



Invasive Species Update

Aquaculture

PSMFC 72nd Annual Meeting
Skamania Lodge, WA



WDFW Boat Wash Station, Ephrata, WA

September 24, 2019

Stephen Phillips, Senior Program Manager

PSMFC Aquatic Invasive Species Program Since 1999

Main Species of Concern: Zebra and Quagga Mussels

Talk Outline

Update on Quagga/Zebra Mussels -- WRDA

European Green Crab

Northern Pike

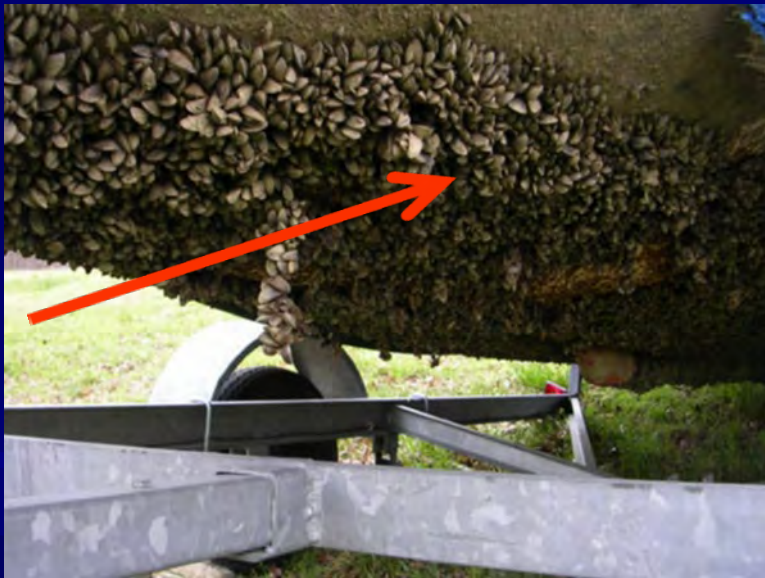
Aquaculture

PSMFC AIS Program Support Provided by



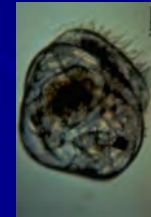
ZEBRA/QUAGGA MUSSEL (AKA Dreissenids)

- ❑ Significant Biofouler, filter enormous amounts of plankton disrupting the food chain, No natural predators of consequence
- ❑ Can live out of water for up to two weeks+
- ❑ Move by attaching to watercraft/equipment (adults) or by contaminated water (downstream flow, Ballast) (larvae AKA “veligers”)



Ballast Tanks in Recreational Watercraft (*wakeboard boats*)

Veliger



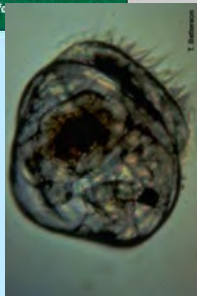
#1 DRESSSENID VECTOR: WATERCRAFT



Decon by NDOW staff at Lake Mead NRA

Photo Credit K. Vargas, NDOW

Zebra and Quagga Mussel Sightings Distribution
Dreissena polymorpha and *D. rostriformis bugensis*



**Tiber Reservoir, Missouri Basin
2016**

1988

**Canyon Ferry Reservoir, Missouri Basin
2016, should be de-listed in early 2020**

2007

STATUS

- Infested
- Positive
- Suspect
- Eradicated
- Delisted
- Failed



Water Resources Reform and Development Act (WRDA) (2014, 2016, 2018)

April 2017: Watercraft Inspection and Monitoring 50/50 Cost Share Program Begins; PSMFC signs agreement to administer the \$\$\$ with the USACE (Walla Walla) on behalf of OR, ID, MT and WA.

2018 WRDA Reauthorization (The Expansion)

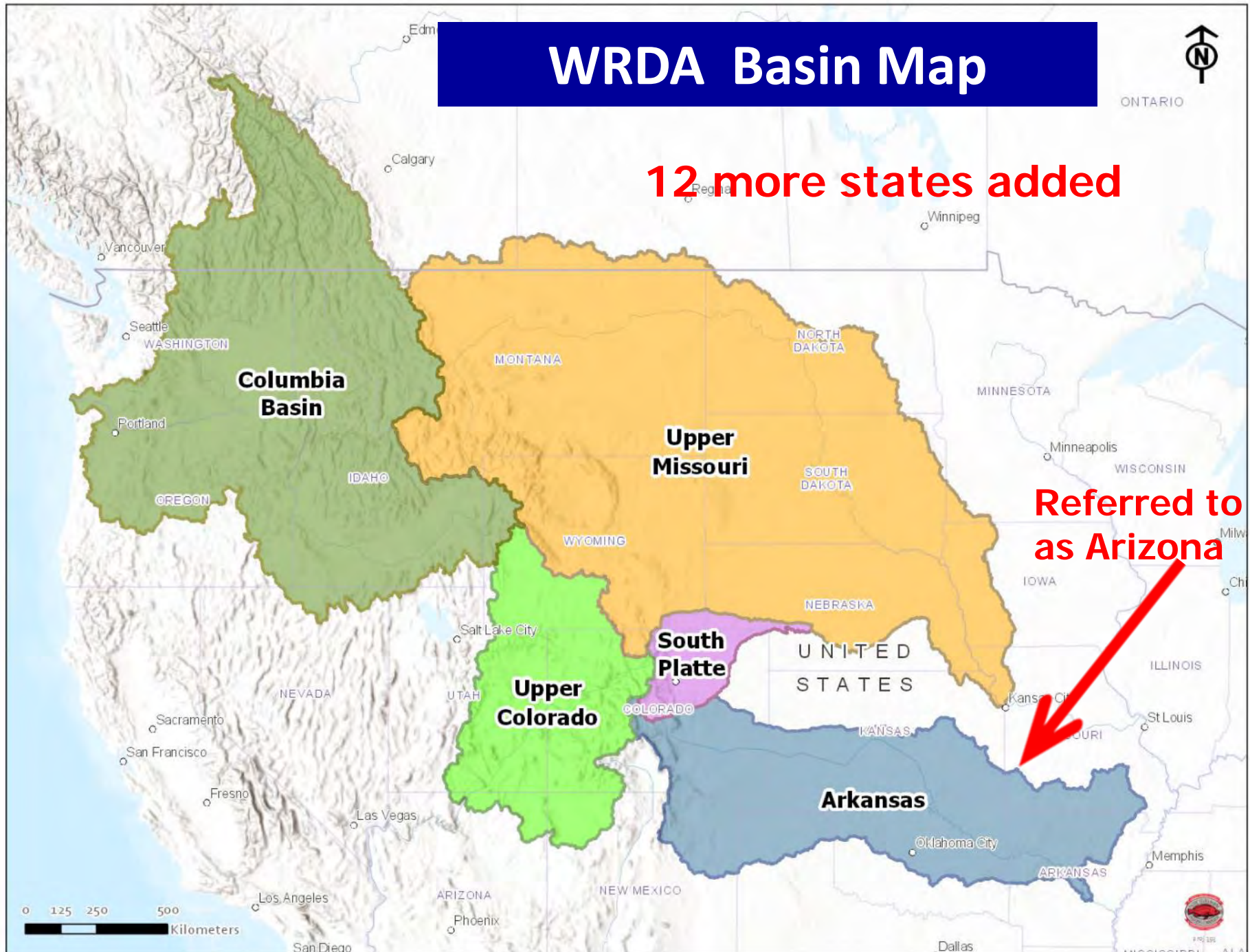
“(A) WATERCRAFT INSPECTION STATIONS.—In carrying out this section, the Secretary shall establish (as applicable), operate, and maintain new or existing watercraft inspection stations—

- “(i) to protect the Columbia River Basin;
- “(ii) to protect the Upper Missouri River Basin; and
- “(iii) to protect the Upper Colorado River Basin and the South Platte and **Arizona** River Basins.

WRDA Basin Map

12 more states added

Referred to
as Arizona



FY 2020 ENERGY AND WATER FEDERAL APPROPRIATIONS

HOUSE

U.S. Army Corps Engineers

Aquatic Plant Control Program (WRDA Directed)

- Watercraft Inspection Stations: **\$15,000,000** (FY 2019 \$5 Million)
- Monitoring: **\$3,000,000** (FY 2019 \$1 million)

SENATE

- \$5,000,000 shall be for watercraft inspection stations and rapid response,
- \$1,000,000 shall be for related monitoring
- Of the funding recommended for the Aquatic Plant Control Program:
\$1,000,000 shall be for activities for monitoring, surveys, and control of
flowering rush

PREVENTION: WATERCRAFT INSPECTION STATIONS

Samuels, ID



Troy, MT



Ashland, OR



Spokane, WA





Washington Department of Fish and Wildlife Police

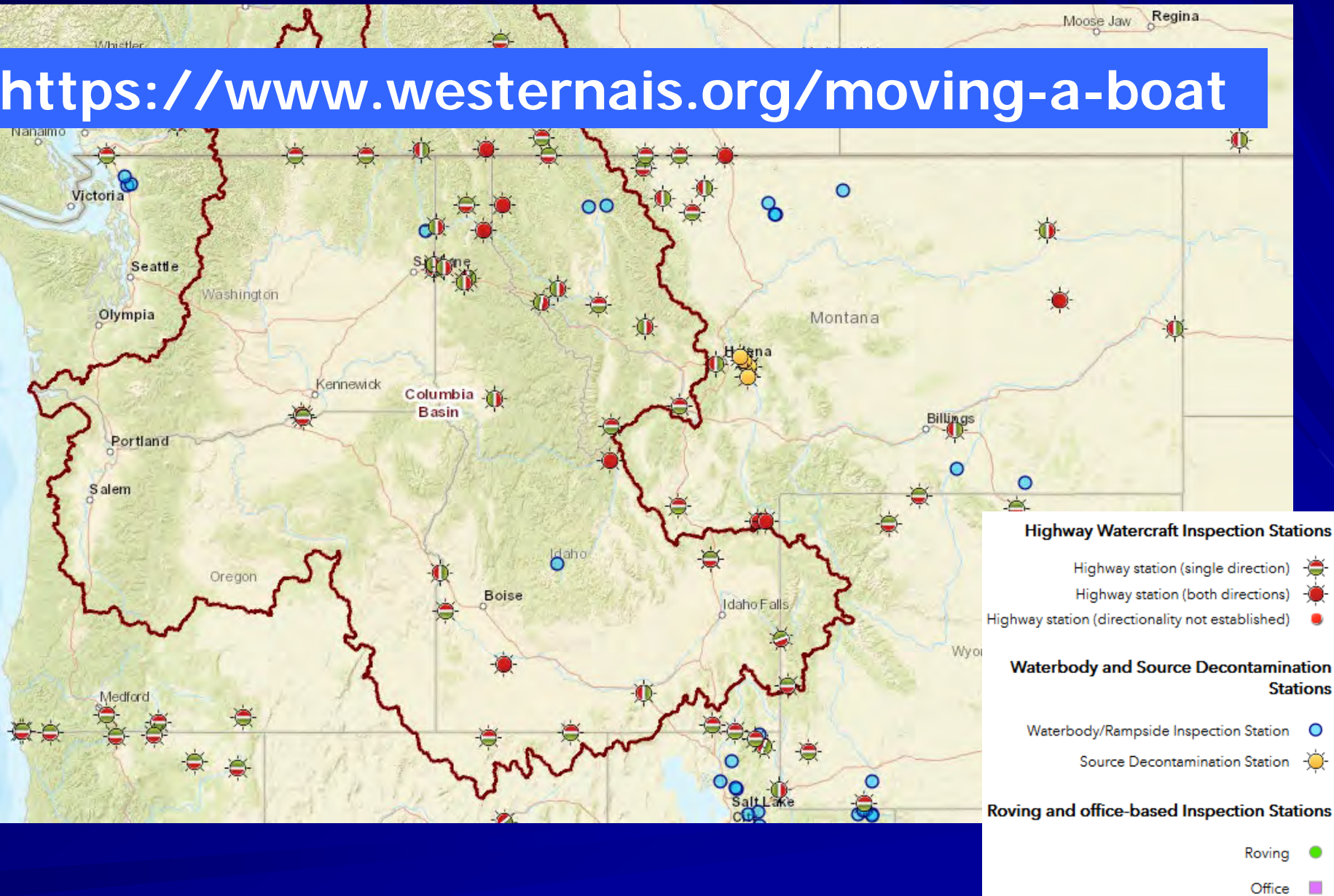
Meet Puddles!

She can detect mussels that humans cannot see (veligers).



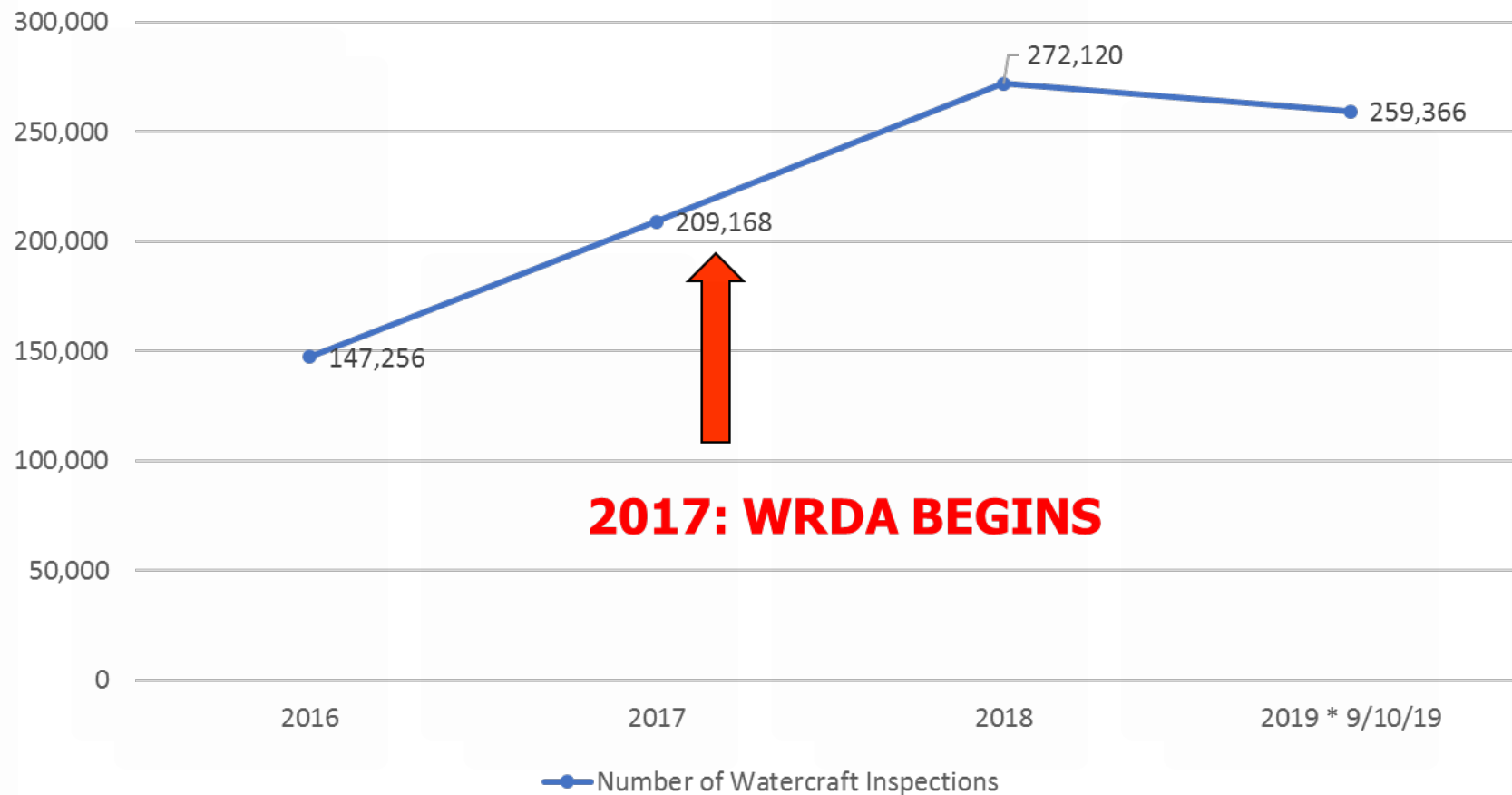
Map of Watercraft Inspection Stations in Western N. A.

<https://www.westernais.org/moving-a-boat>



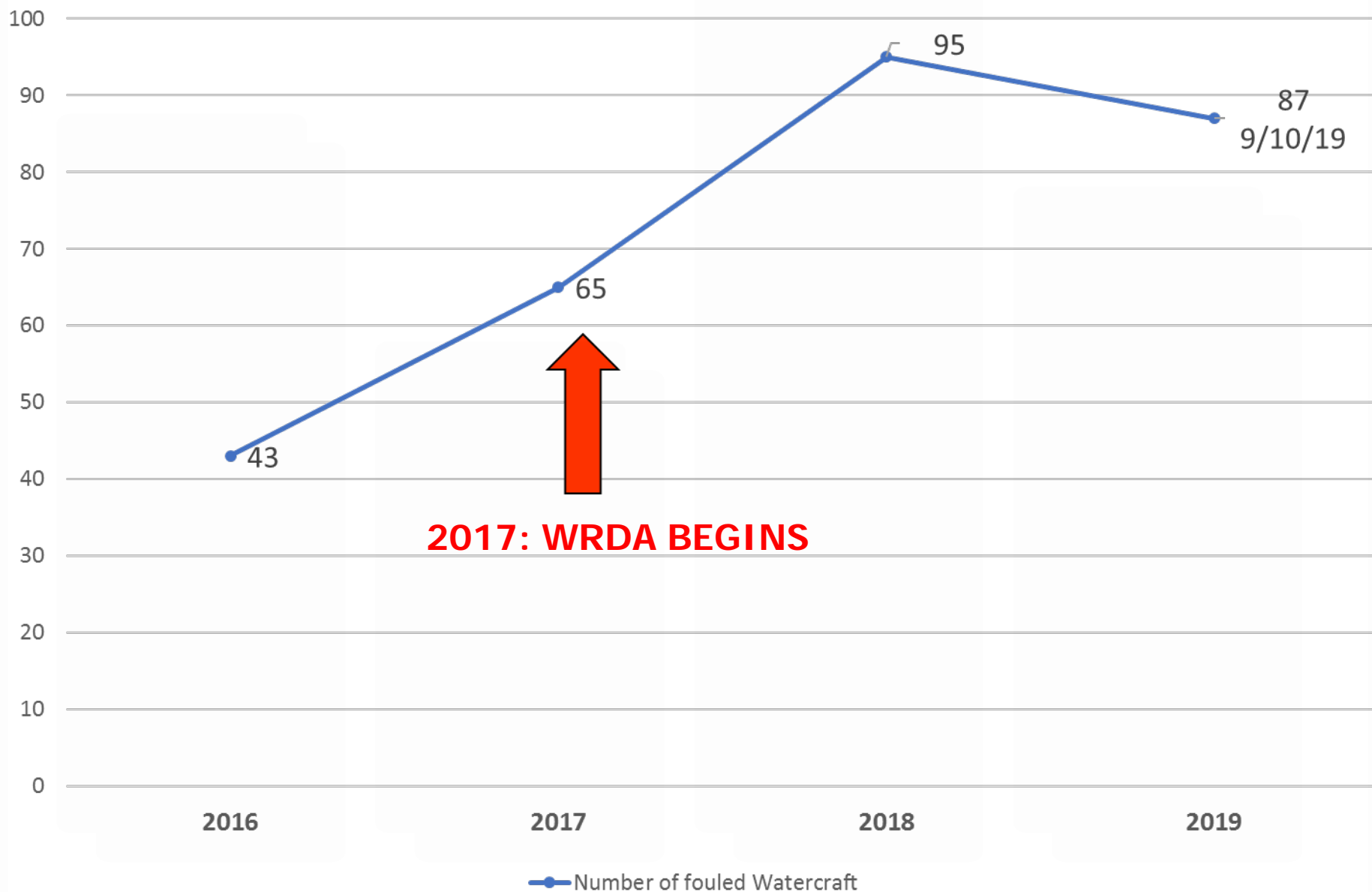
Number of Watercraft Inspections 2016- 2019 (Oregon Washington Montana Idaho)

(Through 9/10/19)

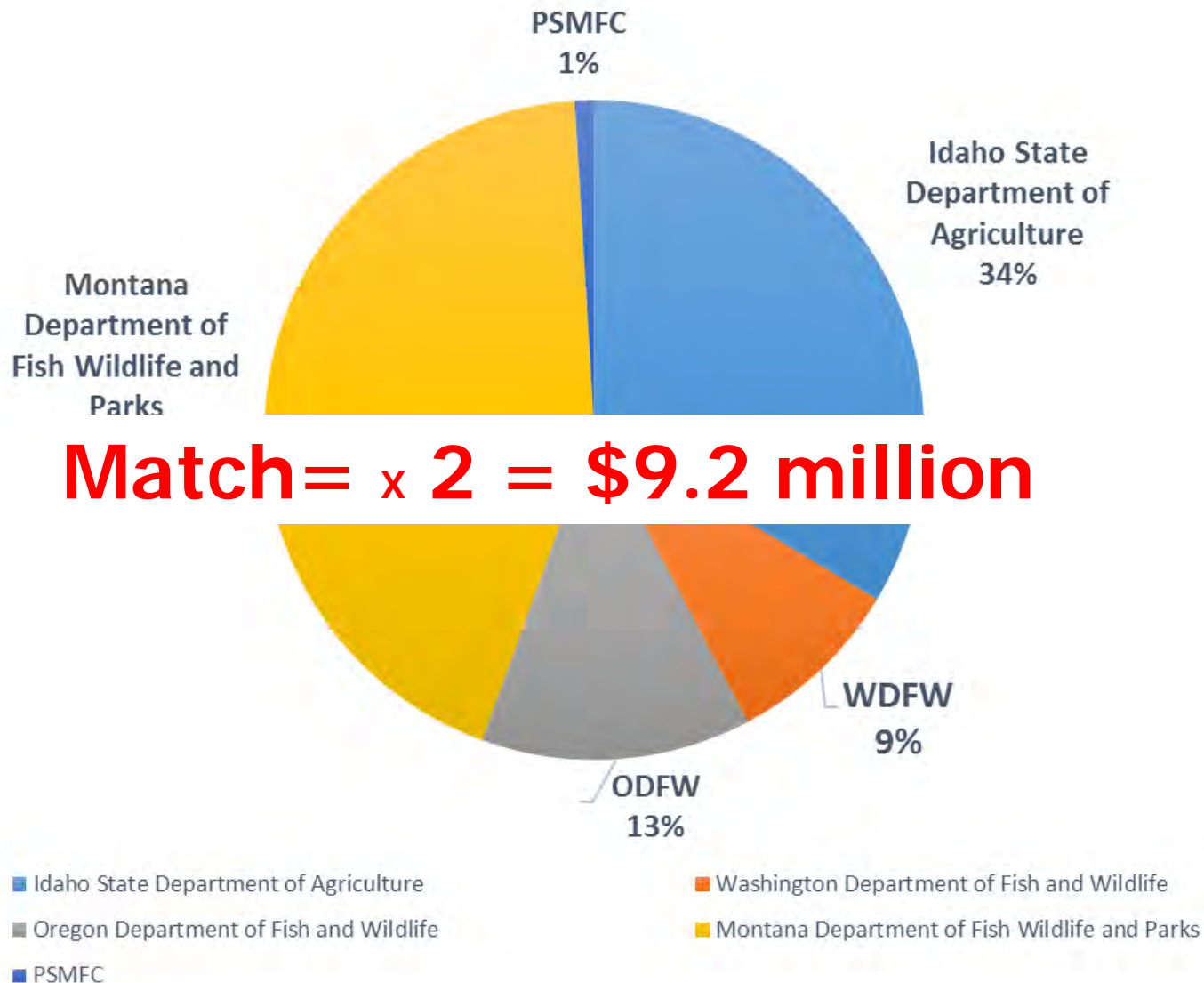


Number of Dreissenid Fouled Watercraft Interceptions

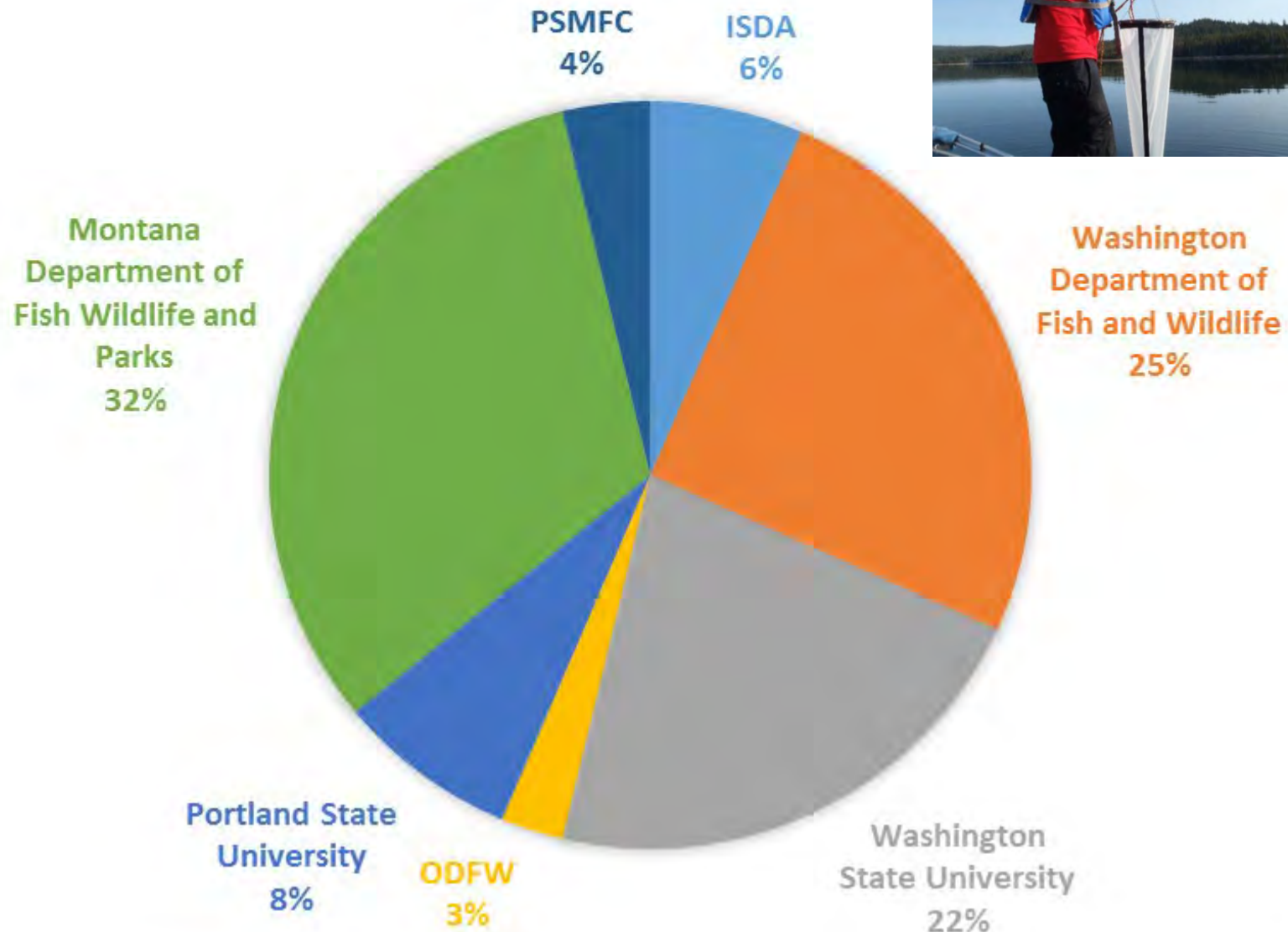
Oregon Washington Montana Idaho



USACE Funded 2019 Watercraft Inspection \$4.6 Million



USACE 2019 MONITORING PROGRAM - \$719,983



WRDA 2020 – What Next?

REAUTHORIZATION appears to be coming

FLOWERING RUSH – We hope to get money on the ground in CY 2020



RAPID RESPONSE – We are “close” to entering into a cost share agreement with the USACE for a 50/50 emergency RR fund

Northern Pike

(Esox Lucius)



Huge pike with 16" kokanee in its stomach
(Source: NWPCC)

Current Known Distribution of Northern Pike in the Columbia Basin



Data provided by: Montana Department of Fish, Wildlife and Parks, Idaho Department of Fish and Game, Washington Department of Fish and Wildlife

May 2019 NWPCC Independent Scientific Advisory Board Report:

“It is likely that even with the best efforts in public education, early detection, and control or eradication, northern pike will eventually invade the anadromous zone, either naturally or by human agents.”

And once they do, the pike are likely to “drastically reduce salmonid abundance, especially in low-gradient river segments with wide floodplains.”

Control? Stan Gregory, OSU: “ Detection could be done with genetic tools, such as eDNA, and suppression could be done by releasing fish with “Trojan” sex chromosomes (YY males). **Overtime – about a dozen years – the makeup of northern pike in the river would be all males with no way to reproduce**

August 2019: PUDs, Tribes Asking For Help From Anglers In Reducing Northern Pike Numbers Above Grand Coulee; \$10 For Every Pike Head

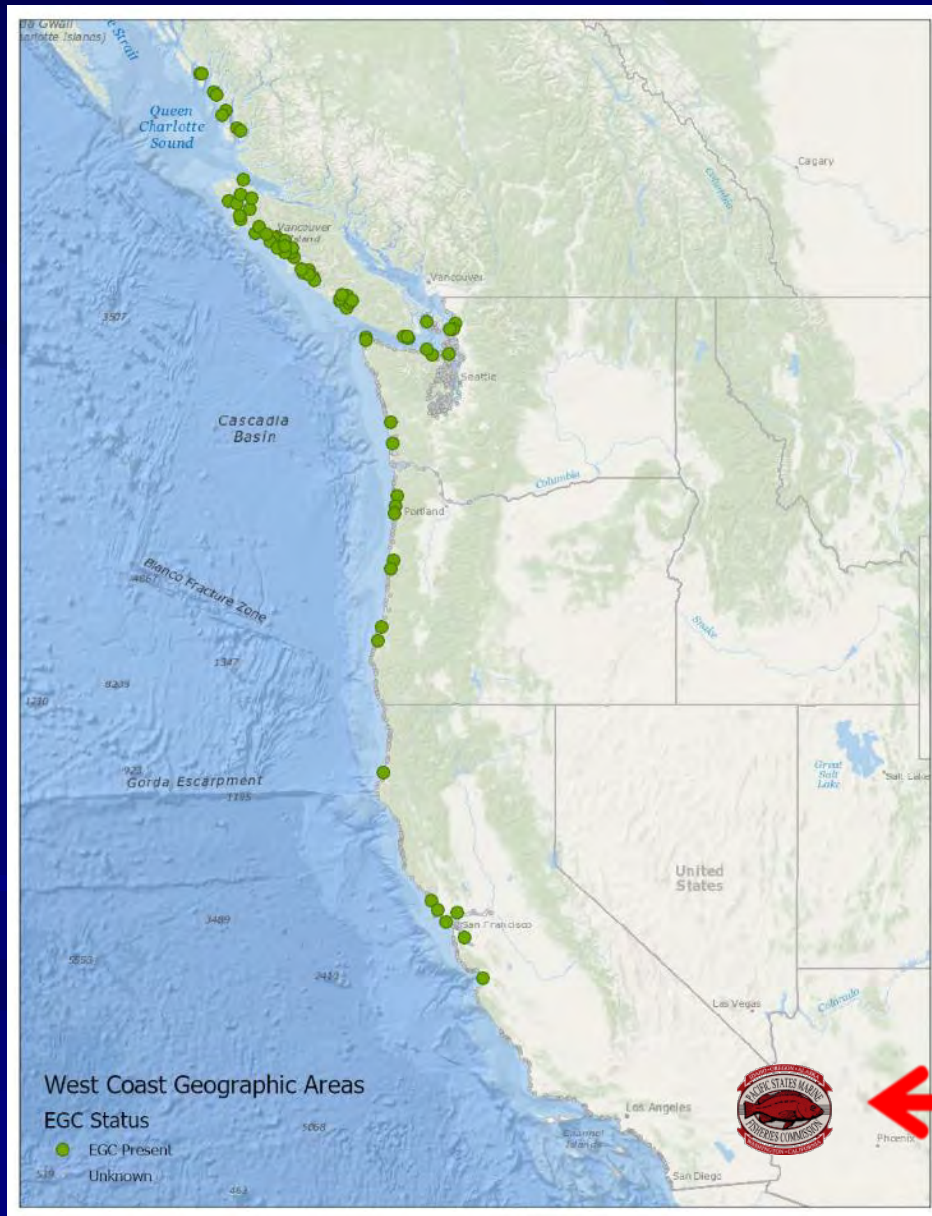
September 2019: the Washington Fish and Wildlife Commission is poised to upgrade pike from a Level 3 invasive species to a Level 1 invasive species, which would give a high-priority ability to curb the spread

European Green Crab

(*Carcinus maenas*)



European Green Crab Distribution



They prey on clams, oysters, mussels, “potentially” compete with Dungeness crab; **can eliminate eelgrass beds**

Introduced into California from the East coast in the 1970's/80's (bait was Likely vector)

By 1998 had moved north into Vancouver Island with an el Niño facilitated transport

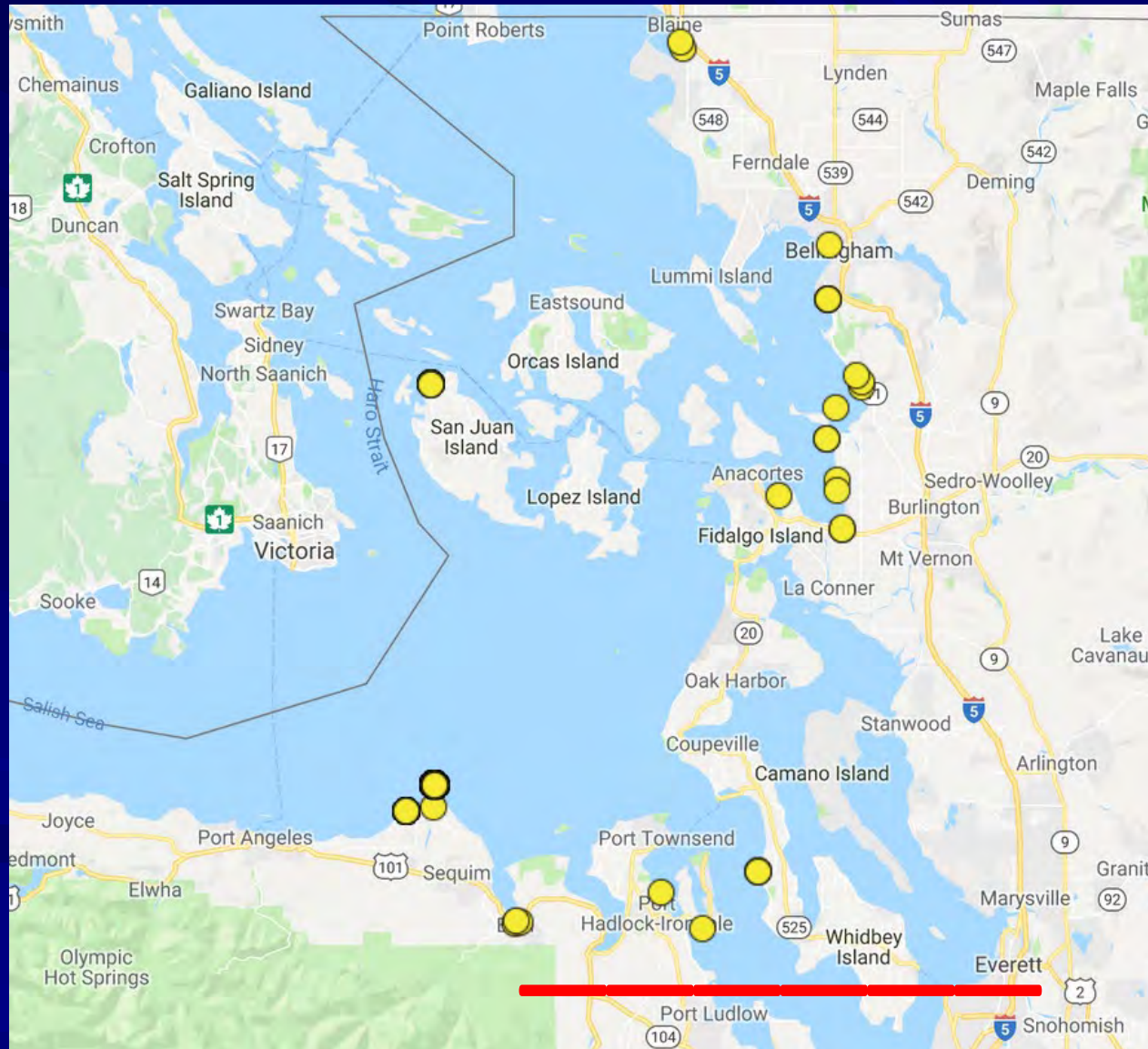
Range expansion during el Niño /positive PDO years ..population **BOOMING**

PSMFC supports one WDFW EGC staffer and OSU researcher Sylvia Yamada,

← We host WC Green Crab Database (Kate Sherman, PSMFC)

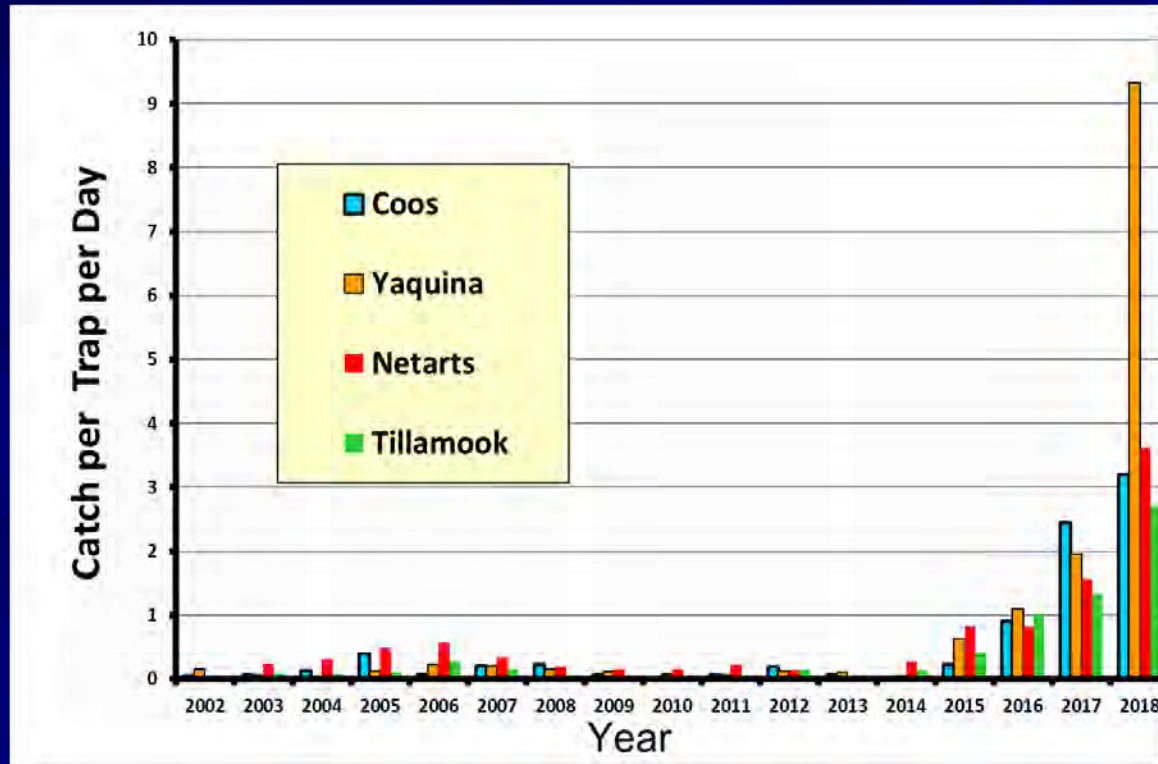
European Green Crab Locations in Washington

(Source: Washington Sea Grant)



European Green Crab Abundance in Oregon

(# per trap per day, **Draft** Source: S. Yamada, OSU)



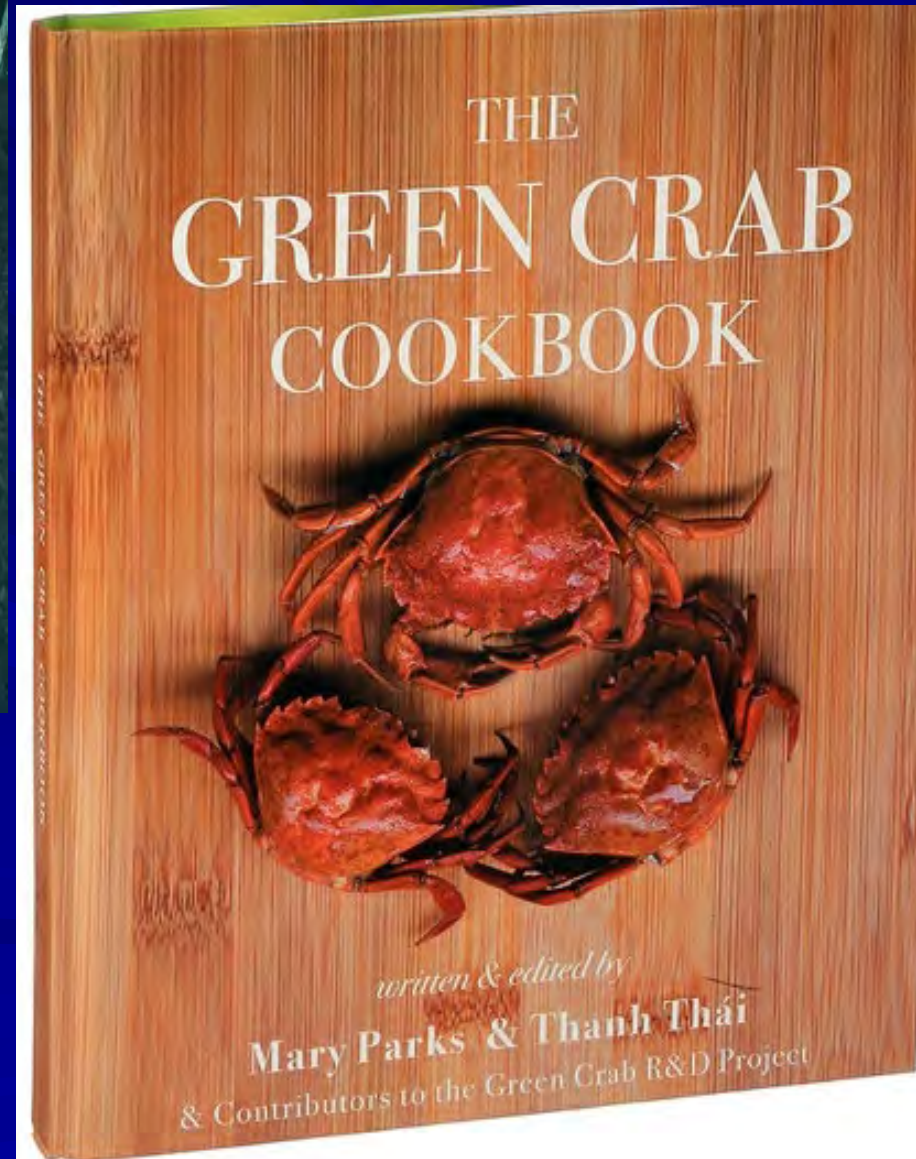
2019 recruitment this year is also "good". It will be the 5th year in a row.

Source: Sylvia Behrens- Yamada Oregon State University

Green crabs in Freeport, Maine destroyed
local salt marshes and eelgrass beds.
"Ecological Engineers"



Can we harvest and eat our way out of this ?





Pheromones: A novel new method to monitor and control the invasive green crab

Joerg Hardege, Nicola Fletcher (Hull University, England), and Sylvia Yamada (Oregon State University)

Slow release doses of natural green crabs pheromones have been produced

Field Work: South Slough Estuarine Research Reserve (Coos Bay) is ongoing w/Sylvia Yamada right now

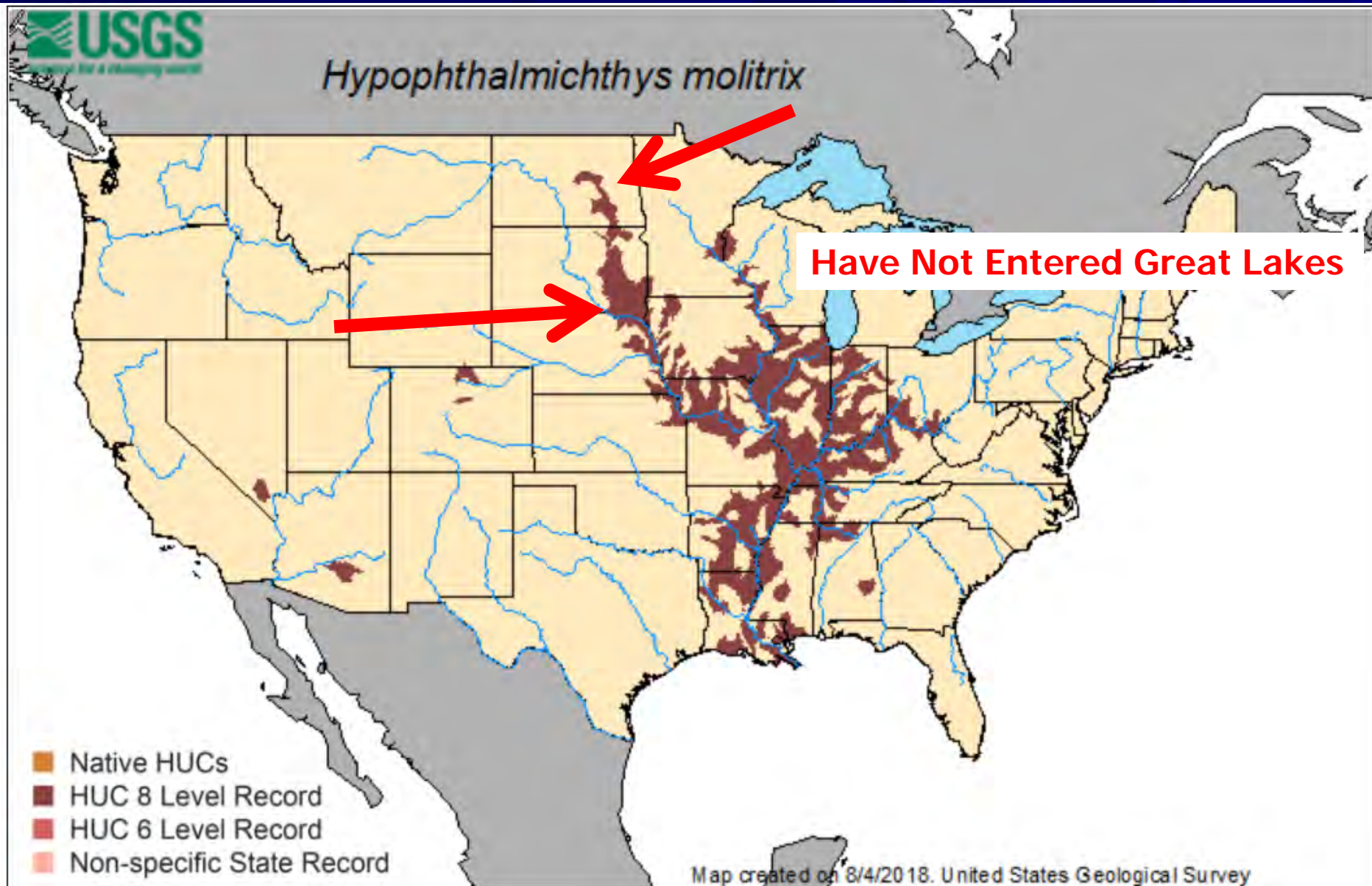
This is as such a vital step towards proof of principle that in the aquatic environment chemical signals (pheromones) can be used to monitor and manipulate animal behaviour i.e. for pest control.

[?] [?] [?] [?]

Asian Carp (Mississippi Drainage)



Asian Carp (Mississippi Drainage)



"Carp-Crete"

(Above Grade Environmental)



Our Process

Making an industrial use out of Asian carp could lead to the eradication of the fish by using Asian carp fish ash (the burned remains of the fish) as a concrete admixture, our product "Carp-Crete" is lighter then conventionally used concrete. The applications for this could be used on projects such as roads and retaining walls and various other projects where concrete can be used.



Carp-Crete

"Carp-Crete" is a concrete which uses Asian carp fish ash (the burned remains of the carp) as an admixture. The core principle behind the development of Carp-Crete stems from attempting to find a beneficial use for a waste product in a civil engineering application. Our goal is to show that fish ash can be used to make a concrete mix.

Miscellaneous Critters



Green Iguana (*Iguana iguana*)

July 3, 2019: Florida authorities [FWC] beg locals to slaughter invading iguanas (*NY POST*)

July 25, 2019 FWC Commissioner Rodney Barreto.

"Unfortunately, the message has been conveyed that we are asking the public to just go out there and shoot them up. This is not what we are about; this is not the 'wild west.' If you are not capable of safely removing iguanas from your property, please seek assistance from professionals who do this for a living,"

National Geographic: **Argentina brought beavers to Tierra del Fuego. It was not a good idea. 1946, the Argentine military flew in 20 beavers from Canada.**

Today = 110,000



Photograph by Luján Agusti, National Geographic.

An invasive snail species was discovered in luggage at the Atlanta airport thanks to a pair of beagles



(l-r) "Candie" and "Chipper" members of the CBP Beagle Brigade sniffed out these snails and food



Man arrested at JFK accused of smuggling dozens of live finches inside hair curlers



AQUACULTURE

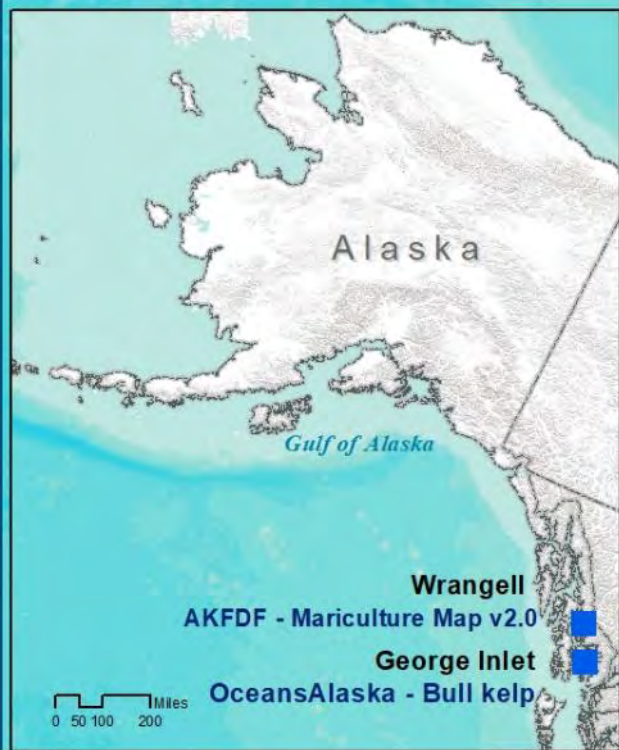
The 2017 appropriations bill included funding and direction for the NMFS Aquaculture Office to conduct regional marine aquaculture pilot programs

NOAA then partnered with ASMFC, GSMFC, PSMFC on marine pilot programs (“research”)

PSMFC first RFP in 2018

No finfish projects

PSMFC Pilot Marine Aquaculture Projects



Manchester
PSI - Sea Cucumber

Seattle
UofW
Genomic Processes (Geoduck)

Washington

Garibaldi
Dulse Energy, Inc
Dulse Seaweed

Oregon

Pacific Ocean

Moss Landing
San Jose State
Rock Scallop

California

Santa Barbara
The Cultured Abalone Farm - Native seaweed
&
Holdfast Aquaculture - Mediterranean mussel

San Diego
Hubbs SeaWorld - Ogo, Sea Lettuce, and Nori



2019 Regional Oyster Consortia Projects

In FY 2019, Congressional funds were provided to NOAA Fisheries Office of Aquaculture to support ongoing research for oyster production in coastal areas.

Assessment of ecological function and interactions of oyster culture and eelgrass

- **Pacific Shellfish Institute, Olympia, WA:** Assessment of ecological function and interactions of oyster culture and eelgrass
- **Oregon State University, Hatfield Marine Science Center: Preparing for Future Challenges** – Threats from Ocean Acidification, *Vibrio Coralliilyticus* and OSHV-1 μ VAR [Herpes] to West Coast Oyster Farmers

Thank You!

Questions?

PSMFC AIS WEBSITE: WWW.WESTERNAIS.ORG

