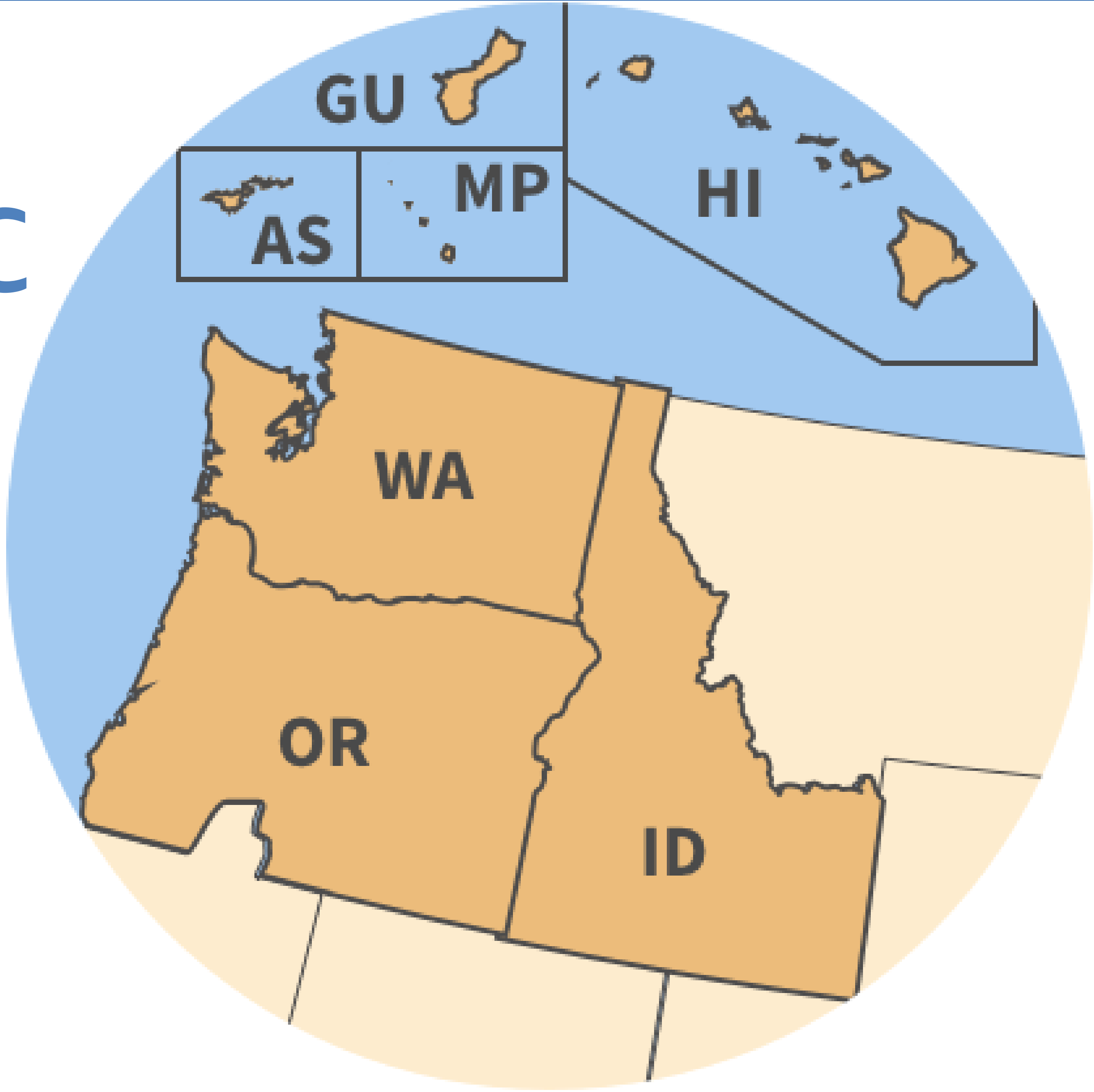
FISH AND AQUATIC CONSERVATION

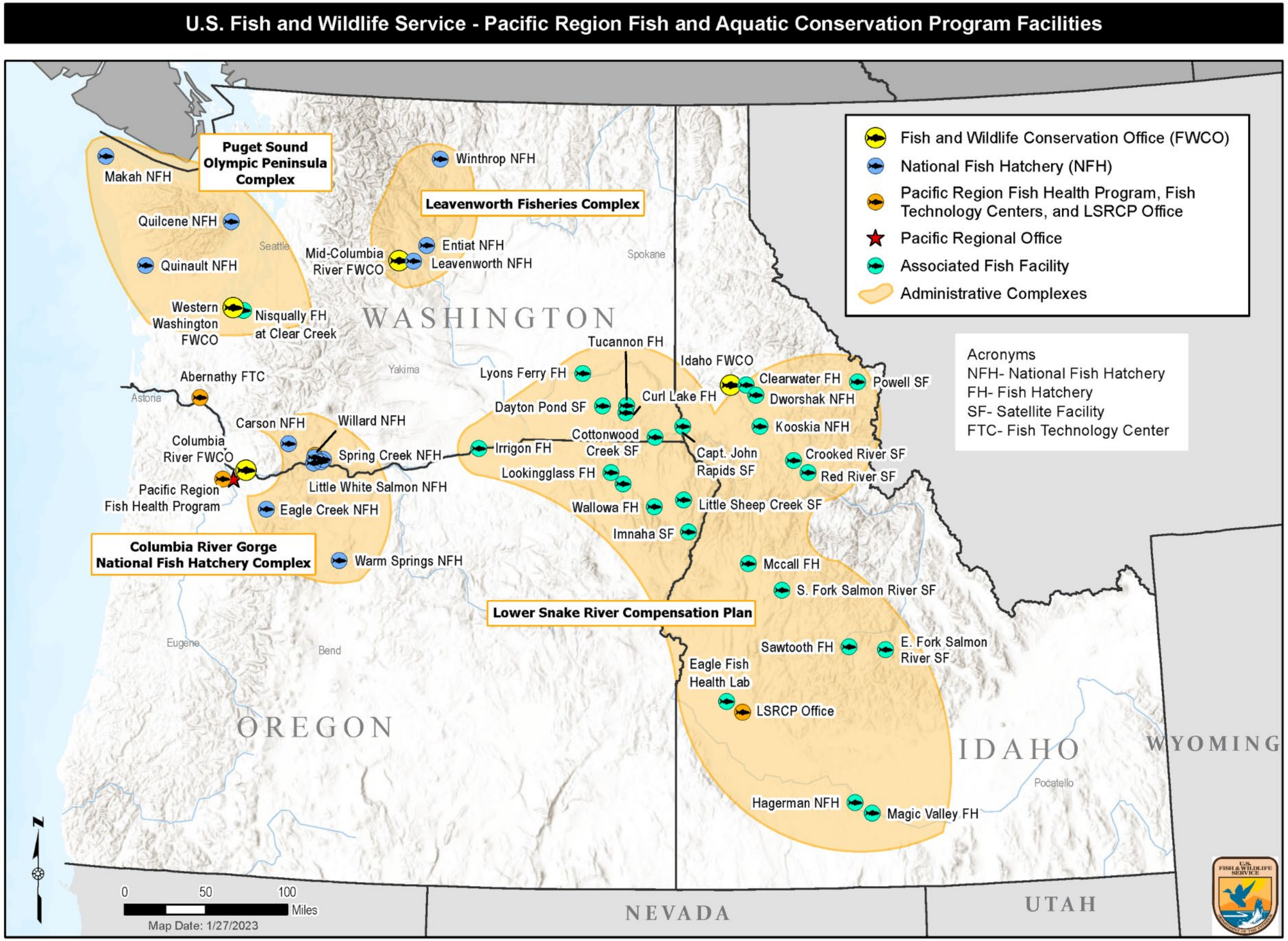
PACIFIC REGION AQUATIC INVASIVE SPECIES PROGRAM

Columbia River Basin
Coordination Meeting
June 2024

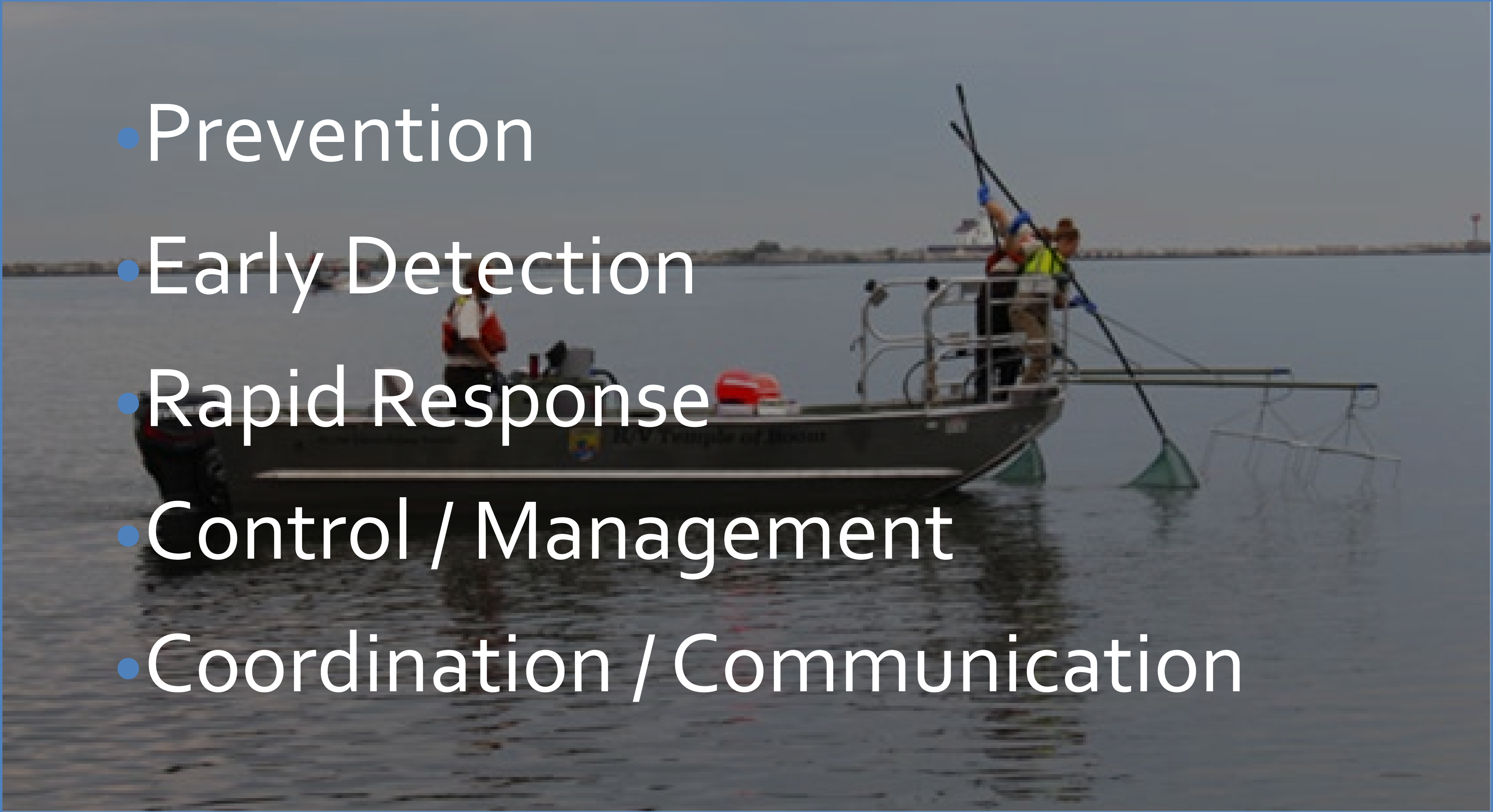
Geographic Scope



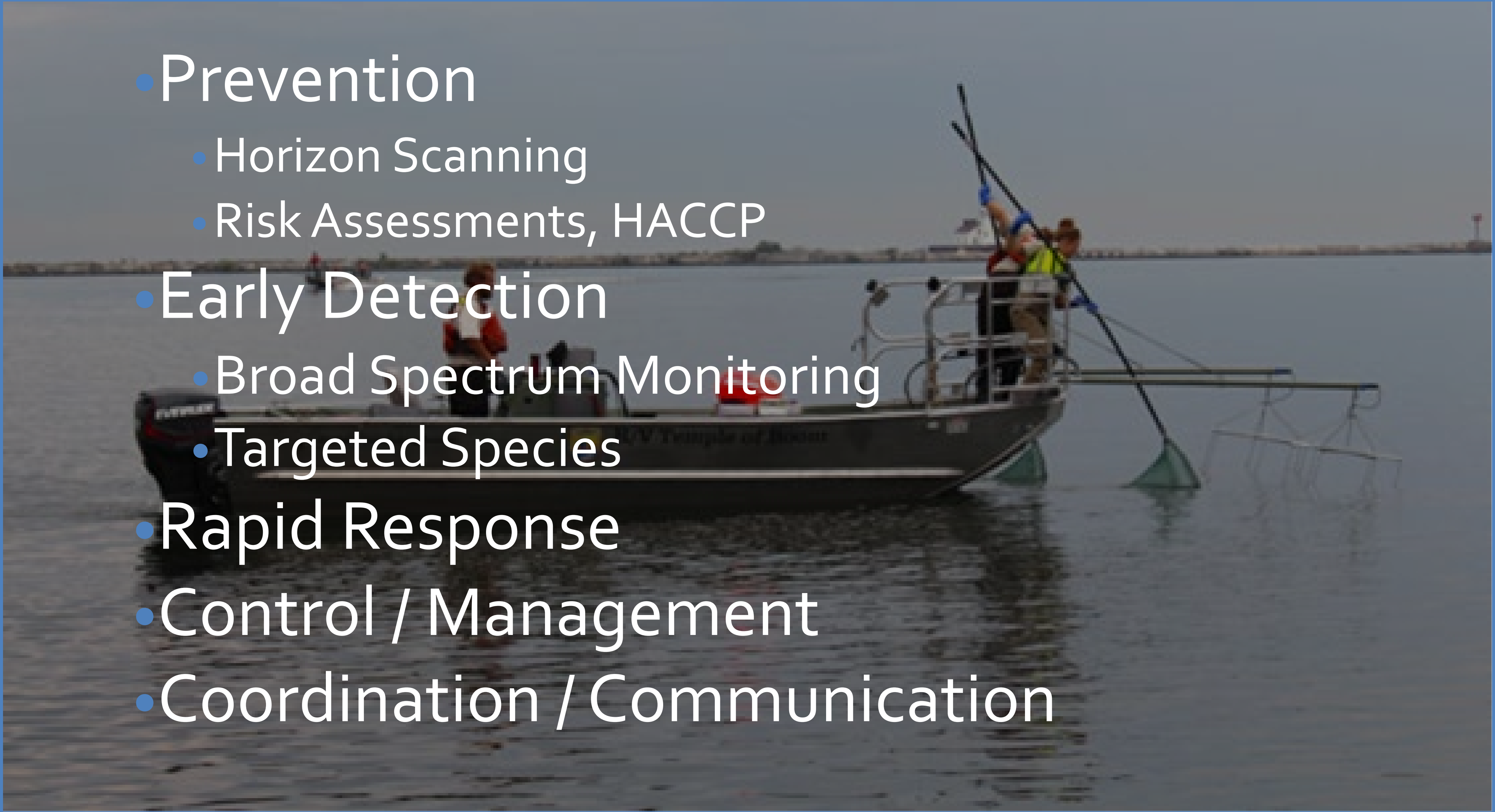
FAC Assets Pacific Region



Program Priorities



- Prevention
- Early Detection
- Rapid Response
- Control / Management
- Coordination / Communication



- Prevention
  - Horizon Scanning
  - Risk Assessments, HACCP
- Early Detection
  - Broad Spectrum Monitoring
  - Targeted Species
- Rapid Response
- Control / Management
- Coordination / Communication

Priority Aquatic Invasive Species

- Zebra mussels
- Quagga mussels
- New Zealand mudsnail
- *Corbicula spp*.
- Mystery snail(s)
- Rusty crayfish
- Marbled crayfish
- Virile crayfish
- American bullfrog
- Eurasian watermilfoil
- Hydrilla
- Elodea
- Spiny waterflea
- Algae
- Copepods (*Pseudodiaptomus forbesi, Oithona davisae*)

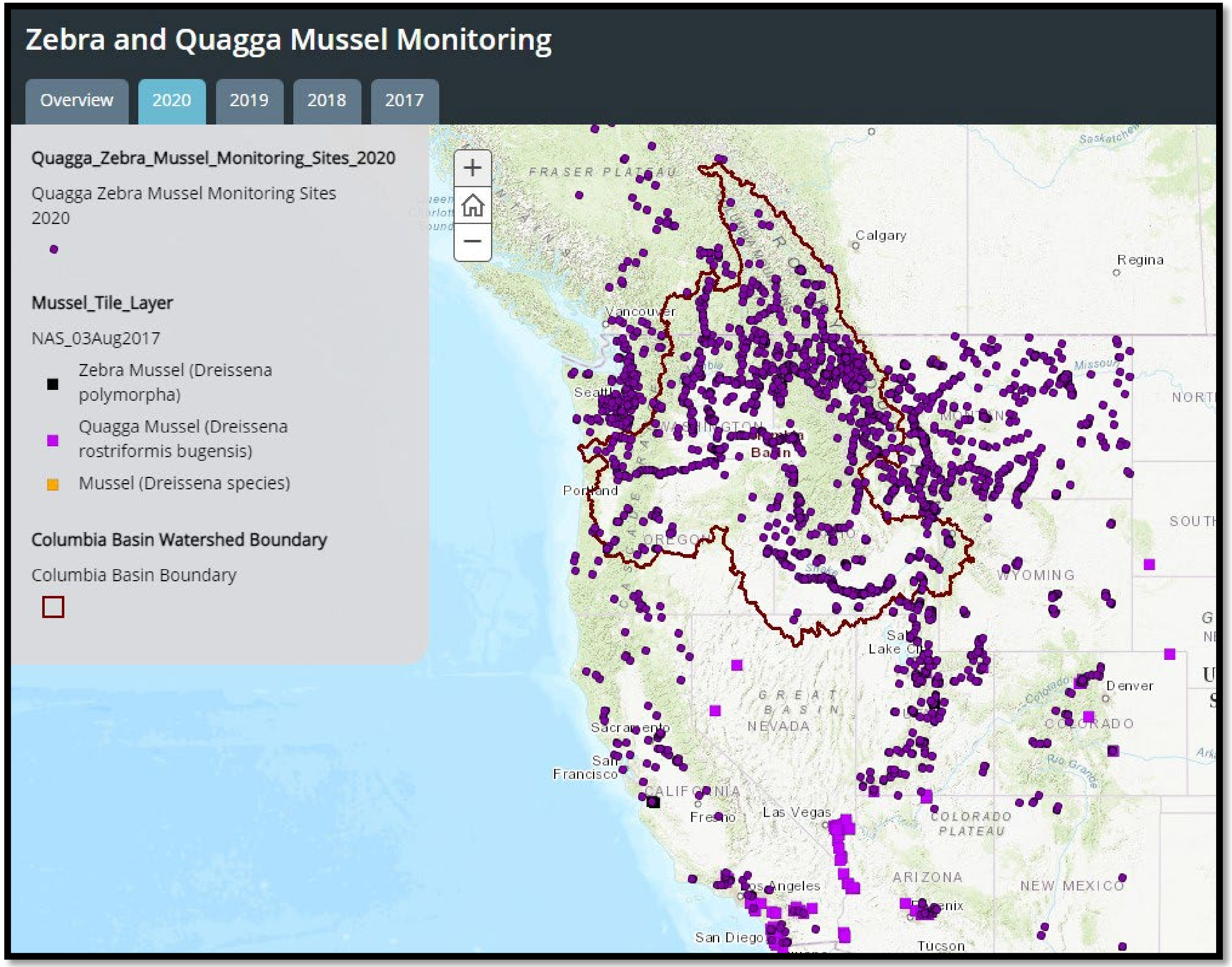
Priority Aquatic Invasive Species

- Northern pike
- Largemouth bass
- Smallmouth bass
- walleye
- Brook trout
- Invasive carp species
- Large scale loach
- Round goby

- Invasive copepods
- American shad
- European green crab

Monitoring

- Early Detection
- Multi-agency coordination
- eDNA sampling
- Plankton sampling /veligers
- Artificial substrates
- Snorkel / SCUBA surveys
- Opportunistic sampling



https://www.westernais.org/monitoring

Surveillance Monitoring

- Visual inspection surveys

- eDNA monitoring
  - Zebra & Quagga mussel
  - Northern pike
  - Common carp
  - New Zealand mudsnail

Carson, Willard, Little White Salmon, Spring Creek, Eagle Creek, and Warm Springs NFHs

eDNA monitoring at NFHs

Carson, Willard, Little White Salmon, Spring Creek, Eagle Creek and Warm Springs NFHs

- ongoing since 2015 to present
- FY24 – 8 samples total per facility (x 6 facilities)
  - 64 samples tested for 5 species ($153.00 / sample)
  - 60 samples tested for a single species ($67.32 / sample)
  - supplies including cellulose nitrate filters

Non-salary costs is approx. $16,000 ($12K in FY23)

eDNA monitoring at NFHs

Three separate projects in one:

1) Presence / absence for high priority AIS

2) eDNA protocol testing

3) Occupancy modeling and detection probability

   New Zealand mudsnail

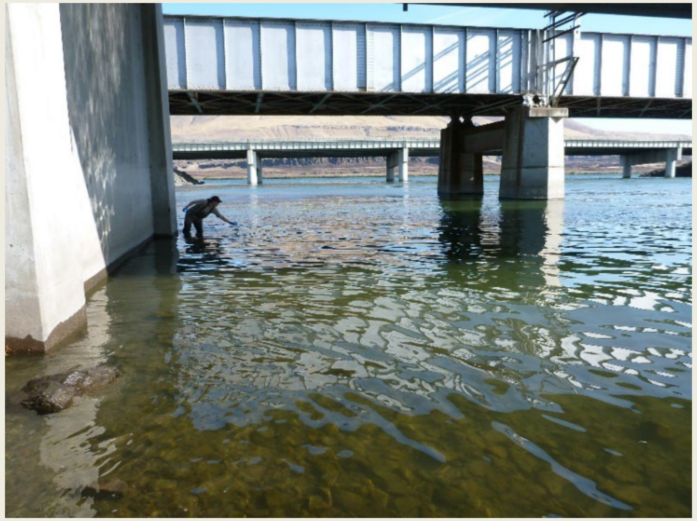
Project Objectives

- Estimate the detection probability of eDNA and visual surveys.

- Estimate the probability of occupancy if NZMS not detected at a site.

NZMS Survey Locations

Burnt Bridge Creek, WA
<10m wide, 4 sample sites



Lower Deschutes River, OR
>100m wide, 4 sample sites

Nestucca River, OR
<90m wide, 1 sample site

Youngs Bay, OR
>100m wide, 1 sample site

Columbia/Kalama River, WA
>100m wide, 4 sample sites

Occupancy Analysis

- Single-season occupancy model with 2 levels.
  1. Probability that a site is occupied.
  2. Probability of detecting NZMS in 1 sample of eDNA or visually, given a site is occupied.

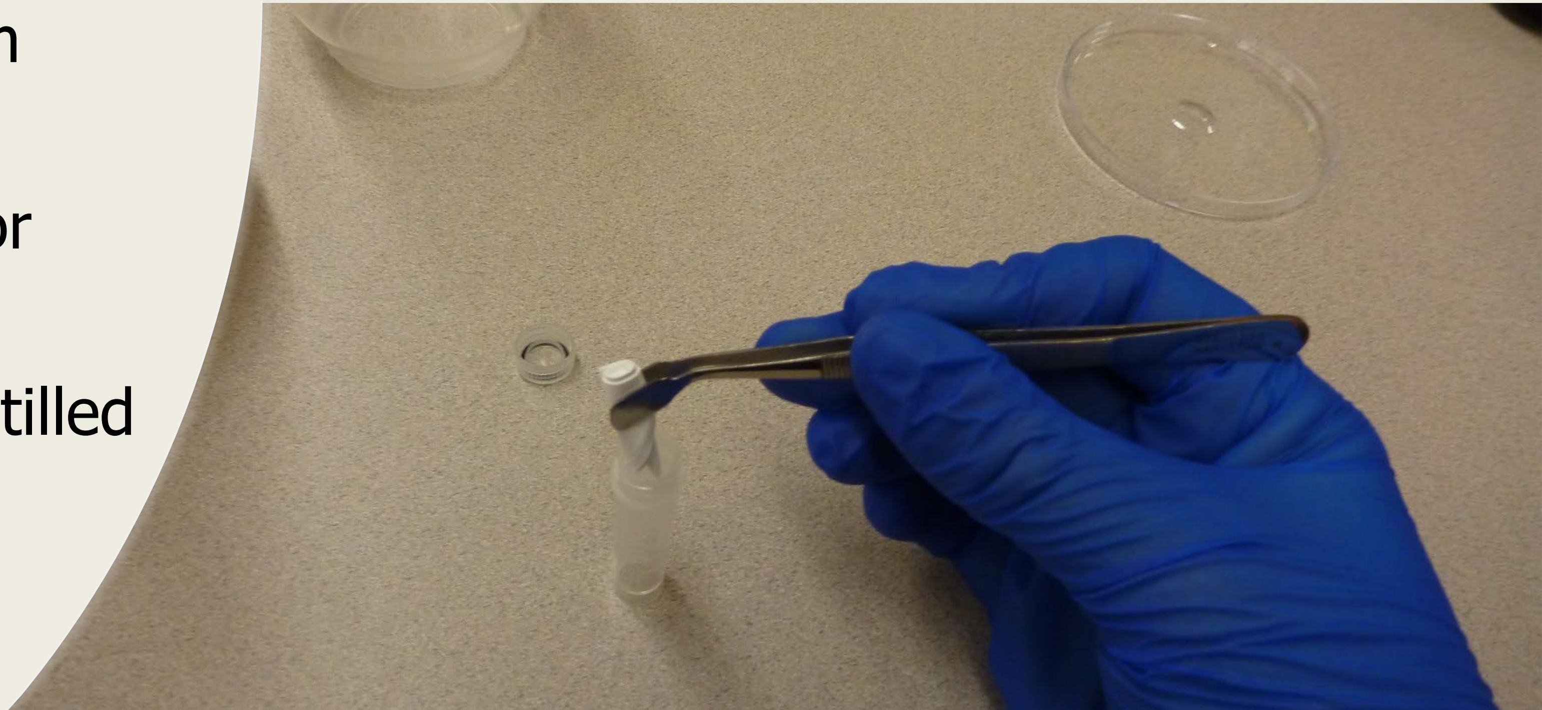
- Detection probability of eDNA modeled as a function of waterbody size.
- Detection probability of visual surveys modeled as function of waterbody size and NZMS eDNA concentrations at the site.
- Model developed by Peterson and Dunham (2003) used to estimate probability of occupancy if NZMS NOT detected at a site. Used to guide/optimize sampling effort.
- Analyses were conducted using Bayesian methods with uninformative priors.

Visual Surveys

- 1-2 field personnel
- Inspected 20m section of stream for ≥10 minutes
- Survey focused on suitable NZMS habitat in water depths <1.2m
- NZMS specimen collected for ID verification

eDNA sample collection & filtration

- Three 0.5L grab samples (replicates) collected from each site.
- Samples filtered through 0.45µm cellulose nitrate membrane.
- Sent to WSU eDNA laboratory for analysis.
- Single negative control (0.5L distilled water) collected from each site.



Results – NZMS visual surveys

- 33 visual surveys conducted from 2015-2021.
- NZMS observed during 12 surveys.
- Relative snail abundance
  - Youngs Bay (≈800 snail/m^2)
  - Burnt Bridge Cr. (≈20 snail/m^2)
  - Nestucca R. (≈2 snail/m^2)
  - Columbia/Kalama R. (≈1 snail/m^2)

Youngs Bay
NZMS observed at 1 site & 3 of 3 surveys

Burnt Bridge Creek
NZMS observed at 2 of 4 sites & 7 of 10 surveys

Nestucca River
NZMS observed at 1 site & 1 of 2 surveys

Columbia/Kalama River
NZMS observed at 1 of 4 sites & 1 of 9 surveys

Results – eDNA

99 eDNA grab samples collected.

Youngs Bay, N=9
100% samples NZMS+
Avg. eDNA copies/ml = 286.61

Nestucca River, N=6
100% samples NZMS+
Avg. eDNA copies/ml = 9.93

Burnt Bridge Creek, N=30
90% samples NZMS+
Avg. eDNA copies/ml = 40.08

Lower Deschutes River, N=27
41% samples NZMS+
Avg. eDNA copies/ml = 0.42

Columbia/Kalama River, N=27
33% samples NZMS+
Avg. eDNA copies/ml = 2.16

Study Conclusions

- eDNA can provide a higher detection probability of NZMS than visual surveys.
- Current level of eDNA sampling sufficient to detect NZMS at NFHs.
- eDNA detection inconsistent if flow is high, species abundance low or has patchy distribution.
- Visual surveys prone to imperfect detection if NZMS abundance low, or sample site is large or complex.
- Visual surveys reliable in small, shallow streams or when NZMS abundance high.

Willard NFH intake

eDNA monitoring at NFH

- Currently sample 6 lower Columbia River hatcheries
- Expand to conduct baseline sampling for R1 hatcheries
- Baseline would be 8 samples total per facility
- Conduct this work 2x/year (ideally 1x in summer @ low water)
- Consider timing of fish releases to time sampling and results
- Coordinated financial instrument may save on overhead costs
- This work is currently conducted with Washington State Univ.
- Current sample process timing is several months

Questions?

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