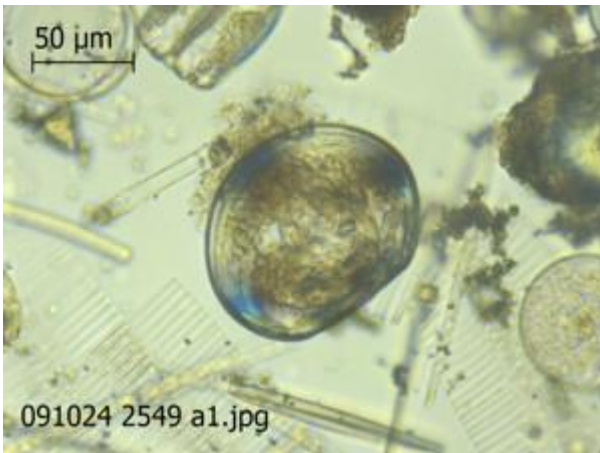


Quagga and Zebra Mussel Update



 Idaho State Department of Agriculture

Justin Bush
Aquatic Invasive Species
Division Manager

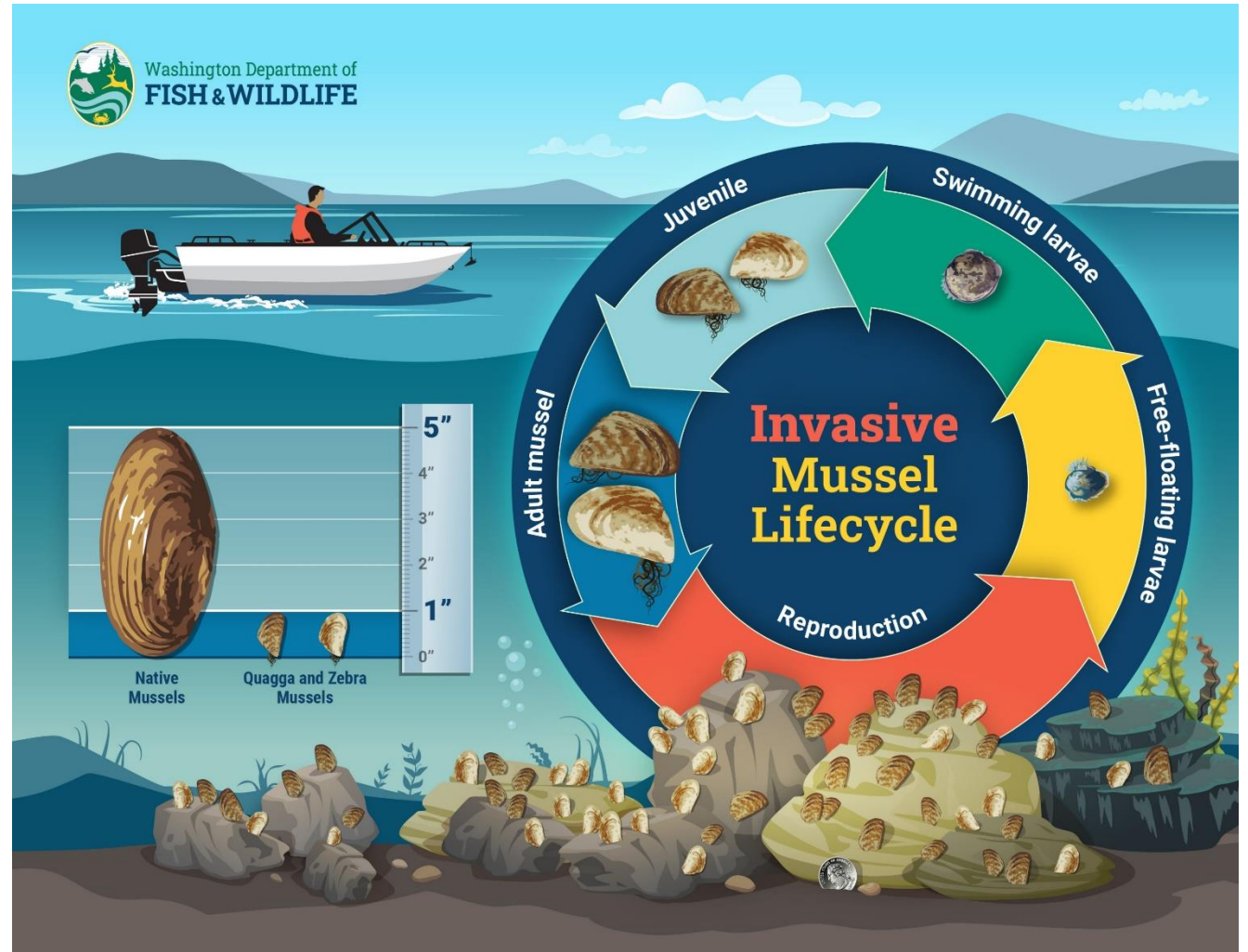


Washington
Department of
**FISH &
WILDLIFE**



Invasive Mussel Background

- Freshwater mussels
- Attach to hard surface with byssal threads
- Densities greater than 20,000 per square foot
- Larval life stage is microscopic and free-floating
- Introduced to North America through contaminated ballast water
- Transported domestically through movement of watercraft or downstream from infested waterbodies



Economic Risk

- \$100 million annual hydroelectric mitigation and maintenance.
- Anticipated similar mitigation and maintenance costs for:
 - Fish Hatcheries
 - Fish Passage Infrastructure
 - Agricultural Irrigation Systems
 - Drinking and Wastewater Systems
 - Legacy Data Centers
 - Navigational Locks



Invasive mussels fouling a penstock gate at Davis Dam.
📷: U.S. Bureau of Reclamation



Dense colonies of zebra mussels can clog intake pipes.
📷: Marrone Bio Innovations



Economic Risk



\$31.2 billion

Columbia river shipping

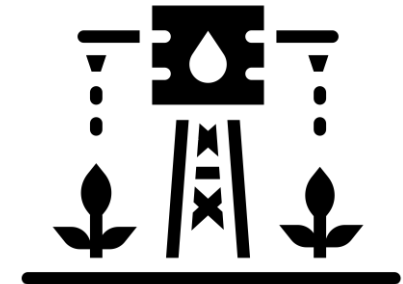
- Commodities and products
- Key U.S. trade gateway
 - **Leading** wheat export pathway
 - **Second** soy and corn export pathway



\$20.5 billion

Outdoor recreation and fisheries

- \$5 billion in outdoor recreation involving public waters
- \$1.5 billion in recreational fisheries
- \$14 billion in commercial salmon fisheries




\$9.6 billion

Irrigated agriculture

- 75% of Washington's agricultural output



: Pacific Northwest Waterways Association

: Washington Recreation and Conservation Office (2020)

: Washington State Department of Agriculture

Environmental Risk



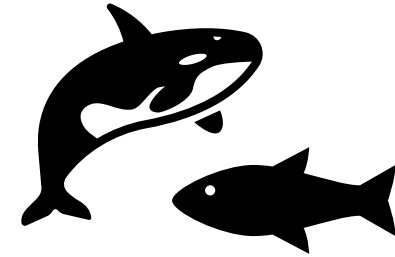
Aquatic habitat

- Reduce available habitat for native species
- Loss of native filtering and cleaning species
- Increases water transparency and aquatic weeds



Water quality and pollution

- Filter feeding impacts phytoplankton structures and increases bacteria
- Reduce dissolved oxygen
- Bioaccumulate pollutants, increasing native species exposure



Native species

- Habitat loss leads to decreased populations of native species including salmon and steelhead
- Decreased salmon populations impact Southern Resident killer whale recovery

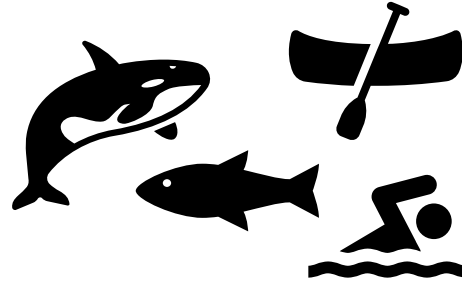


Cultural and Human Health Impacts



Human health concerns

- Increase in botulism causing bacteria, a serious neurotoxin
- Increase of harmful cyanobacteria and harmful algal blooms
- Bioaccumulated toxins in fish and wildlife may be consumed by humans



Cultural concerns

- A risk to Washington's identity and way of life
 - Impacted or lost treaty protected resources
 - Impacted or loss of place
 - Impacted or loss of beneficial and treasured species
 - Impacted or loss of economic and environmental resources
 - Mitigation, maintenance, and recovery costs a public burden



Sharp shells of dead mussels litter beaches.

📷: Milwaukee Journal Sentinel



Invasive mussels encrusting recreational boat motor.

📷: Pacific States Marine Fisheries Commission



📷 : Kansas Department of Parks and Wildlife

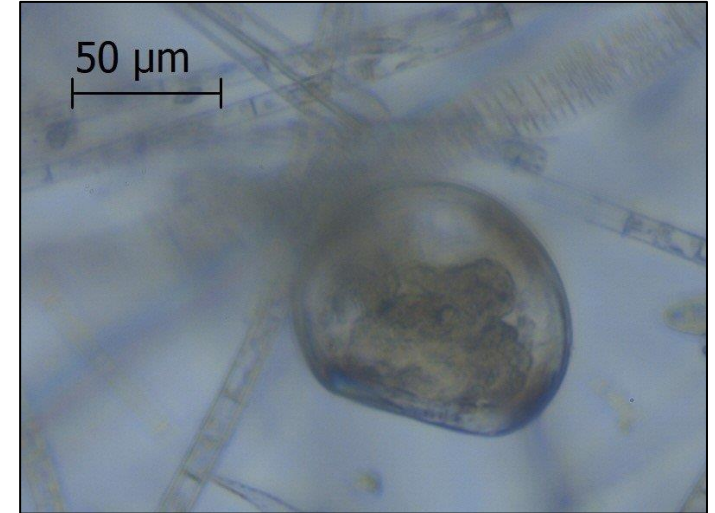


📷 : U.S. Army Corps of Engineers

Imminent Threat and Uncertainty



: Washington Department of Fish and Wildlife



: Idaho State Department of Agriculture



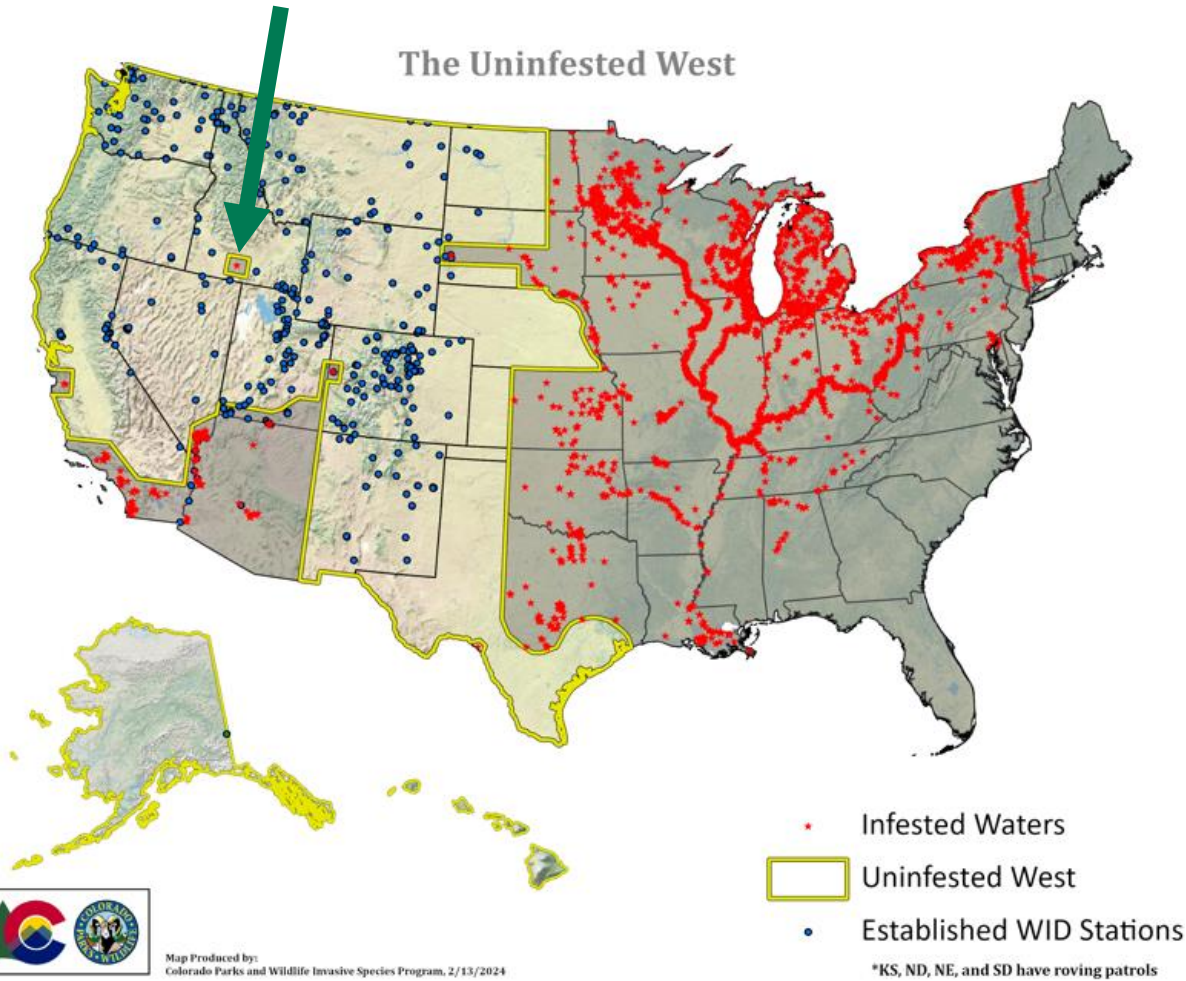
State Fiscal Year 2025 One-Time Proviso to Enhance Prevention and Readiness



- Prevention, Monitoring, and Preparedness
- General Fund-State Appropriation - \$1,810,000
- Federal Funds \$1,810,000



Multiple Threat Pathways



● Snake River

Number of Boats:

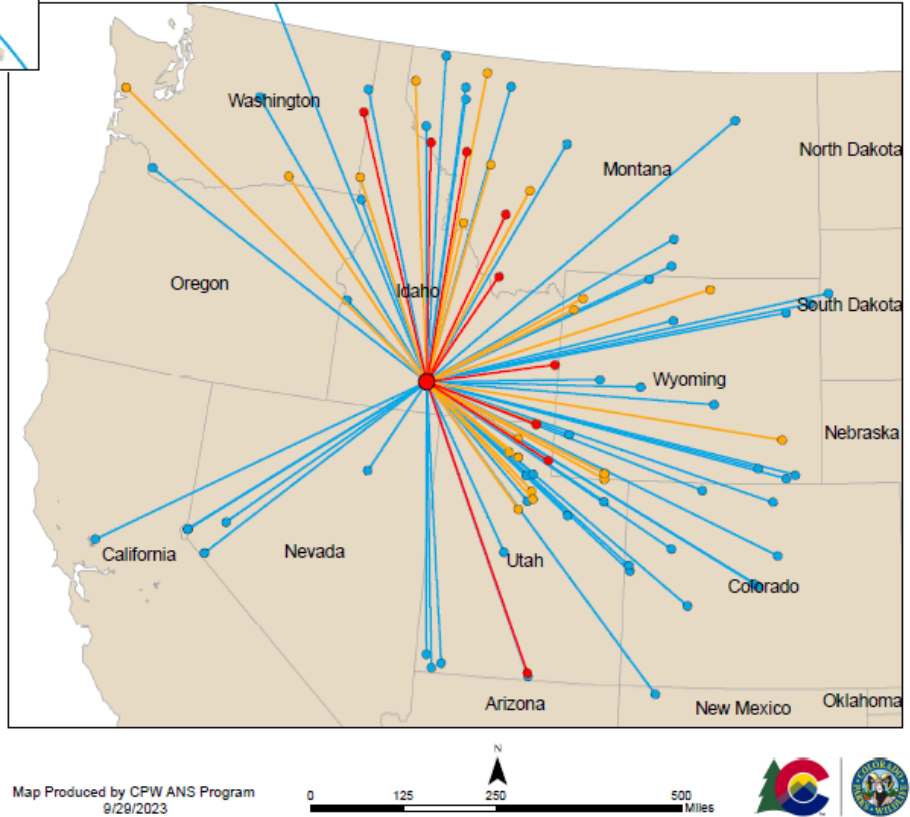
— 1 - 9

— 10 - 49

— 50 - 279

Location	State	Count
Dillon	MT	279
Evanston POE	WY	279
Hwy 89 Garden City	UT	161
Spokane	WA	104
Ravalli	MT	86
Anaconda	MT	83
Alpine POE	WY	66
Lake Powell	UT	60
St. Regis	MT	57
Sula	MT	46
Cleanwater Junction	MT	43
Bear Lake	UT	40
Flaming Gorge	UT	36
Pasco	WA	35
Pineview Reservoir	UT	33
Grant	WY	28
Glacier National Park	MT	26
Troy Rest Area	MT	23
Bridge Bay	WY	21
Hwy 40 Daniels POE	UT	20
Clarkston	WA	17
Cle Elum Eastbound	WA	17
Helena Highway 12	MT	14
Hyrum Reservoir	UT	14
Utah Lake	UT	13
Jordanelle Reservoir	UT	12
Willard Bay	UT	12
Lewis Lake	WY	11
Sheridan Rest Area	WY	10
Anvil Draw	WY	10

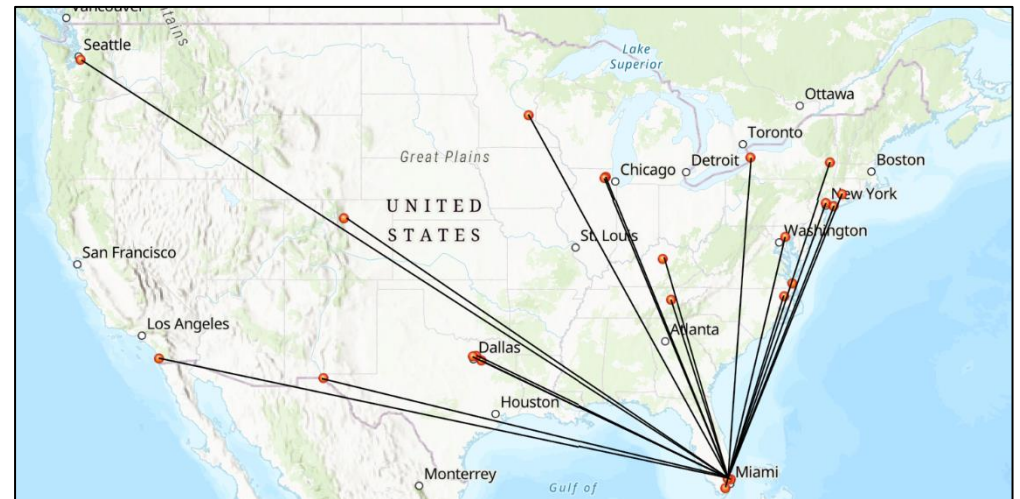
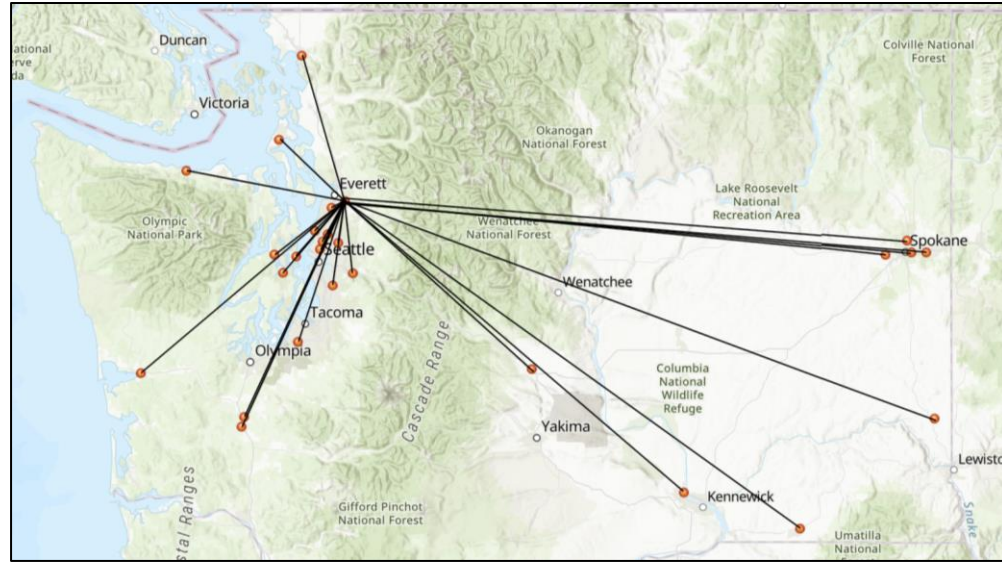
Boat Inspections Where Snake River Was Last Water Visited: 2022 - 2023



WA Count: 173




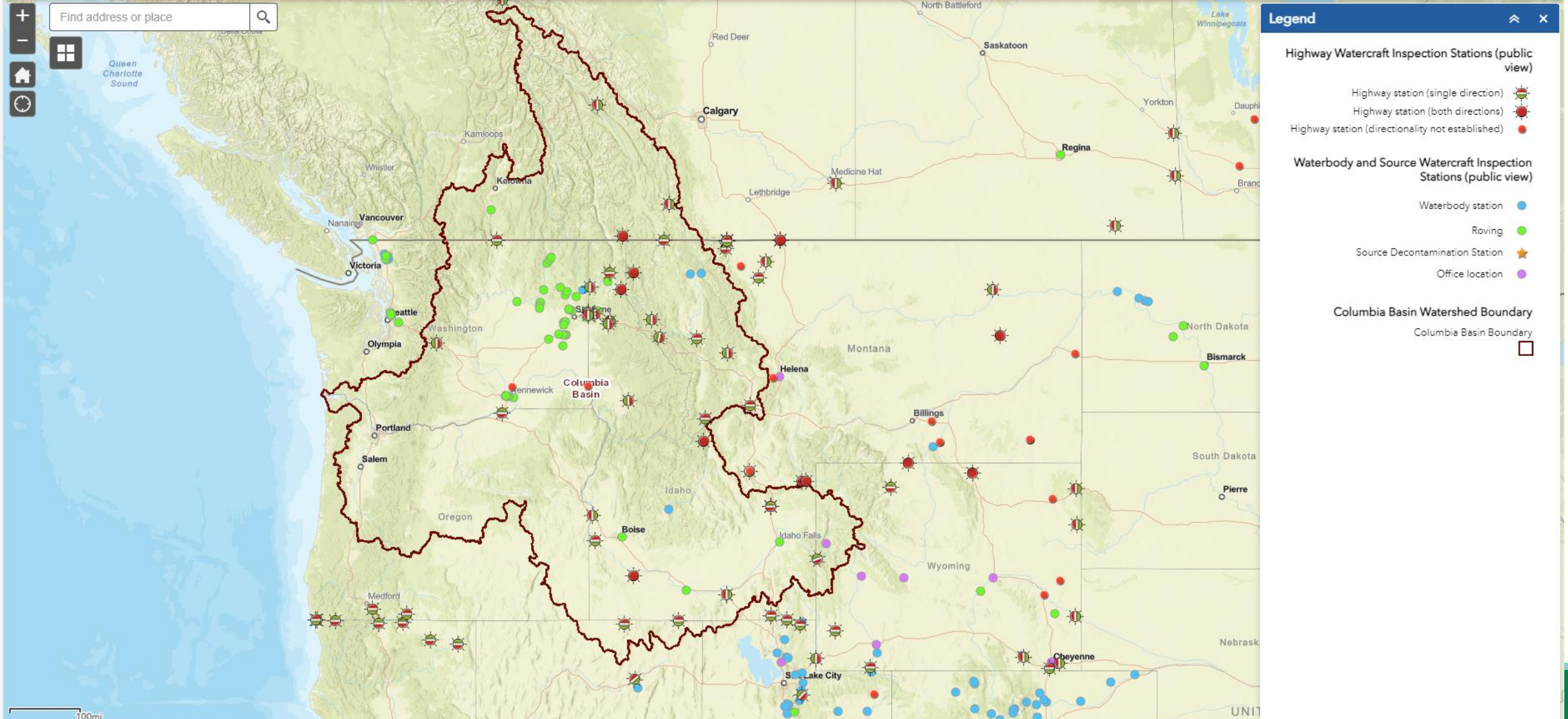
Multiple Threat Pathways



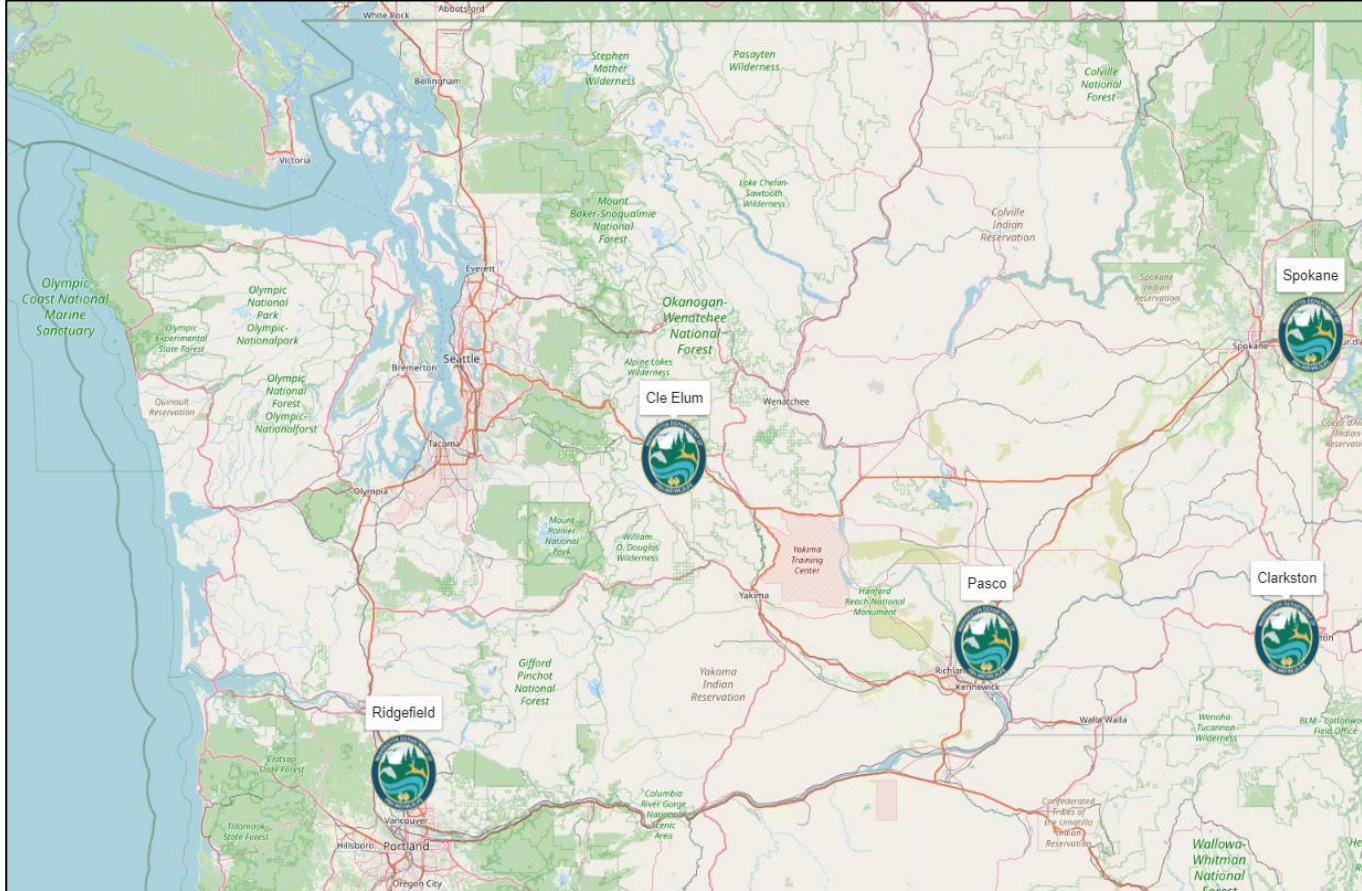
 Washington Department of Fish and Wildlife


Watercraft Inspections - Regional

 Pacific States Marine Fisheries Commission



Watercraft Inspections - State



 & : Washington Department of Fish and Wildlife



	2021	2022	2023	2024	2025*
Watercraft Inspected	55,812	51,942	58,618	54,790	1,399
Mussel Fouled Watercraft	39	25	25	13	3

*January 1, 2025, to February 28, 2025



Decontamination

January 1, 2024 to December 31, 2024: 2,130 decontaminations
January 1, 2025 to February 28, 2025: 76 decontaminations



📷: Washington Department of Fish and Wildlife



January Largest Interception on Record: Increased Prevention and Readiness in Action



- Conveyance:
 - 2 Tugboats; 1 infested
 - 30 feet length
- Origin: Lake Michigan

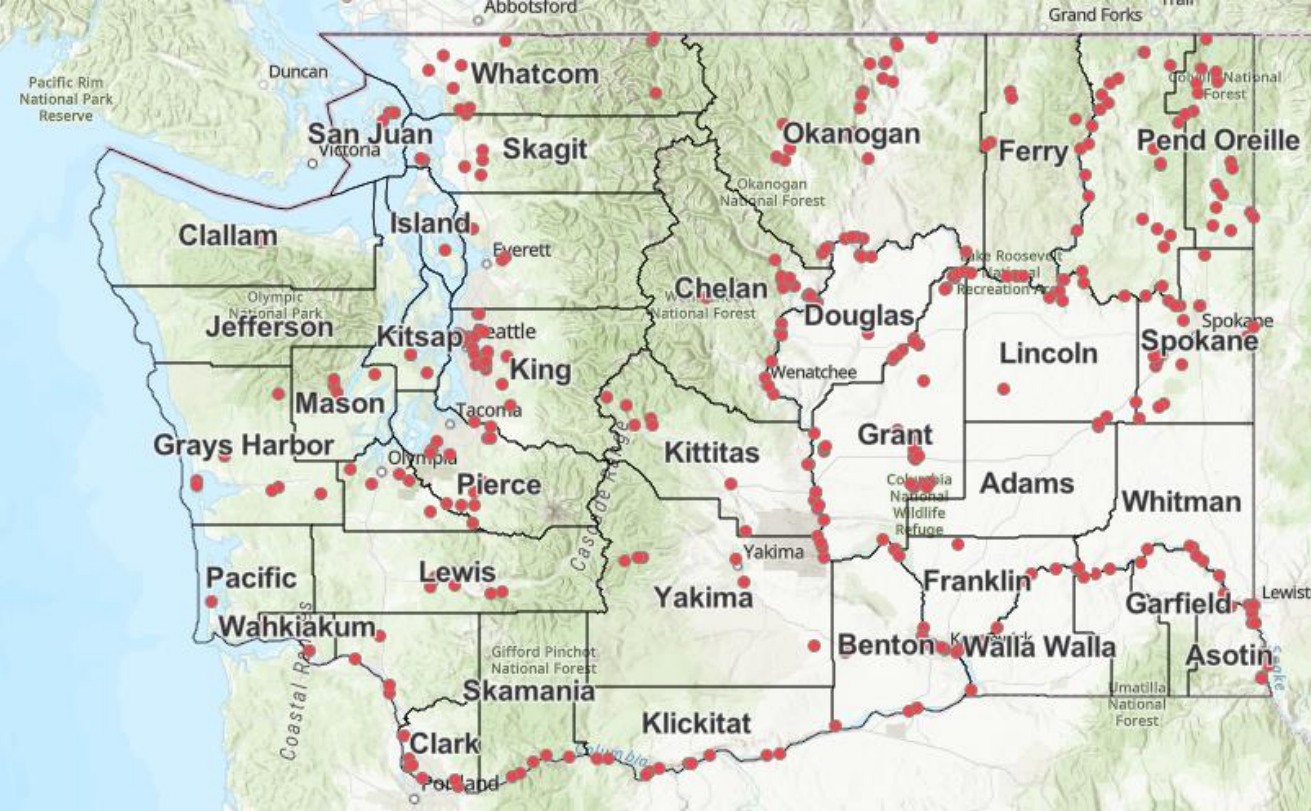
- Interception Point: Spokane (Liberty Lake)

- Interception: 21 gallons of invasive mussels – analysis indicates some may have been **alive**
- Staff Time: 20 hours



Early Detection Monitoring

January 1, 2024 – December 31, 2024:
173 water bodies, 392 sites, 7,519 (+13%) total samples)



🗺️ & 📷 : Washington Department of Fish and Wildlife



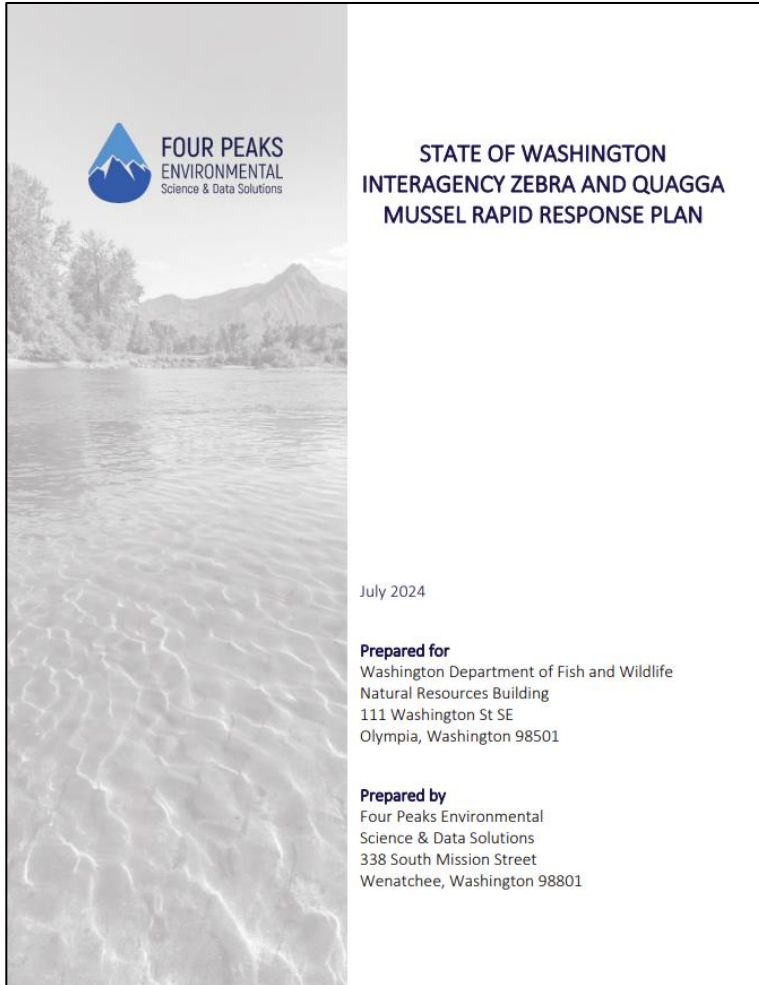
Early Detection Monitoring Partners


Partners	Water Body Common Name
Chelan County Public Utility District (PUD)	Lake Entiat
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
Kalispel Tribe of Indians*	Boundary Reservoir
Portland State University	Columbia River, Snake River, Lake Umatilla, Lake Wallula, Boundary Reservoir, and Box Canyon Reservoir
Seattle City Light	Boundary Reservoir
Snohomish County PUD	Spada Lake
Spokane Tribe of Indians	Lake Roosevelt
U.S. Bureau of Reclamation	Lake Roosevelt

* New partner in State Fiscal Year 2025



Response Readiness



 **FOUR PEAKS ENVIRONMENTAL**
Science & Data Solutions

**STATE OF WASHINGTON
INTERAGENCY ZEBRA AND QUAGGA
MUSSEL RAPID RESPONSE PLAN**

July 2024

Prepared for
Washington Department of Fish and Wildlife
Natural Resources Building
111 Washington St SE
Olympia, Washington 98501

Prepared by
Four Peaks Environmental
Science & Data Solutions
338 South Mission Street
Wenatchee, Washington 98801

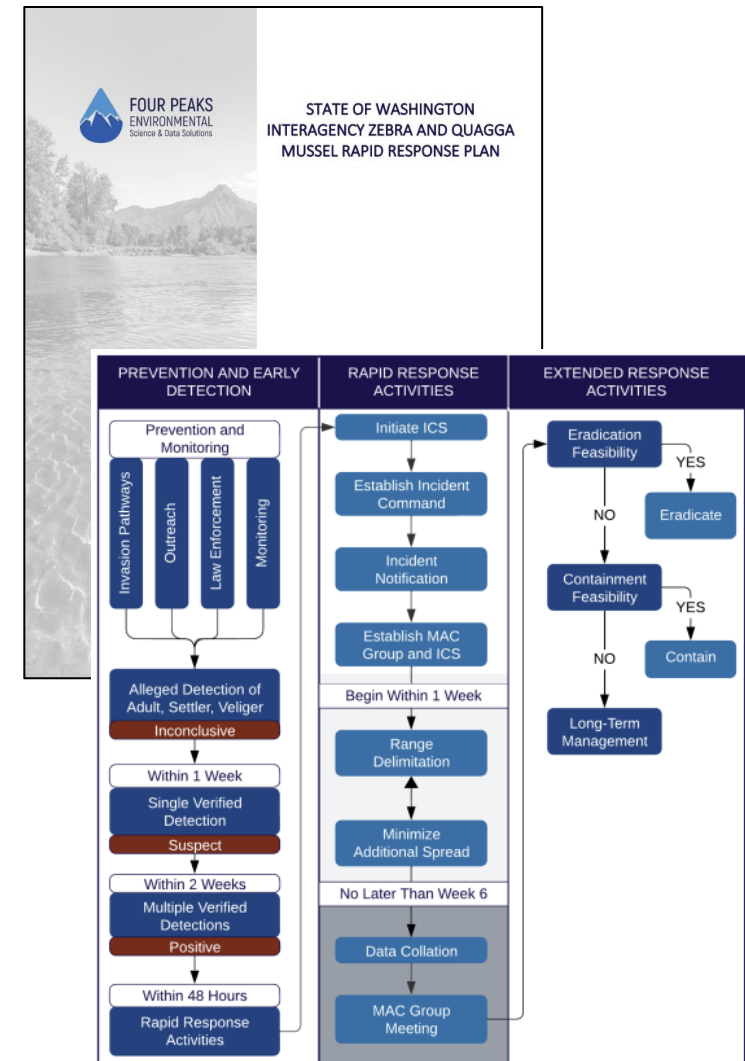


 : Washington Department of Fish and Wildlife & Washington Invasive Species Council



Fiscal Year 2025 Short Term Actions

1. Develop and deploy a long-term leadership, planning, and command structure that includes internal and external partners including tribal, federal, regional, state, and local governments.
2. Fully staff Southeast Region mandatory watercraft inspection and decontamination stations in Clarkston and Pasco.
3. Procure and deploy one additional invasive mussel detection canine to support Southeast Region check stations and early detection monitoring.
4. Perform intensive Snake River and Middle Columbia River early detection and monitoring to detect downstream quagga mussel establishment.



Fiscal Year 2025 Short Term Actions

PERMIT #: _____

WASHINGTON DEPARTMENT OF FISH AND WILDLIFE
PO BOX 43150
OLYMPIA, WASHINGTON 98504-3150

FISH TRANSPORT APPLICATION/PERMIT
To Import, Export or Transfer, Live Fin Fish, Viable Eggs or Gametes
(Please print or type items 1-5 and return to address above)

1. Type of application: Import Export Transfer

2. Name of Applicant _____ Phone number(_____) _____
Mailing address _____ City _____ State _____ Zip _____
WDFW Aquatic Farm Registration # (for commercial aquaculture facilities only) _____

3. Species _____ Number (fish or eggs) _____

4. Destination (name of facility/receiving waters) _____
County _____ Sec. _____ Township _____ Rng _____

5. Source of fish/eggs: Facility name _____ Phone number (_____) _____
Physical Location _____ City _____ State _____ Zip _____
Mailing Address _____ City _____ State _____ Zip _____
WDFW Aquatic Farm Registration # (for commercial sources in Washington) _____

6. Applicant's Signature _____ Date _____

INSTRUCTIONS: Return this application to the address at the top of the form.

NOTE: It is unlawful to transport or stock fish without a permit issued by the Director or his/her designee. Failure to comply with any provisions of this permit or to perform any act not included in this permit shall be grounds for revocation of this permit and may constitute a gross misdemeanor.

INFORMATION BELOW TO BE COMPLETED BY WDFW PERSONNEL

Provisions _____

Expiration date _____

Additional provisions attached

Approved Not Approved Fish Health Manager _____ Date _____

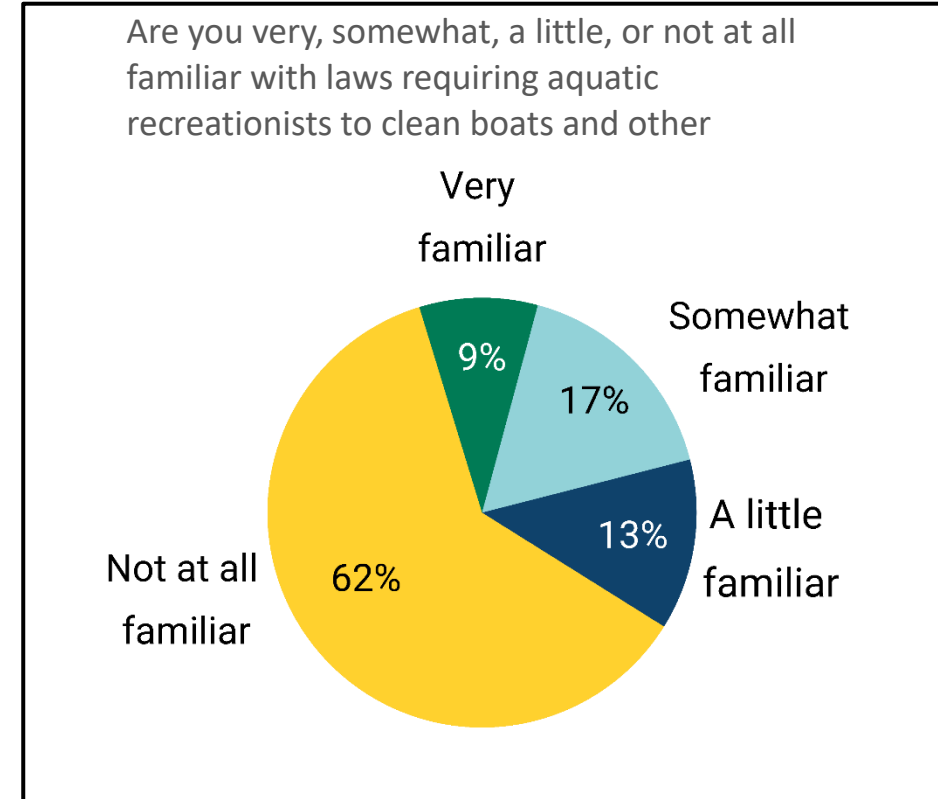
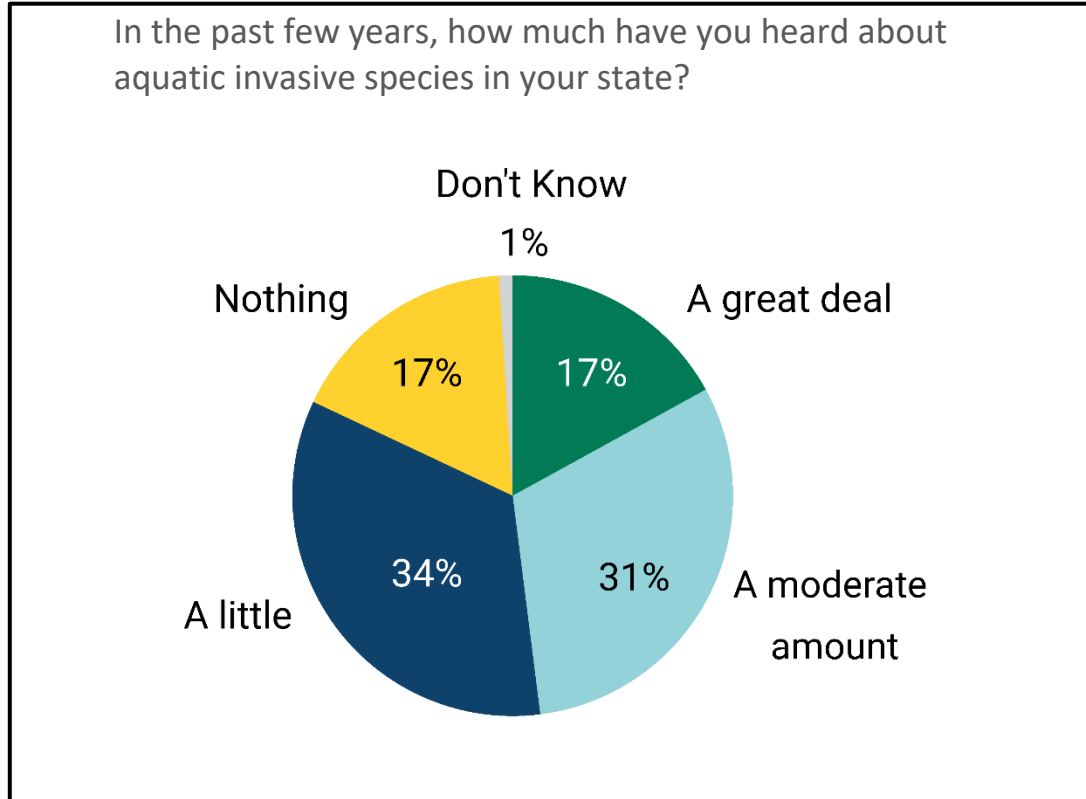
Approved Not Approved Aquaculture Coordinator _____ Date _____

5. Strengthen prevention of quagga mussel importation from both recreational and commercial pathways by addressing pet trade, food fish aquaculture, and recreational transportation of live fish.
6. Expand state preparedness for containment and rapid response treatment for quagga mussels through procurement of equipment and training.
7. Understand risk to infrastructure such as irrigation systems and fish hatcheries to develop strategies to prevent and mitigate quagga mussel establishment and impacts.
8. Increase communications and outreach capacity focused on invasive mussel prevention, response, and enforcement to grow awareness and support among decisionmakers, media, communities, and the public in the Snake and Columbia River basins.



Increasing Awareness and Engagement

Communications and public outreach are critical management tools to increase awareness and compliance.




2022 National Invasive Species Outreach Campaign Assessment
Responsive Management National Office








Increasing Awareness and Engagement

Clean, Drain, Dry

 The Washington Department of Fish and Wildlife
Mar 5, 2025 · 6 stories


Invasive Quagga and Zebra Mussels




   


 The Washington Department of Fish and Wildlife

Invasive mussel interception demonstrates crucial need for prevention

WDFW removed a record-setting 21 gallons of invasive mussels from a single vessel intercepted by staff at the Spokane...







2d ago  50  1 

 The Washington Department of Fish and Wildlife

Invasive mussel infested tugboats intercepted in Spokane

Two tugboats infested with quagga and zebra mussels were intercepted at the Spokane watercraft inspection station on...



Jan 22  18  1 



Clean

plants, animals, and mud from boat and gear



Drain

all water from boat and gear onto land



Dry

all parts of your boat and gear completely

The Clean/Drain/Dry method applies to all watercraft and gear including paddles, waders, shoes, life vests, nets, buckets, and trailers. If transporting your watercraft, pull the bilge plug during transit.



Increasing Awareness and Engagement

Don't Let It Loose



2021 WDFW and Washington Invasive Species Council
art contest 1st place winner: 5-9 age group.





Golden Mussels

Golden Mussels

Limnoperna fortunei (Dunker, 1857)

Washington Administrative Code 220-640 prohibits mollusks in the family Dreissenidae such as quagga and zebra mussels.

Golden mussels are in the Mytilidae family. Today, Golden mussels are not prohibited in Washington, although they pose a similar high risk.

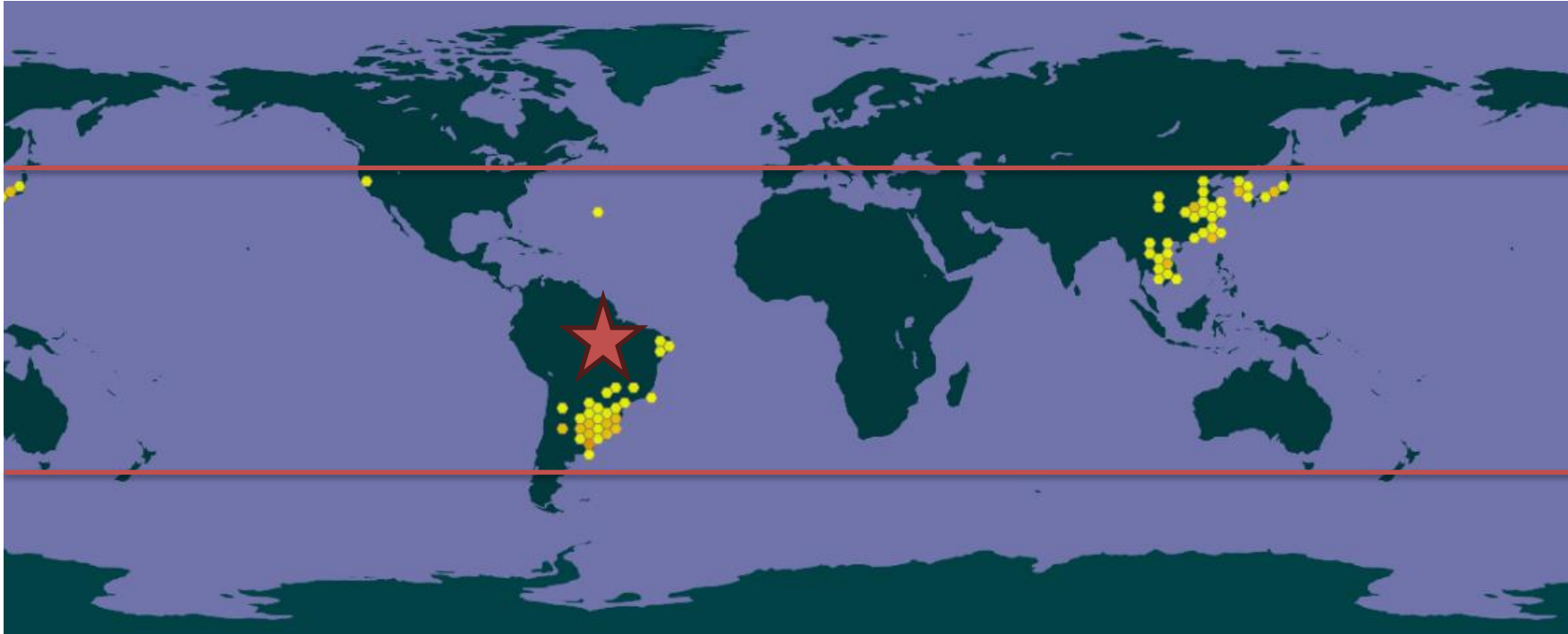
- Detected by California Department of Water Resources staff during routine operations.
- Announced by California Department of Fish and Wildlife November 6, 2024.
- First-in-the-nation detection.
- Suspected introduction by a ship traveling from an international port.
- Determining the infested area is ongoing, with occurrences expanding widely.



📷: California Department of Fish and Wildlife



Golden Mussels – Range and Risk



Global distribution (native and non-native detections) of golden mussel (*Limnoperna fortunei*) as of Nov. 15, 2024.
<https://www.gbif.org/species/5855350>



\$120 million in impacts estimated to Brazil's electricity sector were reported in 2018 (Rebelo et al. 2018).

U.S. Fish & Wildlife Service

Golden Mussel (*Limnoperna fortunei*)
Ecological Risk Screening Summary

U.S. Fish and Wildlife Service, November 2023
Revised, September 2024
Web Version, 11/8/2024

Organism Type: Mussel
Overall Risk Assessment Category: High




Photo: Boltovskoy. Licensed under [CC BY-SA 4.0](https://creativecommons.org/licenses/by-sa/4.0/). Available: https://commons.wikimedia.org/wiki/File:Limnoperna_fortunei.jpg (November 2023).

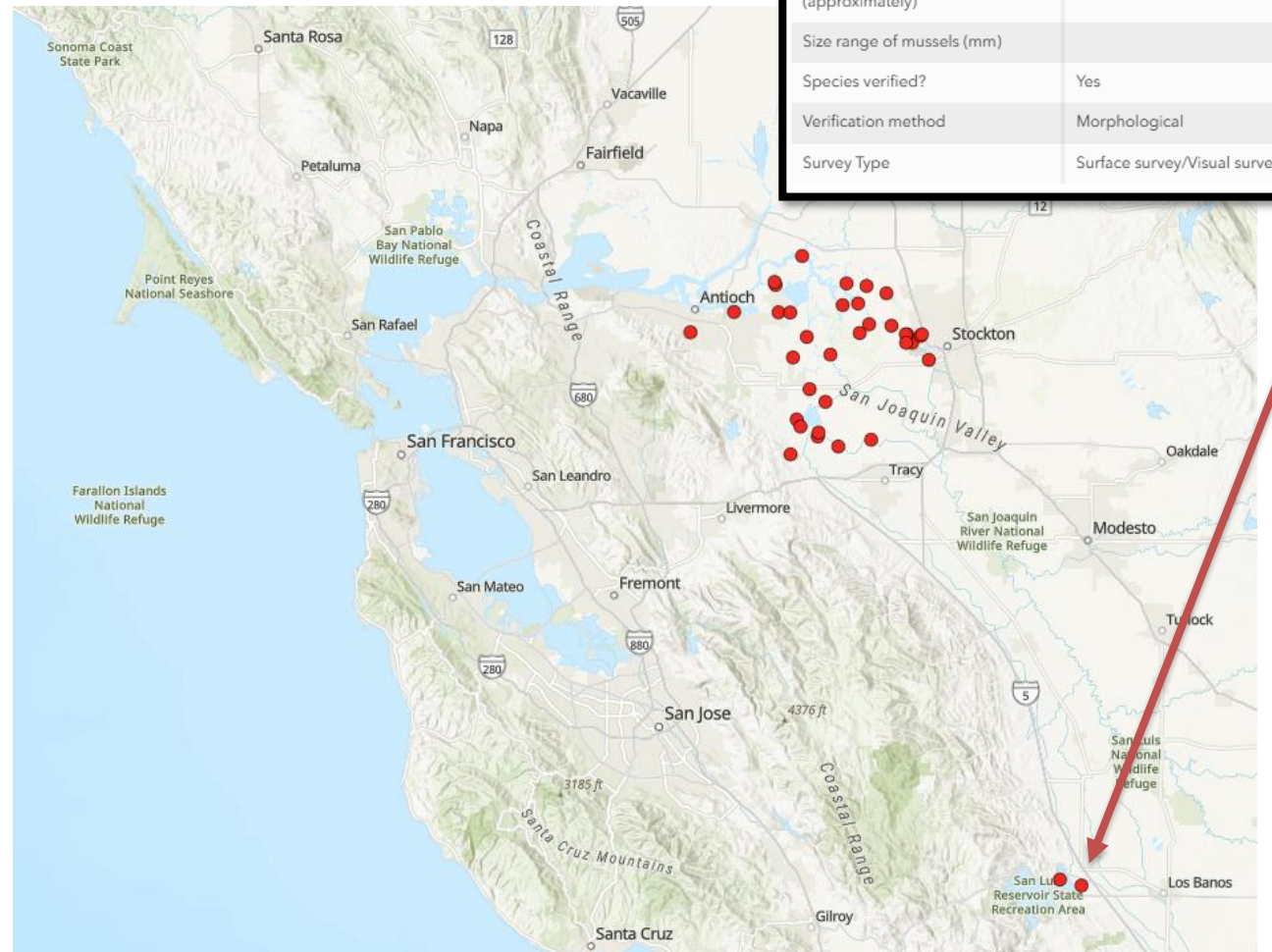
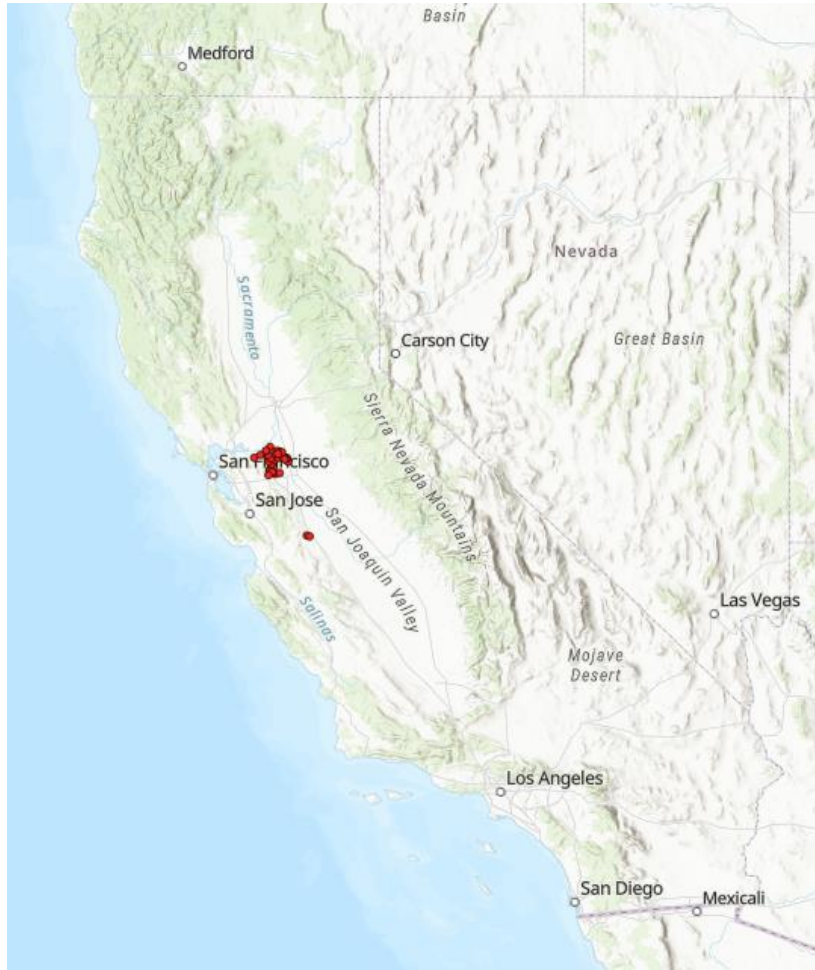
1 Native Range and Status in the United States

Native Range
Boltovskoy et al. (2009) describes *L. fortunei* as native to China, Thailand, Korea, Laos, Cambodia, Vietnam, and Indonesia.

<https://www.fws.gov/media/ecological-risk-screening-summary-golden-mussel-limnoperna-fortunei-high-risk>



Golden Mussels - Sightings

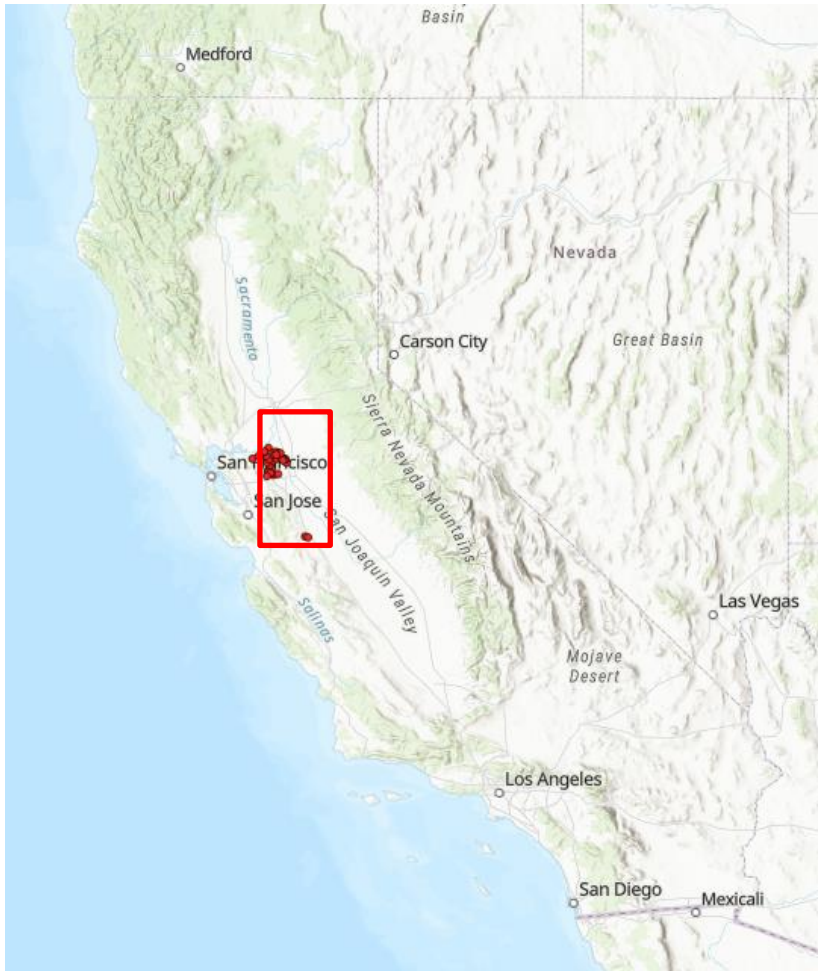


Waterbody	California Aqueduct
Date	10/31/2024, 12:00 PM
Mussels detected?	Yes
Number of mussels (approximately)	5
Size range of mussels (mm)	
Species verified?	Yes
Verification method	Morphological
Survey Type	Surface survey/Visual survey

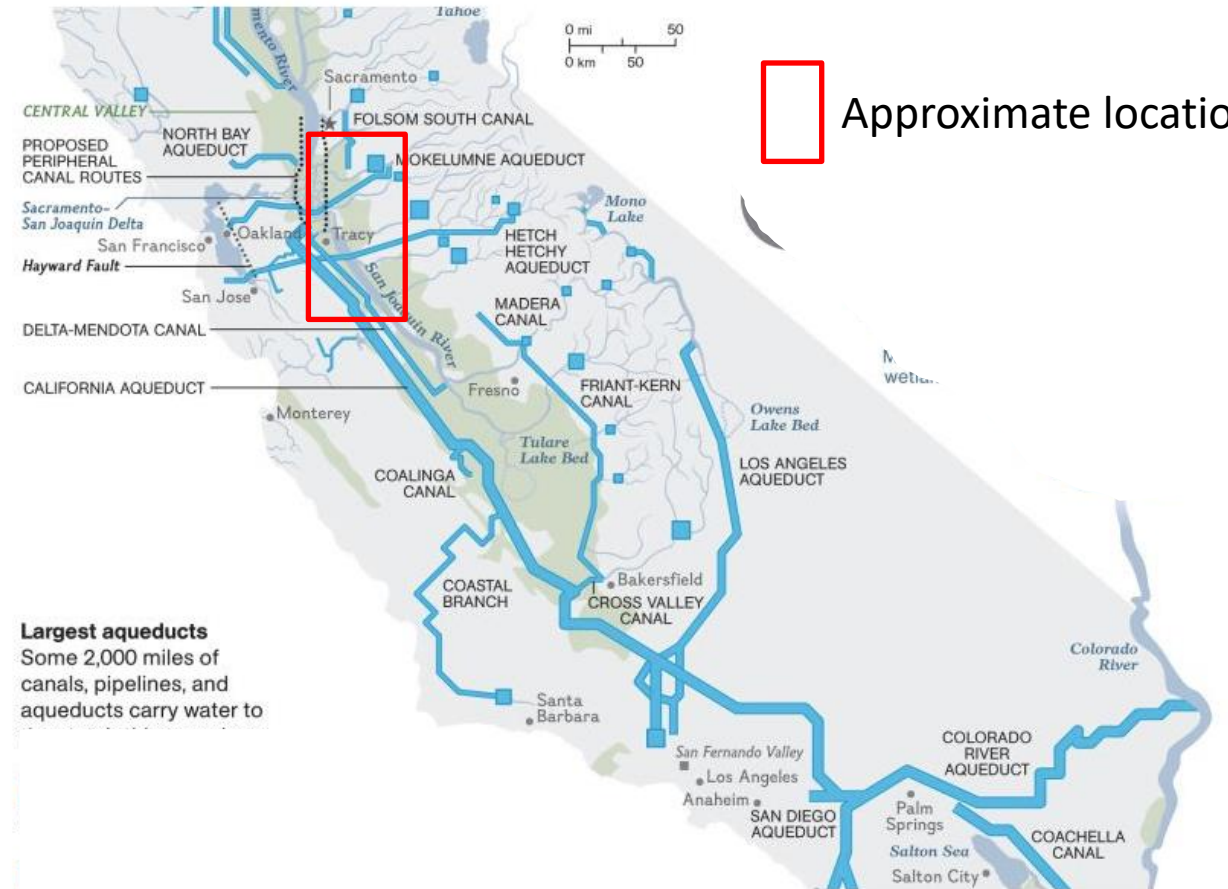
Sightings Map: <https://cdfw.maps.arcgis.com/apps/mapviewer/index.html?webmap=c3912a3866054beeb4d782c93aac007e> (13:11, 1/31/2025)



Golden Mussels – Sightings and Risk



The Governor Edmund G. Brown California Aqueduct



Largest aqueducts
Some 2,000 miles of canals, pipelines, and aqueducts carry water to

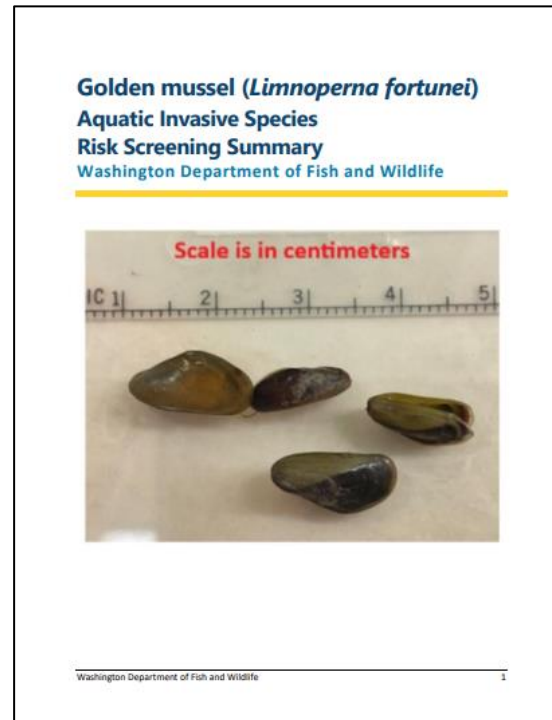
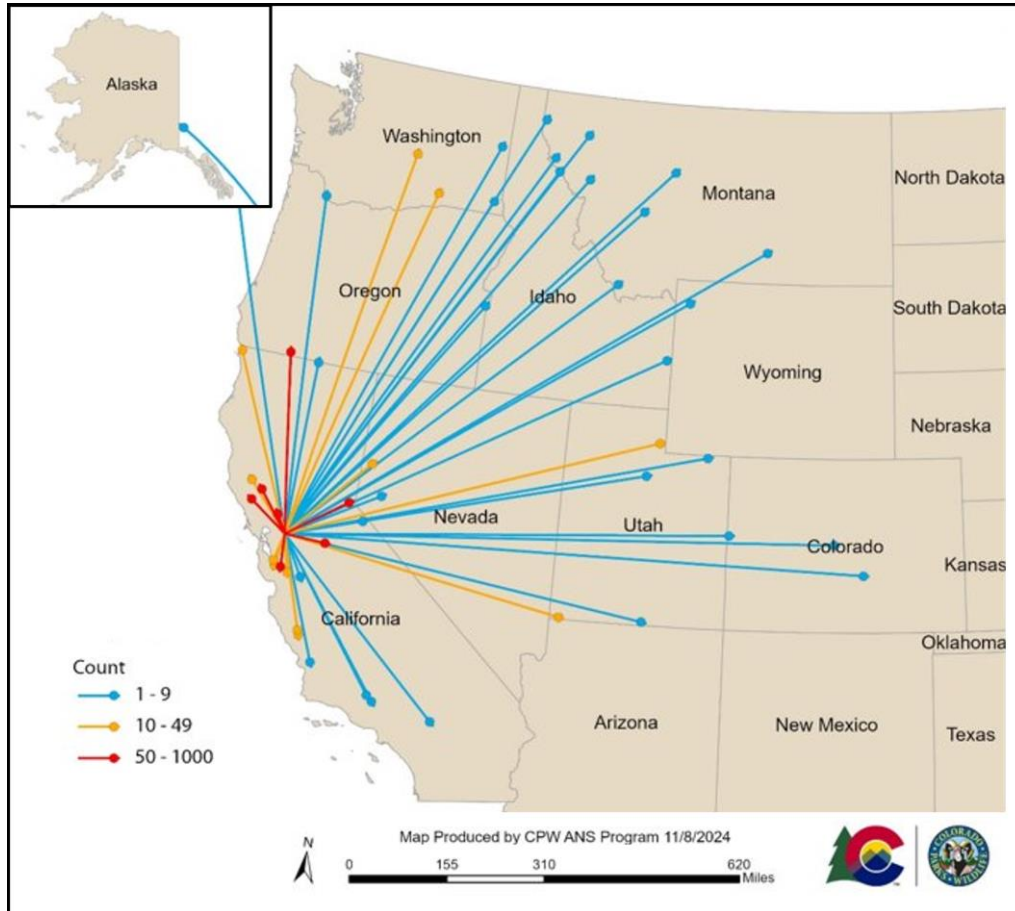
Sightings Map: <https://cdfw.maps.arcgis.com/apps/mapviewer/index.html?webmap=c3912a3866054beeb4d782c93aac007e> (13:11, 1/31/2025)

California's Pipe Dream: <https://education.nationalgeographic.org/resource/californias-pipe-dream/>



Golden Mussels - Overland Movement Risk

2024 Watercraft Inspections Where
"California Delta" was Last Water Visited

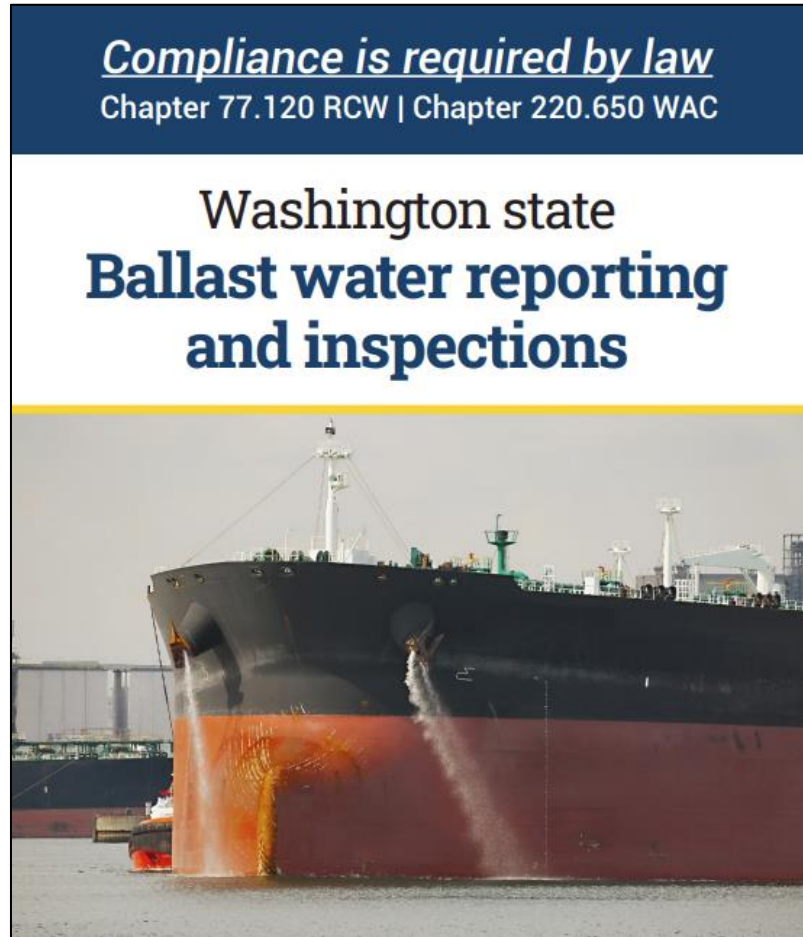


Washington Watercraft Inspection
Information for 2024 on vessels
from *Limnoperna fortunei* positive
waterbodies in CA.

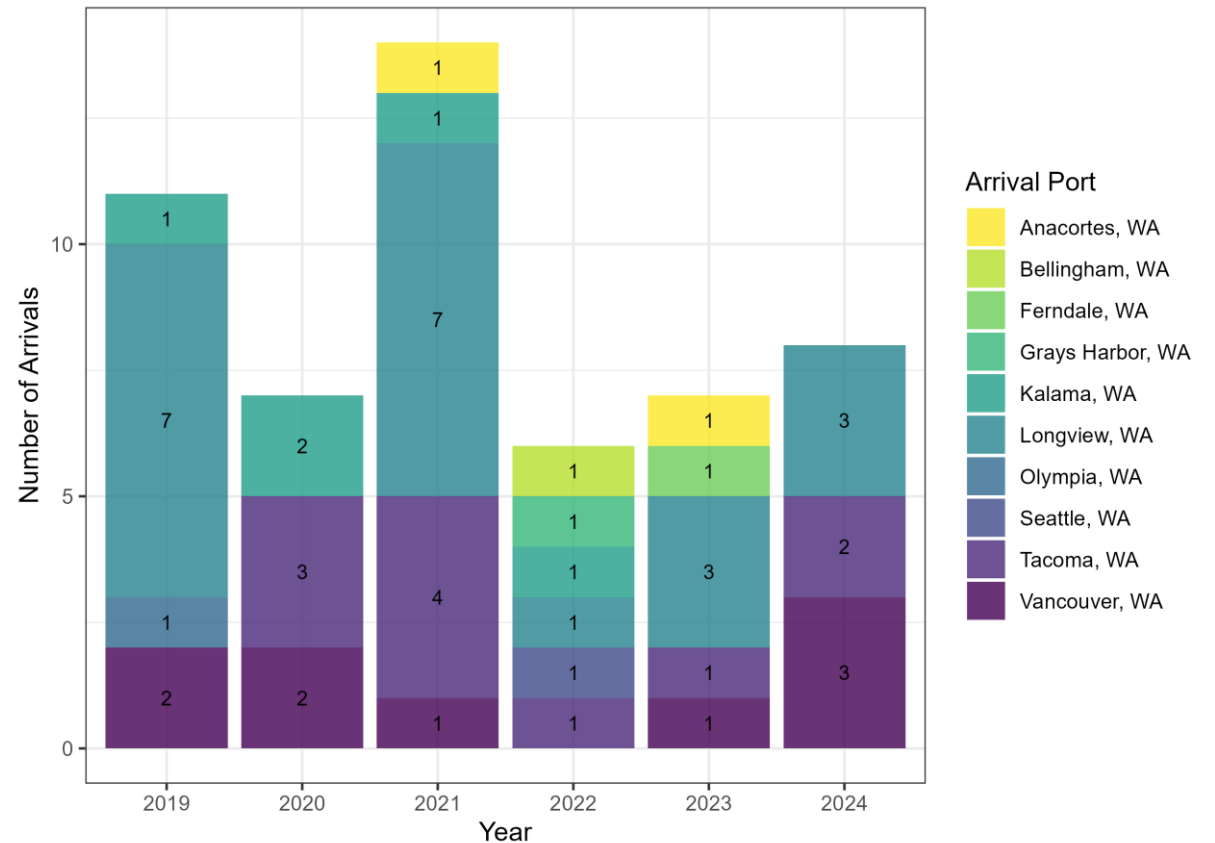
Location	Count
Cle Elum Eastbound	28
Pasco	21
Spokane	2
Ridgefield	1
Clarkston	1
	53



Golden Mussels – Ballast Water Risk



Regulated arrivals from Stockton area, California to Washington ports 2019-2024.



Summary

Quagga and zebra mussels pose an imminent risk

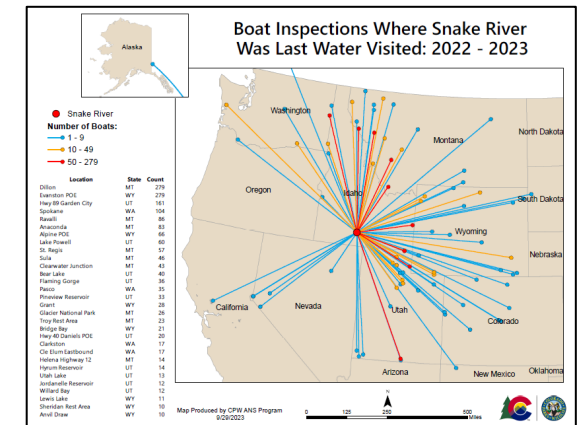
- Known catastrophic impacts to economy, environment, and human health.
- High introduction risk.
 - Population of **quagga mussels** detected in Snake River, Idaho, 375 river miles away. (2024)
 - Marimo moss balls contaminated with **zebra mussels** detected. More than 2,000 moss balls impacted. (2024)
 - Invasive mussel fouled watercraft interceptions:
 - 2024: 13
 - 2025: 3 (since January 1st)
 - Includes largest volume of invasive mussels intercepted on record

Prevention and readiness activities

- Maintain current prevention and readiness activities supported by SFY 2025 proviso through June 30, 2025. WDFW standing ready for the 2025 to 2027 biennium.

Invasive golden mussels

- Rapidly expanding in California. Clear risk of introduction by ballast water discharge, and overland movement.



Questions

Justin Bush

Aquatic Invasive Species (AIS)

Division Manager

Justin.Bush@dfw.wa.gov

564-669-9481

State of Washington

Department of Fish and Wildlife

wdfw.wa.gov/ais

1-888-WDFW-AIS

Protect Your Waters From Aquatic Invasive Species

BEFORE and AFTER launching boat

CLEAN	DRAIN	DRY
Clean interior/exterior of boat, trailer, & vehicle of any organic matter such as aquatic plants & mud. Dispose organic matter & unused bait in trash.	Drain bilge, ballast, wells & buckets before you leave area. Keep bilge plug out during transport.	Dry equipment before launching watercraft into another body of water.

Diagram labels: Anchorage, Trailer, Live well, Engine, Bilge, Ballast, Swim tabs.

For information on FREE boat inspections, call 1-888-WDFW-AIS (933-9247) or visit wdfw.wa.gov/ais.

Before you launch a boat that is not registered in Washington, you MUST purchase an Aquatic Invasive Species Prevention Permit.

How to buy:

- Online at fishhunt.dfw.wa.gov
- Find a license dealer near you at wdfw.wa.gov/licenses/dealers

Funds from permit sales supports efforts to keep Washington's waters free of aquatic invasive species and manage infestations when prevention fails.

Avoid Citations or Fines
Failure to purchase an Aquatic Invasive Species Prevention Permit - Infraction --- RCW 77A.040
Possession of aquatic invasive species without Clean Boat requirements - Infraction --- RCW 77A.010
See infraction or possession of prohibited species - up to 60-day penalty --- RCW 77A.020(a)

Logos: Department of Fish and Wildlife, Stop Aquatic Hitchhikers.

