yes |
| Municipal Water | No | | | | Yes |
| Proximity to Source Population | | No drainages west of continental divide | West of continental divide | Nearby, but may not be as easily assessable | Downstream, connected, or within easy drive |
| **Monitoring Frequency** | | | | | |
| 0 | 1-20 | 21-34 | 35-39 | 40-49 | 50 or more |
| No monitoring | Once every 3 years | Once every 2 years | Once a year | Twice a year | Three a year |

# Early Detection Zebra and Quagga Mussel Monitoring

(124 water bodies and 304 sites)



# Sampling Methods

(field season May-November)

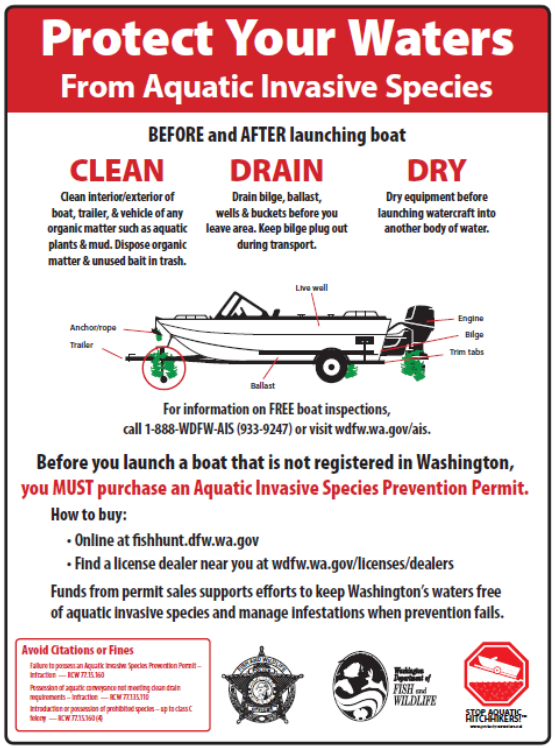
## High-Risk Sites

- Horizontal and vertical plankton net tows
- Artificial substrates/collection plates
- Visual and tactile shoreline
- Water quality
- Dissolved calcium
- Environmental DNA (eDNA)
  - Sites visited 3x per year only
- Petite Ponar grab sampler
- AIS signage installed

## Low-Risk Sites

- Visual and tactile shoreline
- Water quality
- Dissolved calcium
- AIS signage installed
- Other sample methods if site allows

# AIS Signage

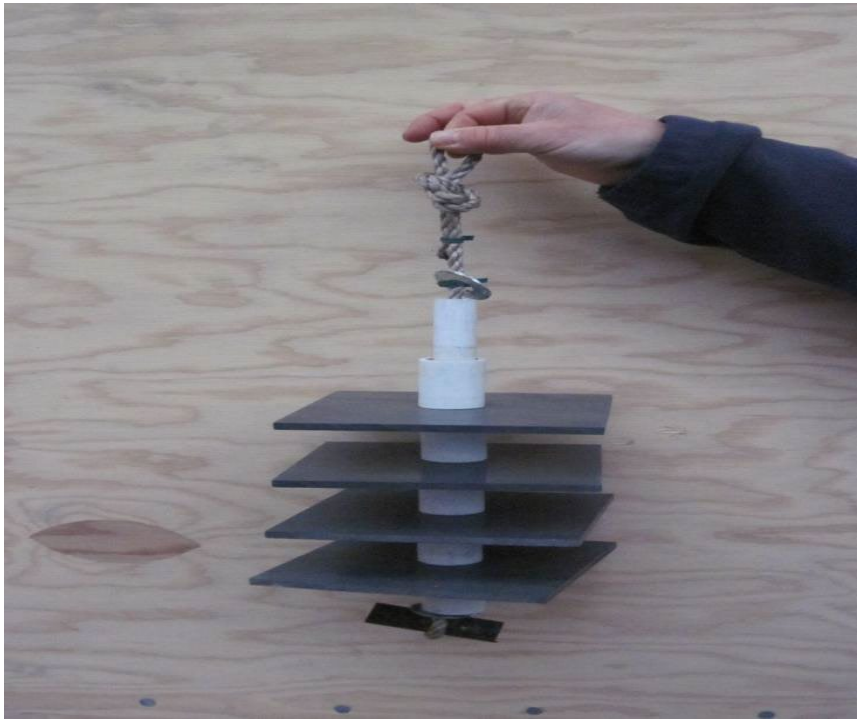


- Each sign installed at site
- Signs are not installed without property manager's permission

# Horizontal and Vertical Plankton Net Tows


- Water temperatures > than 9° C (spawning)
- Juveniles and veligers
- Horizontal and vertical tows for 1 composite sample per site visit
- Analysis by private consultants - Cameron Lange and Steve Wells

# Artificial Substrates/Collection Plates

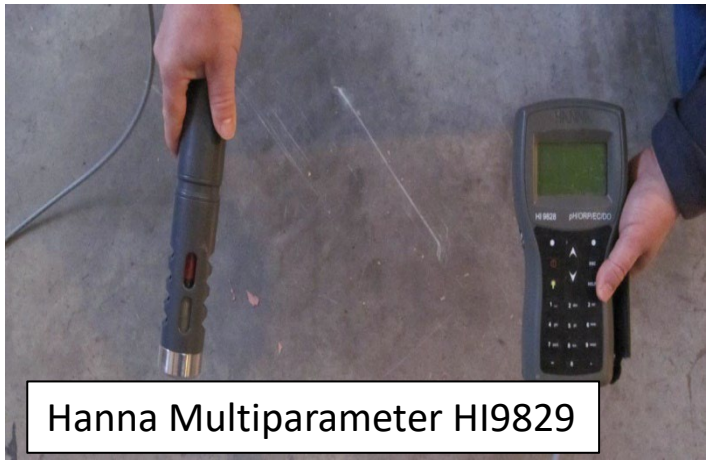


- Left in water year around
- Post-settled juveniles and adults
- 1 per site
- Analysis conducted by staff in the field unless possible AIS taken to lab

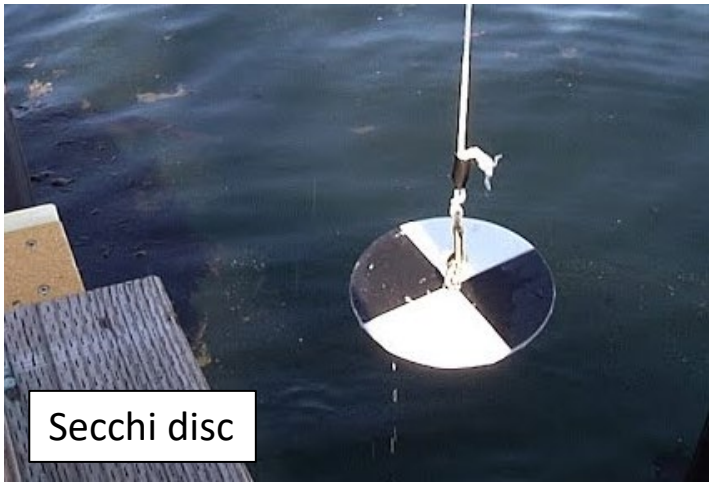
# Visual and Tactile Shoreline


- Post-settled juveniles and adults
- Standardized by time – 10 minutes
- Analysis conducted by staff in the field unless possible AIS taken to lab

# Water Quality



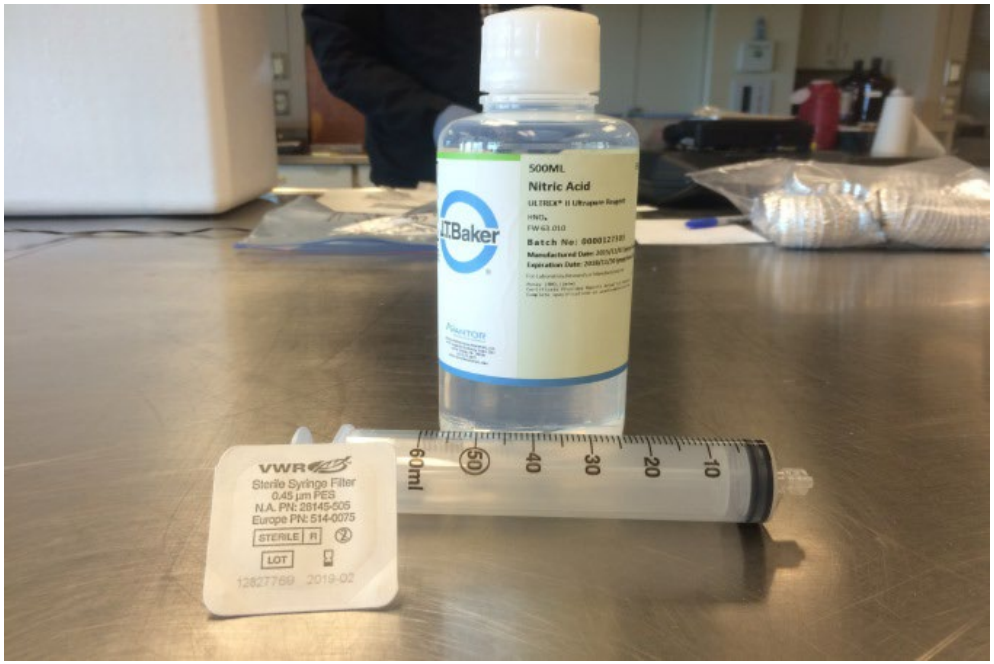
Hanna Multiparameter HI9829



Secchi disc

- Salinity
- pH
- Temperature
- Visibility

# Water Quality - Dissolved Calcium




- 1 sample per site visit
- "Highest" dissolved calcium measurements are generally during the summer and "lowest" during spring
- Analysis by Dr. Carmen Nezat - Eastern Washington University

# eDNA

- Started in 2017 for zebra/quagga mussels only
- 2018 - added New Zealand mudsnails (NZMS)
- 2019 - for zebra/quagga mussels, NZMS, and Northern Pike
- 1 sample per site visit (sites with 3 visits per year only)
  - 3 samples conducted at the site per year
- Smith Root Inc. eDNA backpack filter
- Analysis conducted by WDFW Genetics Lab

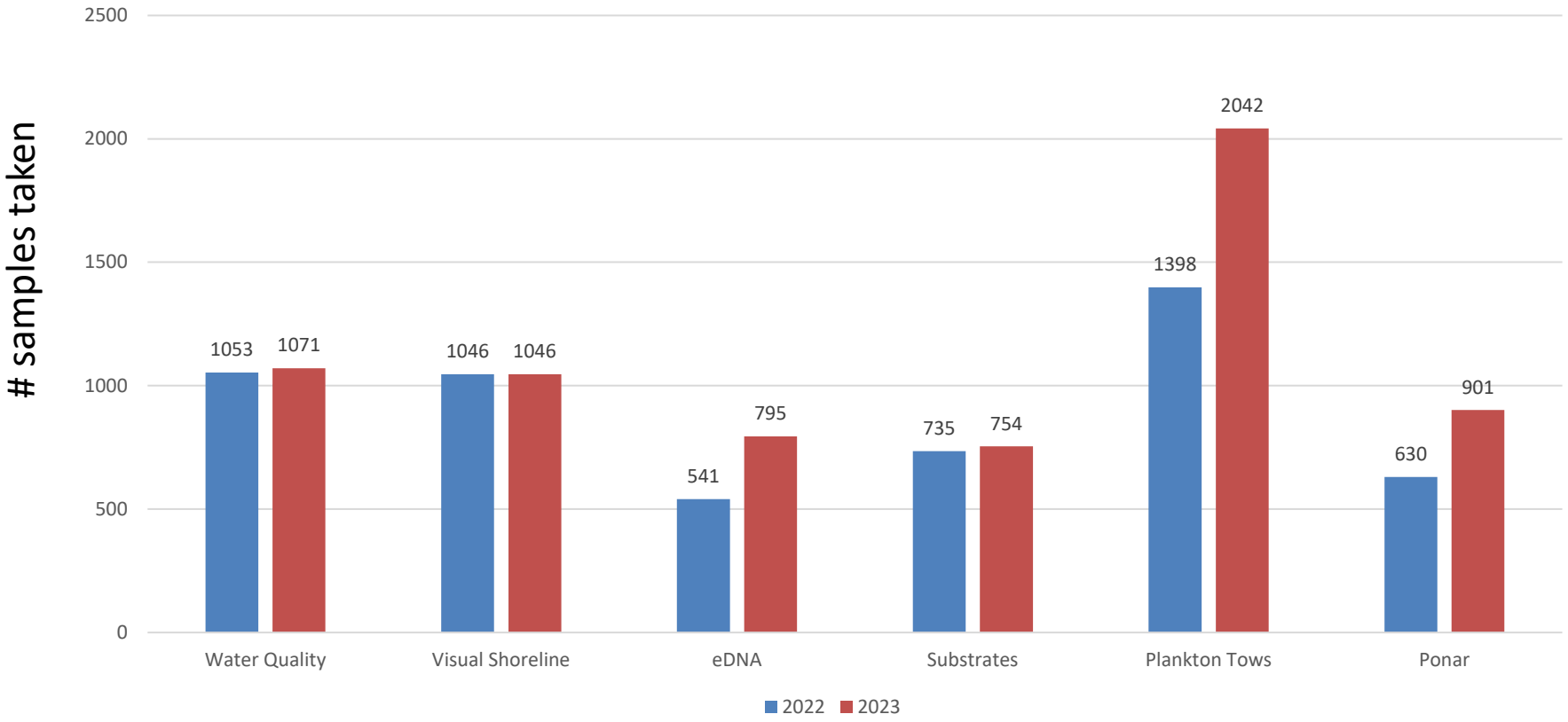
# Petite Ponar Grab Sampler


- Post-settled juveniles and adults
- 1 sample per site visit
- Analysis conducted by staff in the field unless possible AIS taken to lab

# Labs

- Plankton tow samples
  - Steve Wells, Aquaticus LLC
  - Cameron Lange, Consultant
  - **Procuring third lab for 2024**
- eDNA samples
  - Lisa Crosson, PhD, WDFW Molecular Genetics Lab
  - Secondary confirmation Washington State University
- Dissolved calcium
  - Carmen Nezat, PhD, Eastern Washington University

# 2022 Results and 2023 Results (NO zebra/quagga mussels detected)




- Over 5,000 dissolved calcium samples since 2016
- 2024 reduce dissolved calcium samples

# Idaho Detection Overview

- Idaho State Department of Agriculture (ISDA) conducted routine early detection zebra and quagga mussel monitoring
  - Plankton tows
  - In the Snake River at Centennial Waterfront Park, Twin Falls, Idaho

- Steve Wells of Aquaticus, LLC in Florida analyzed the plankton samples using cross-polarized light microscopy
  - Detected quagga mussel veligers
  - Immediately notified ISDA
  - WDFW also uses Steve Wells and another lab

# Idaho Detection Overview

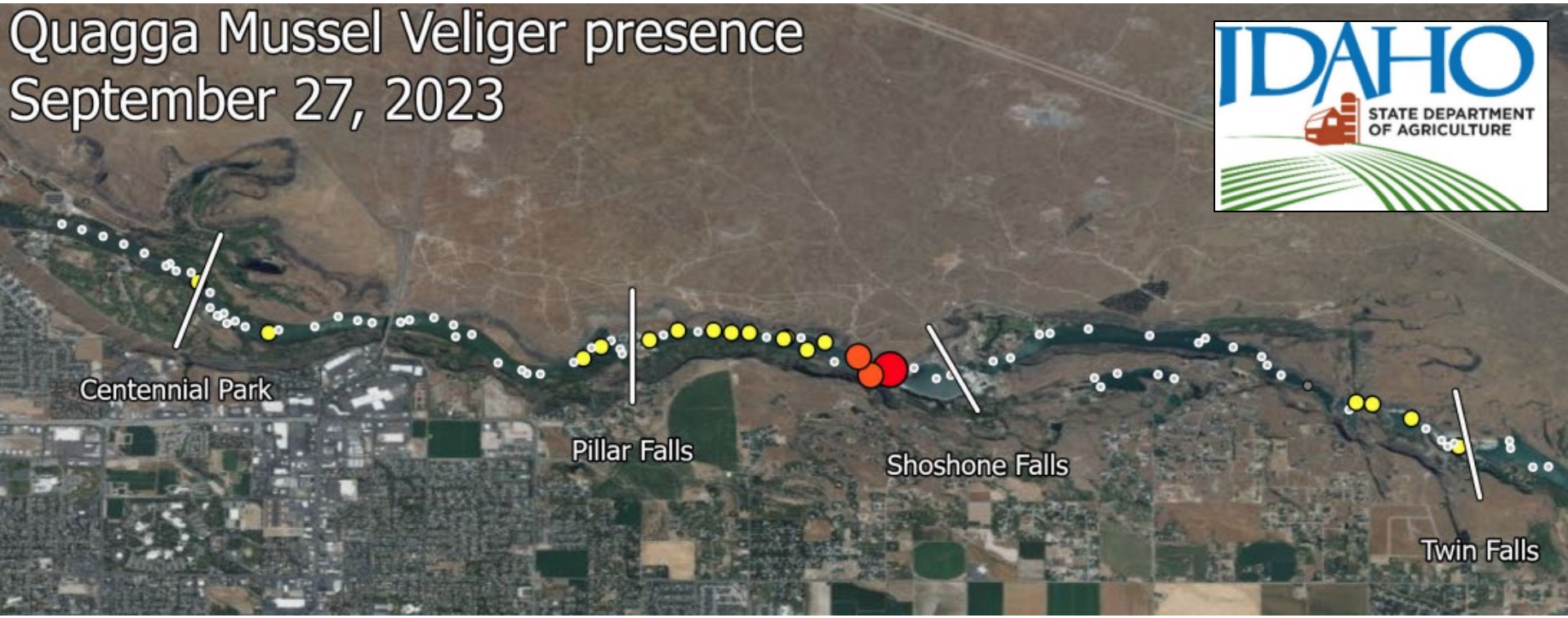
- ISDA conducted rapid response monitoring at Centennial Waterfront Park area and samples sent to another lab for confirmation
- Adult quagga mussels detected using SCUBA
- September 18, 2023 the State of Idaho announced the presence of quagga mussels

# Rapid Response Plans Activated

- ISDA initiated their zebra and quagga mussel rapid response plan that includes:
  - Notifying impacted entities
  - Implementing containment measures
  - Conducting distribution surveys
  - Evaluating for potential treatment options

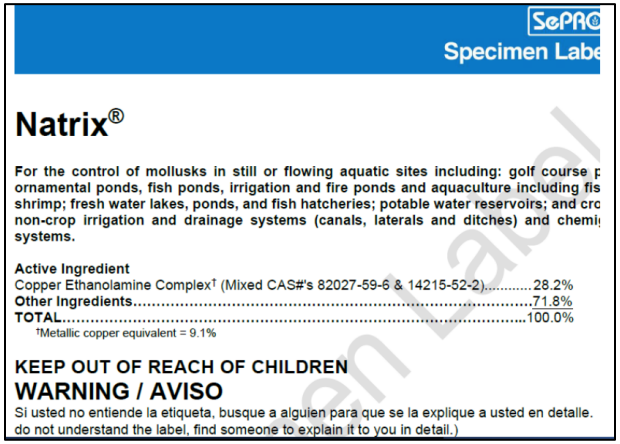
- The 100th Meridian Initiative Columbia River Basin Team
  - Coordinated by the Pacific States Marine Fisheries Commission
  - Mobilized a regional Multi-Agency Coordination Group (MAC Group)
  - Activated a regional response plan:
    - Columbia River Basin Interagency Invasive Species Response Plan: Dreissenid Species

# Distribution Surveys



# Treatment Overview

- Treatment area 16 miles
- 1st treatment started October 3, 2023 using chelated copper at 1 ppm for a contact time of 96 hours
- 2nd treatment conducted October 9, 2023 using chelated copper at 1 ppm for a contact time of 96 hours
- Link to ISDA treatment presentation [Snake River Quagga Mussel (idaho.gov)]


SePRO
Specimen Labe

**Natrix®**

For the control of mollusks in still or flowing aquatic sites including: golf course p ornamental ponds, fish ponds, irrigation and fire ponds and aquaculture including fis shrimp; fresh water lakes, ponds, and fish hatcheries; potable water reservoirs; and cro non-crop irrigation and drainage systems (canals, laterals and ditches) and chemi systems.

**Active Ingredient**

| | |
|---|---|
| Copper Ethanolamine Complex[1] (Mixed CAS#'s 82027-59-6 & 14215-52-2) | 28.2% |
| **Other Ingredients** | 71.8% |
| **TOTAL** | 100.0% |

[1]Metallic copper equivalent = 9.1%

**KEEP OUT OF REACH OF CHILDREN**

**WARNING / AVISO**

Si usted no entiende la etiqueta, busque a alguien para que se la explique a usted en detalle. do not understand the label, find someone to explain it to you in detail.)

# Treatment Application


# Post Treatment Monitoring

- Copper levels are at pretreatment levels
- ISDA conducted plankton tows October 17, 2023 and detected NO quagga mussel veligers
- ISDA conducted plankton tows October 31, 2023 and detected few quagga mussel veligers in poor condition due to the treatment
- Water temperatures are now too cold for spawning
- Now in a waiting game. Monitoring resumes when water increases to spawning temperature.

# Observed Treatment October 3-4, 2023
# A True Rapid Response

Quagga mussel presence announced= Sept. 18th, 2023



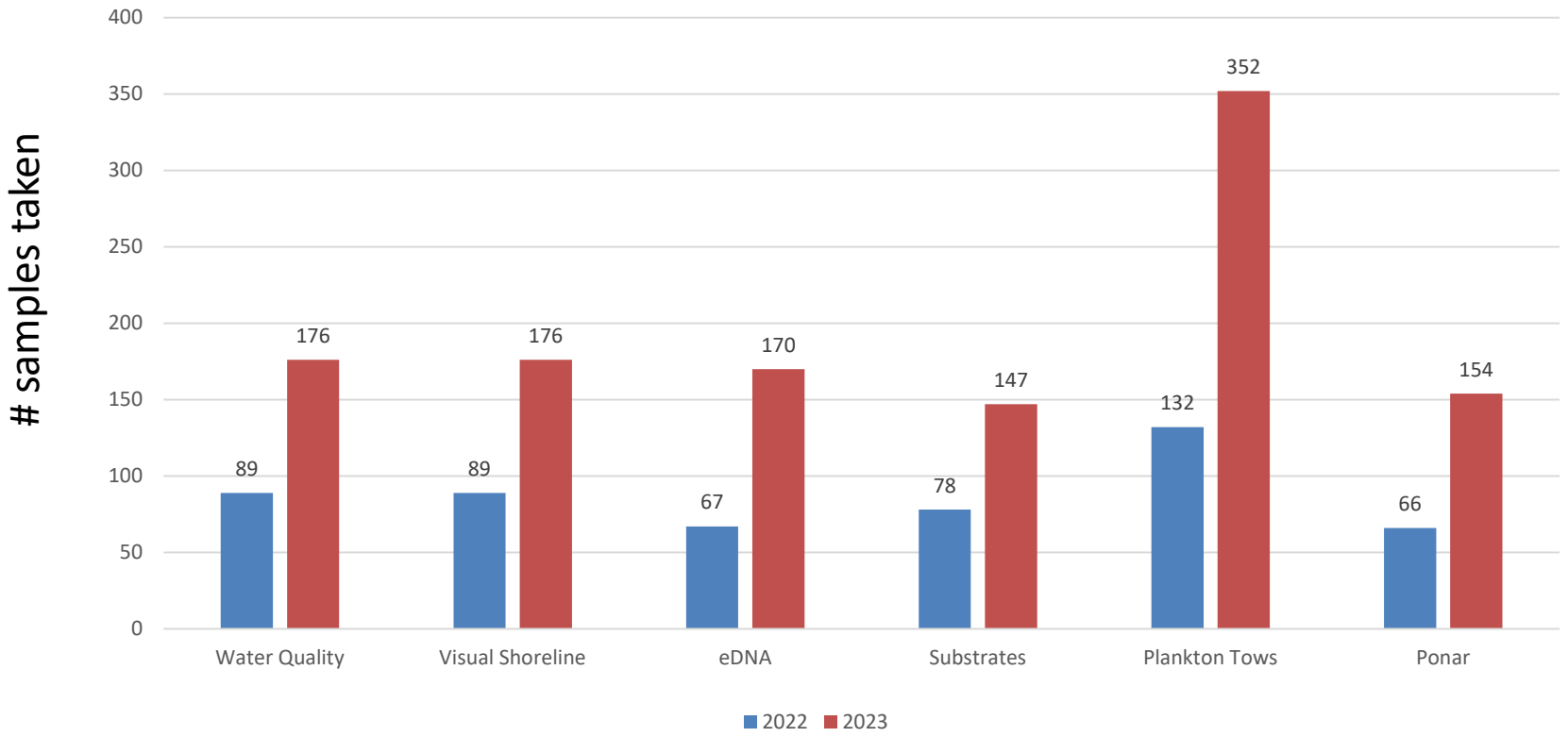
# It Takes a Team

## Collaborative Treatment Plan

- Governor's Office
- Idaho Department of Fish and Game
- Idaho Office of Species Conservation
- Idaho Department of Environmental Quality
- Idaho Department of Water Resources
- Idaho Department of Parks and Recreation
- Idaho Department of Lands
- Idaho Power
- Canal companies
- Idaho Water Users Association
- U.S. Environmental Protection Agency
- U.S. Fish and Wildlife Service
- U.S. Geological Survey
- U.S. Army Corps of Engineers
- U.S. Bureau of Land Management
- U.S. Bureau of Reclamation

# Invasive Fish Mortality

# 2022 Results and 2023 Results - Snake River (NO zebra/quagga mussels detected)




- 403 dissolved calcium samples 2016-2022 average is 19 mg/L

# Snake River Monitoring Sites


- 23 sites prior to Idaho detection
- Added 8 sites from Swallows Park in Clarkston to WA, OR, ID border
- Total of 31 sites

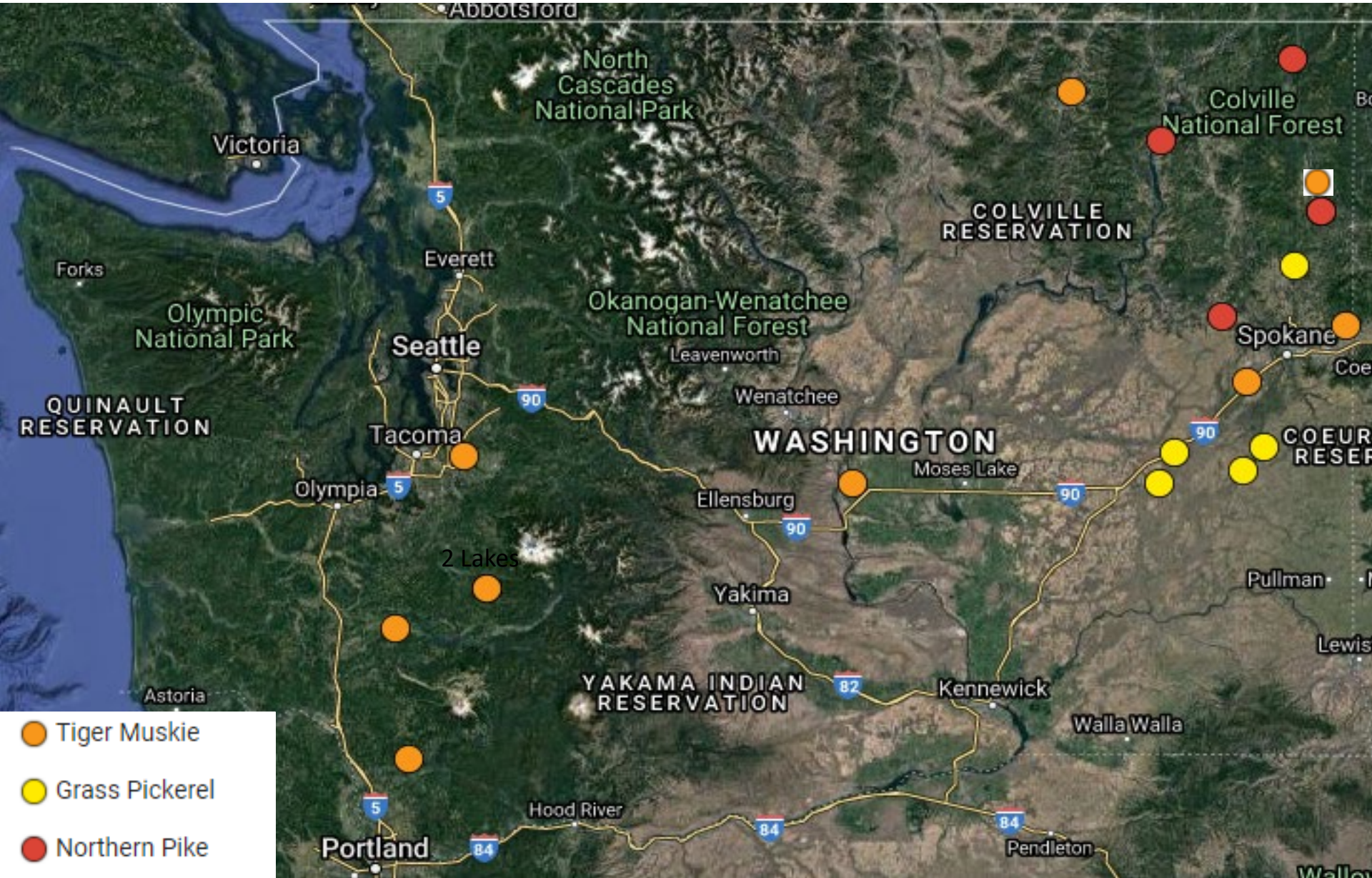
# Northern Pike

Classification: Prohibited

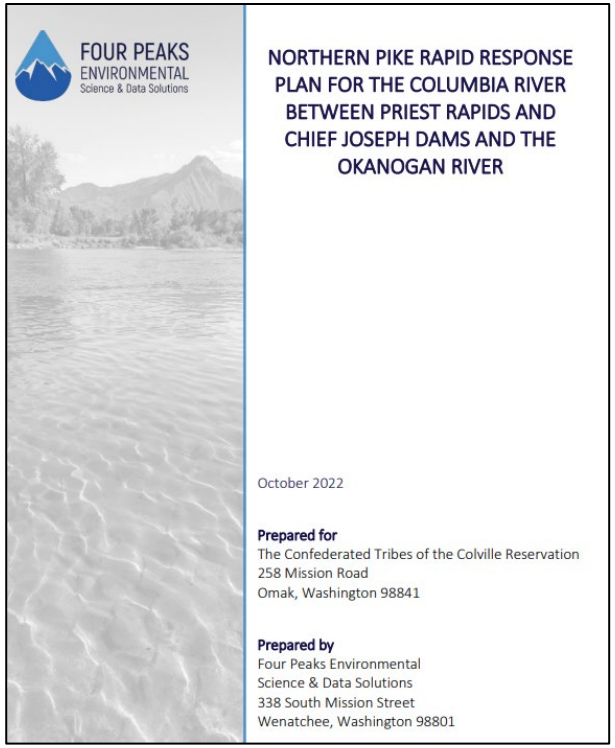
Status: Established in four water bodies in Washington

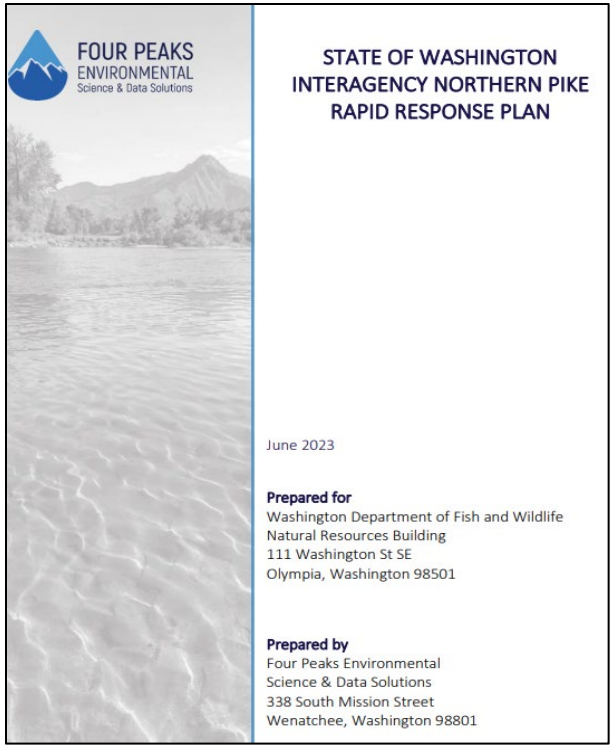


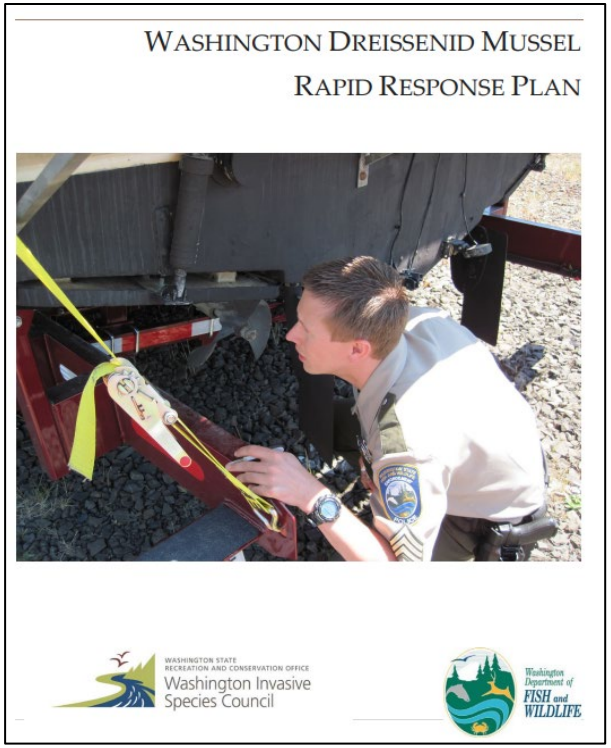
# Northern Pike, Tiger Muskie, and Grass Pickerel



# Management and Rapid Response Plans




- Water body classifications
- Detection verifications
- Notification of detections
- What actions to take

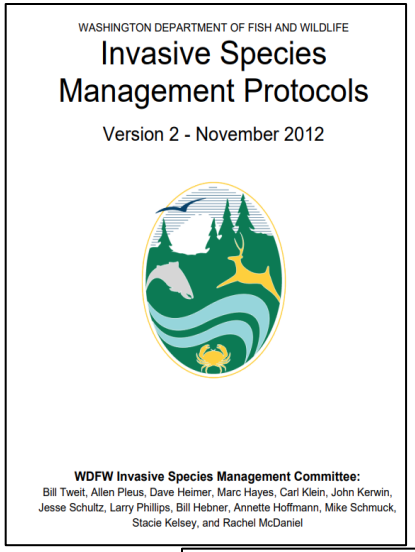
# Invasive Species Management Protocols (ISMP)

– Version 1 July 2011

– Version 2 November 2012

– Draft Version 3 February 2016

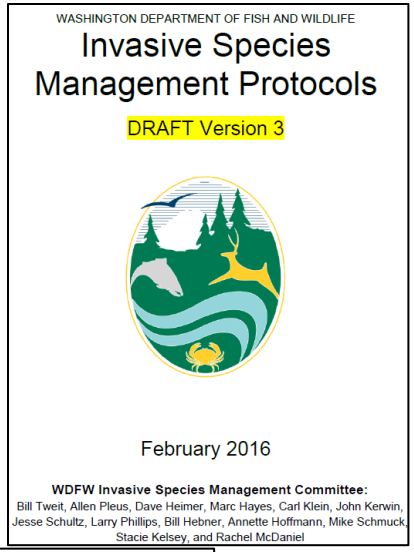
– Version 4 September 2022


WASHINGTON DEPARTMENT OF FISH AND WILDLIFE

Invasive Species Management Protocols

Version 2 - November 2012

**WDFW Invasive Species Management Committee:**
Bill Tweit, Allen Pleus, Dave Heimer, Marc Hayes, Carl Klein, John Kerwin, Jesse Schultz, Larry Phillips, Bill Hebner, Annette Hoffmann, Mike Schmuck, Stacie Kelsey, and Rachel McDaniel


WASHINGTON DEPARTMENT OF FISH AND WILDLIFE

Invasive Species Management Protocols

DRAFT Version 3

February 2016

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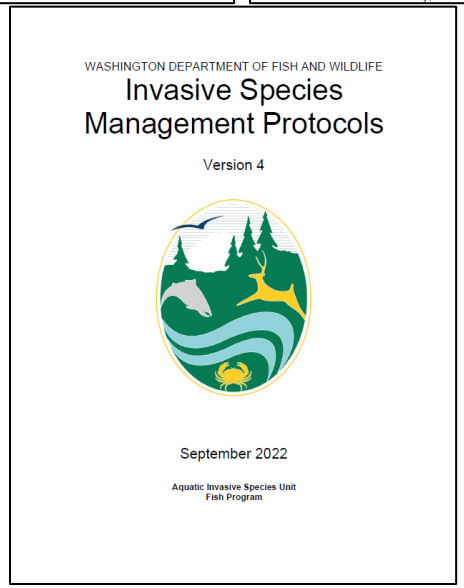

WASHINGTON DEPARTMENT OF FISH AND WILDLIFE

Invasive Species Management Protocols

Version 4

September 2022

Aquatic Invasive Species Unit
Fish Program

# Develop and Implement ISMP Certification Program

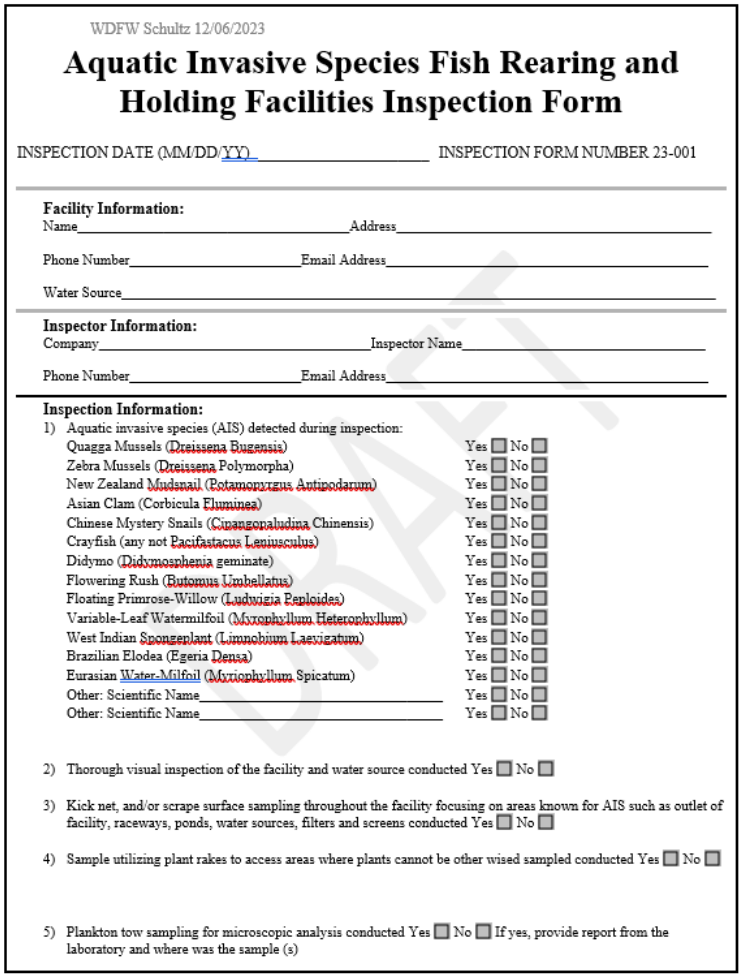
Goal: Certify all WDFW staff needing the training

- Online and in-person trainings
- General AIS information
- Overview of ISMP
- Make the training available to anyone who wants it once WDFW staff are certified

# Develop and Implement Hatchery AIS Inspections

- Develop inspection protocols based on best management practices by the Western Invasive Species Coordination Effort and in coordination with WDFW Hatchery staff

- Inspect WDFW's 70+ hatcheries



WDFW Schultz 12/06/2023

**Aquatic Invasive Species Fish Rearing and Holding Facilities Inspection Form**

INSPECTION DATE (MM/DD/YY)_____ INSPECTION FORM NUMBER 23-001

**Facility Information:**
Name_____Address_____

Phone Number_____Email Address_____

Water Source_____

**Inspector Information:**
Company_____Inspector Name_____

Phone Number_____Email Address_____

**Inspection Information:**

1) Aquatic invasive species (AIS) detected during inspection:

| | |
|---|---|
| Quagga Mussels (Dreissena Bugensis) | Yes ☐ No ☐ |
| Zebra Mussels (Dreissena Polymorpha) | Yes ☐ No ☐ |
| New Zealand Mudsnail (Potamopyrgus Antipodarum) | Yes ☐ No ☐ |
| Asian Clam (Corbicula Fluminea) | Yes ☐ No ☐ |
| Chinese Mystery Snails (Cipangopaludina Chinensis) | Yes ☐ No ☐ |
| Crayfish (any not Pacifastacus Leniusculus) | Yes ☐ No ☐ |
| Didymo (Didymosphenia geminate) | Yes ☐ No ☐ |
| Flowering Rush (Butomus Umbellatus) | Yes ☐ No ☐ |
| Floating Primrose-Willow (Ludwigia Peploides) | Yes ☐ No ☐ |
| Variable-Leaf Watermilfoil (Myrophyllum Heterophyllum) | Yes ☐ No ☐ |
| West Indian Spongeplant (Limnobium Laevigatum) | Yes ☐ No ☐ |
| Brazilian Elodea (Egeria Densa) | Yes ☐ No ☐ |
| Eurasian Water-Milfoil (Myriophyllum Spicatum) | Yes ☐ No ☐ |
| Other: Scientific Name_____ | Yes ☐ No ☐ |
| Other: Scientific Name_____ | Yes ☐ No ☐ |

2) Thorough visual inspection of the facility and water source conducted Yes ☐ No ☐

3) Kick net, and/or scrape surface sampling throughout the facility focusing on areas known for AIS such as outlet of facility, raceways, ponds, water sources, filters and screens conducted Yes ☐ No ☐

4) Sample utilizing plant rakes to access areas where plants cannot be other wised sampled conducted Yes ☐ No ☐

5) Plankton tow sampling for microscopic analysis conducted Yes ☐ No ☐ If yes, provide report from the laboratory and where was the sample (s)

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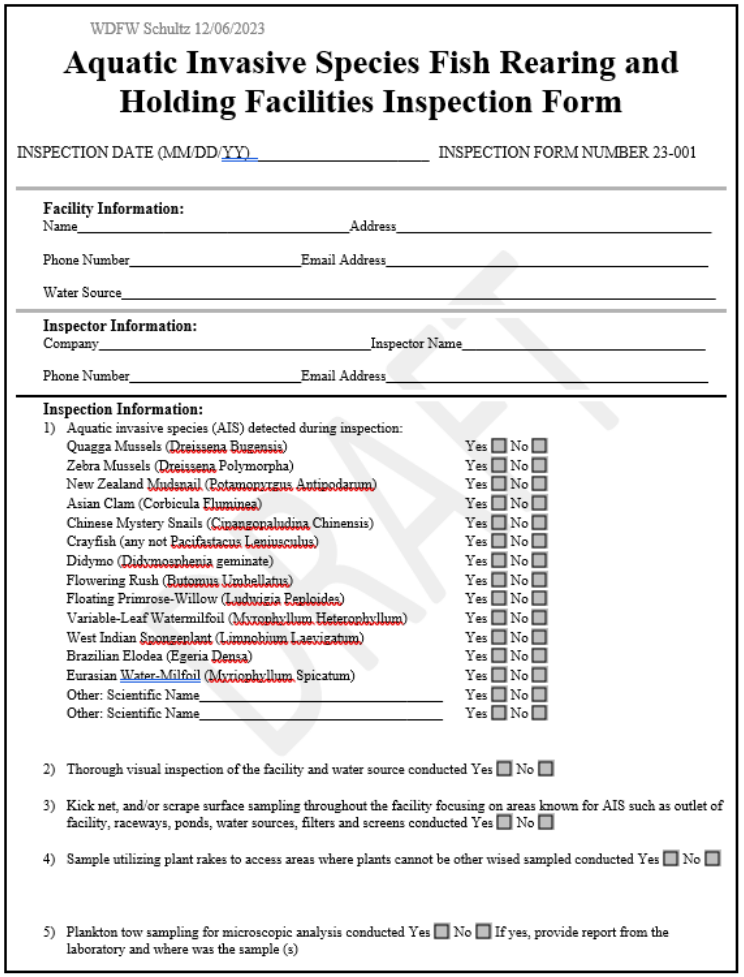
# Rody's First Task

- Develop finfish transport permit process relating to AIS

- Mitigate risk of AIS (i.e. quagga/zebra mussels) entering WA via aquaculture and transport



WDFW Schultz 12/06/2023

**Aquatic Invasive Species Fish Rearing and Holding Facilities Inspection Form**

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Water Source_____

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DRAFT

# Questions?


Jesse Schultz 360-480-2105
Jesse.Schultz@dfw.wa.gov
Aquatic Invasive Species Unit

Rody Seballos 360-584-4501
Rody.Seballos@dfw.wa.gov
Aquatic Invasive Species Unit