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2018 Salish Sea Ecosystem Conference
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Apr 5th, 11:15 AM - 11:30 AM

Dye and microbial study in response to outbreak of norovirus-like illnesses from consumption of shellfish from Hammersley Inlet, Washington

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Raw Oyster Norovirus Outbreak: Shellfish Beds Near Shelton At Fault

State health officials have closed shellfish beds related to a local norovirus-like outbreak, the largest along the Hammersley Inlet.

By Neal McNamara (Patch Staff) - Updated April 17, 2017 6:28 pm ET

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SHELTON, WA - State health officials have traced the

Popular Video



Experts Warn Contaminated Floodwater Could Be Harvey's Next Threat

Trending Now Across Patch

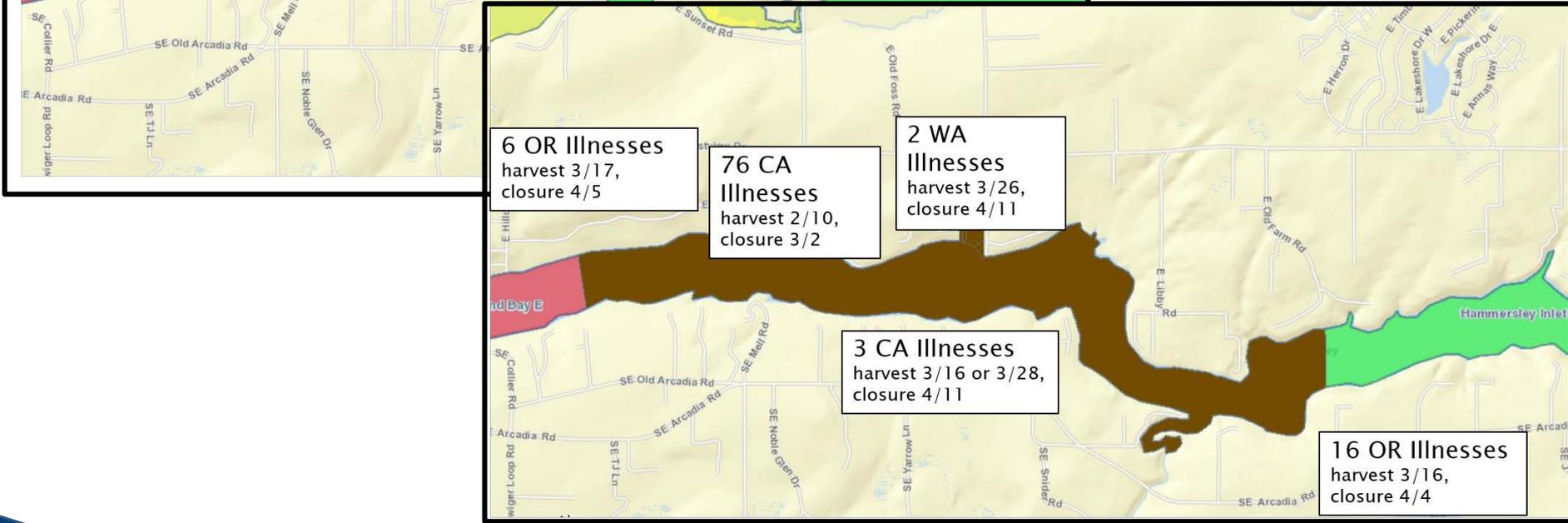
- 1. Houston Cop 'Laid Down Life' For Harvey Victims
- 2. Harvey Expected To Landfall Again East Of Houston
- 3. Politician Defends His Confederate Flag Photo
- 4. Joel Osteen Blasted Amid Hurricane

Dye and microbial study in response to outbreak of norovirus-like illnesses from consumption of shellfish from Hammersley Inlet, Washington

Mark Toy, Environmental Engineer
Office of Environmental Health & Safety
Salish Sea Ecosystem Conference
April 5, 2018



Hammersley Inlet



Study Objectives

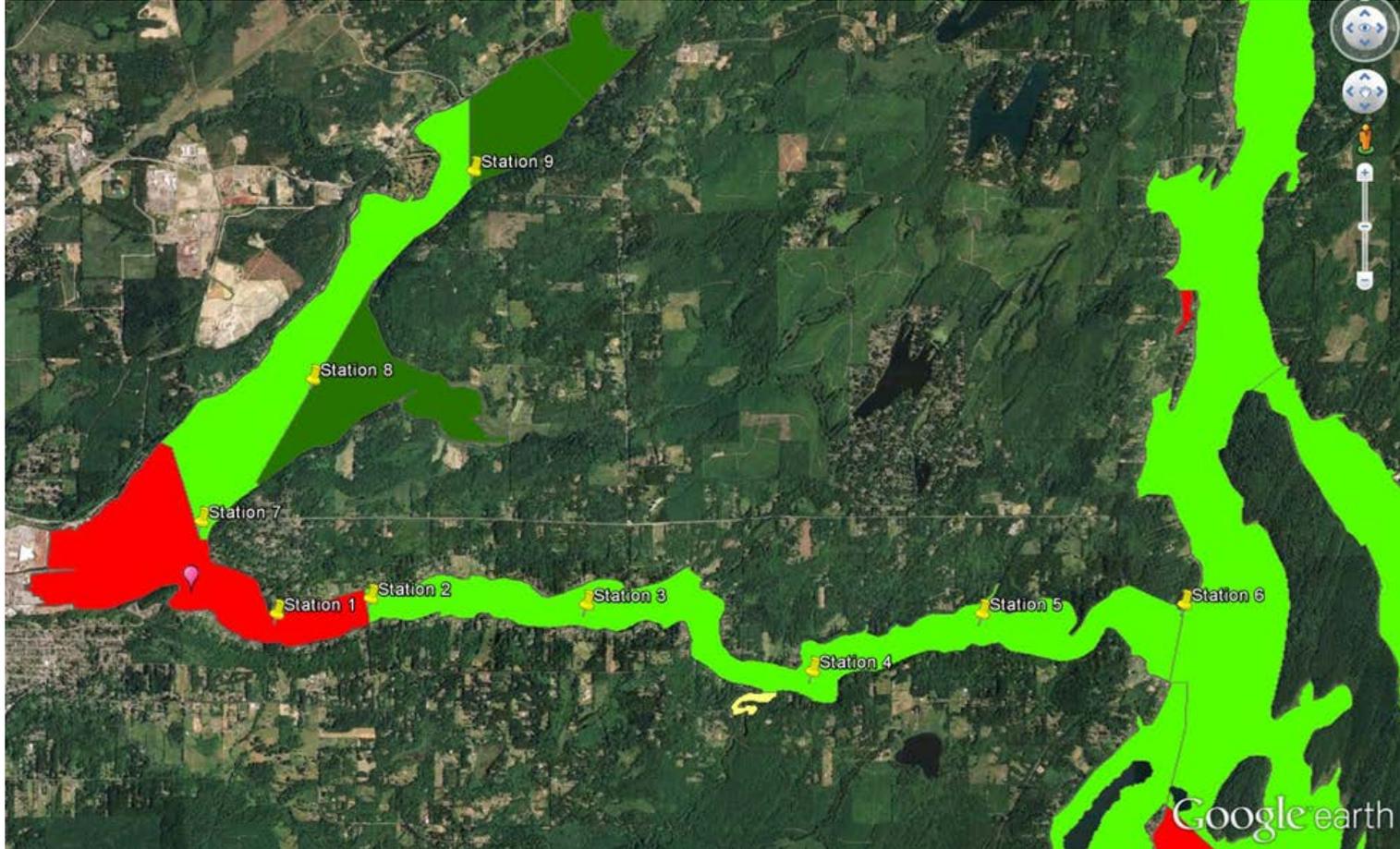
- ▶ Determine steady state dilution, time of travel (ToT) to Hammersley Inlet sanitary line from Shelton WWTP outfall
- ▶ Determine treatment efficiencies of Shelton WWTP under different operational conditions
- ▶ Measure microbial accumulation in oysters in Hammersley Inlet
- ▶ Determine potential of WWTP and other pollution sources to contaminate oysters in Hammersley Inlet

Elements of Study

- ▶ Sentinel oyster cages + instruments
- ▶ Testing of wastewater along treatment train
- ▶ Testing surface discharges in growing area for bacteria and viruses
- ▶ Dye injection at WWTP and tracking of plume
- ▶ Study participants: DOH, FDA, Ecology, WDFW, Squaxin Tribe, Mason County, and City of Shelton

Shelton WWTP Microbial Results

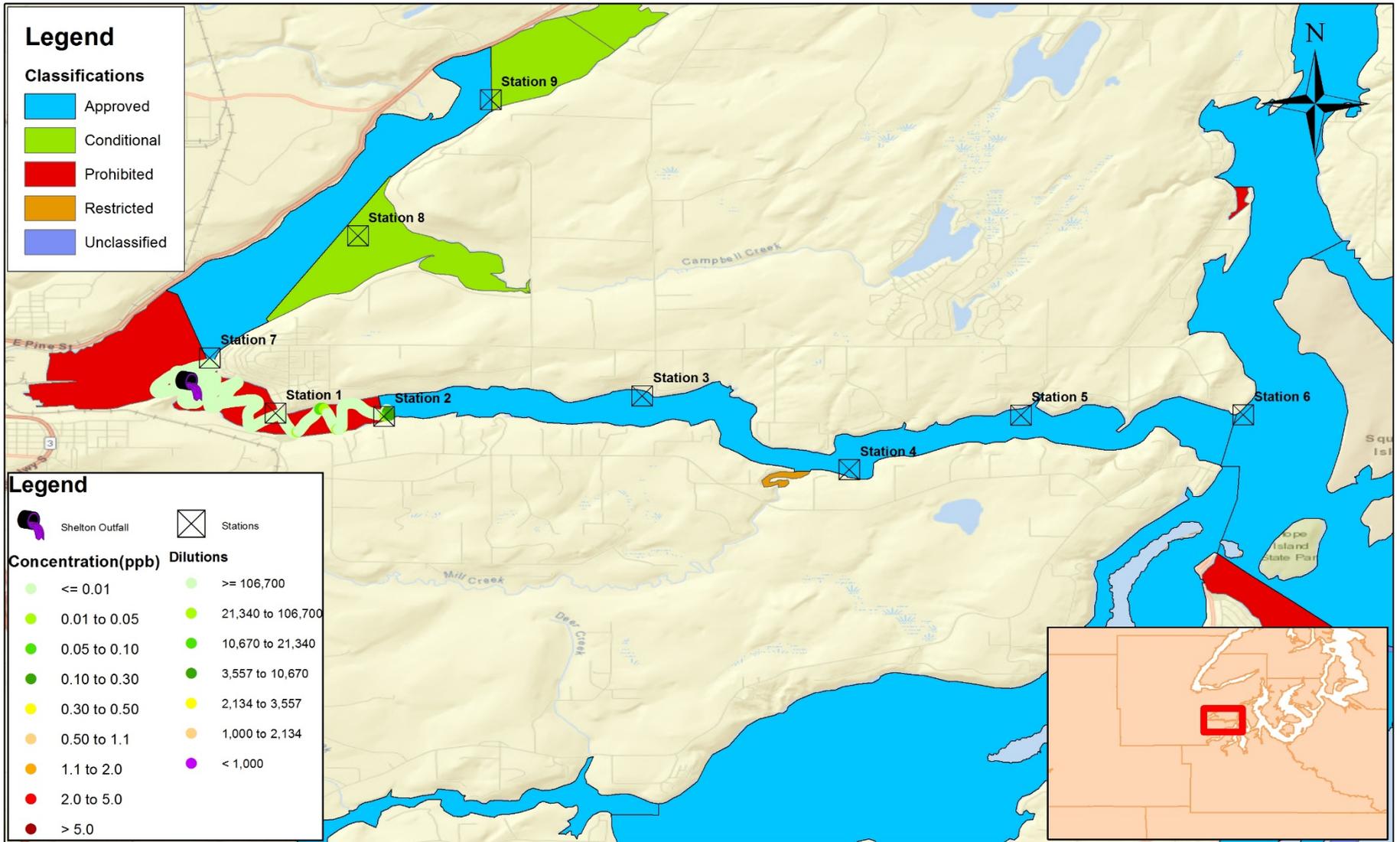
- ▶ Sampling 11/29 to 12/2 every few hours along treatment train
- ▶ Flows 3.7–3.9 MGD (MMDF 4.41 MGD)
- ▶ 0.25” rain on 11/30, 0.74” on 12/1 (7.15” in week prior to study)
- ▶ Generally, influent FC 10^6 – 10^7 , 2–3 log inactivation prior to disinfection, 5–6 log inactivation with disinfection.
- ▶ Generally, influent MSC 10^4 – 10^6 . 2–4 log inactivation prior to disinfection, <10 after disinfection



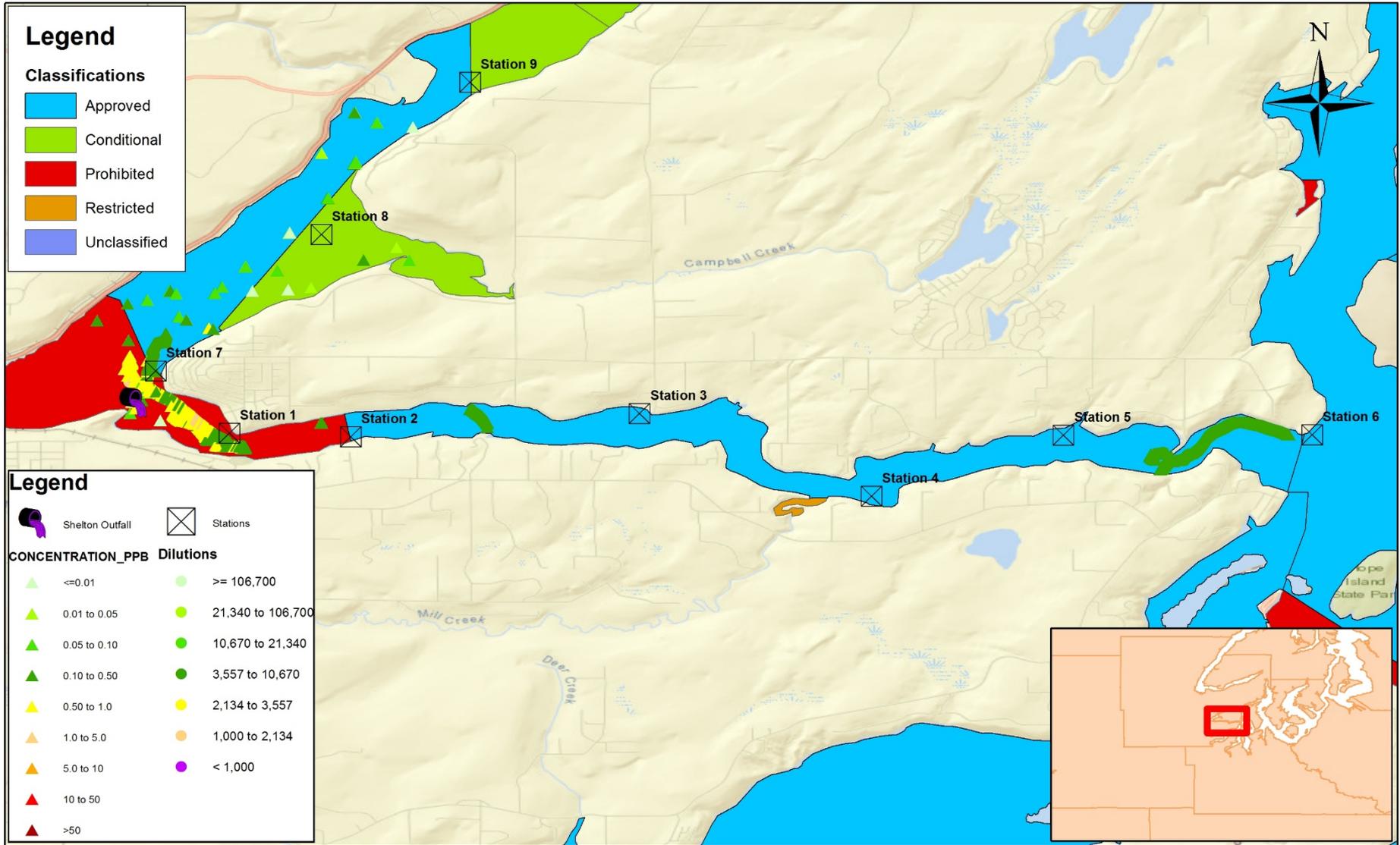
Oyster sampling results

MSC Results (PFU/100 g)							
Date	Station 1	Station 2	Station 3	Station 4	Station 5	Station 6	Totten
Dec. 11	<10.9	476	191	51	Lost	106	<8.9
Jan. 10	Lost	2554	1692	Lost	369	Lost	<10.9
FC Results (CFU/100 g)							
Date	Station 1	Station 2	Station 3	Station 4	Station 5	Station 6	Totten
Dec. 11	<17.9	<17.9	<17.9	45	Lost	78	40
Jan. 10	Lost	20	20	Lost	<17.9	Lost	<17.9

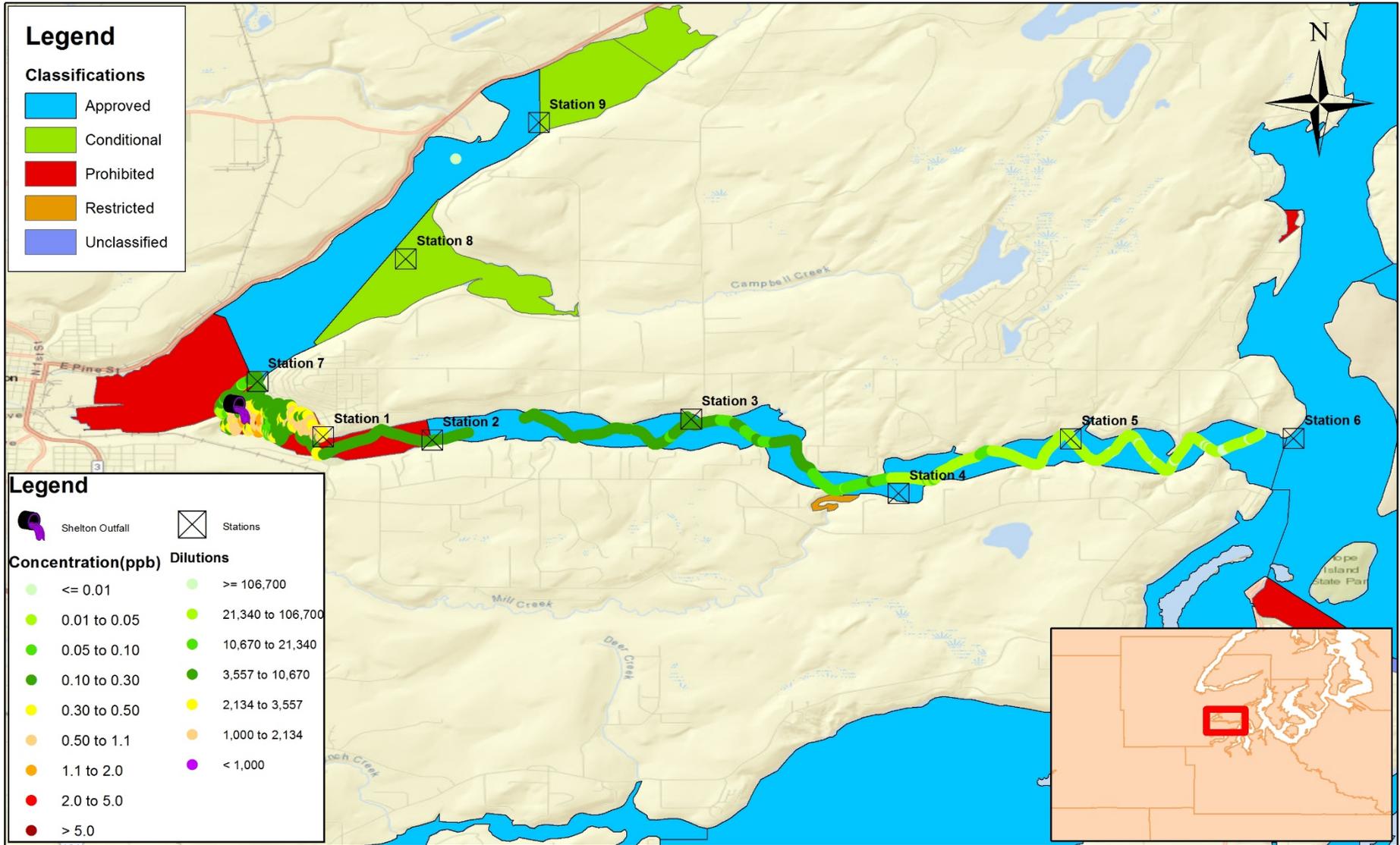
Shelton, WA, December 1, 2017 - Minor Ebbing



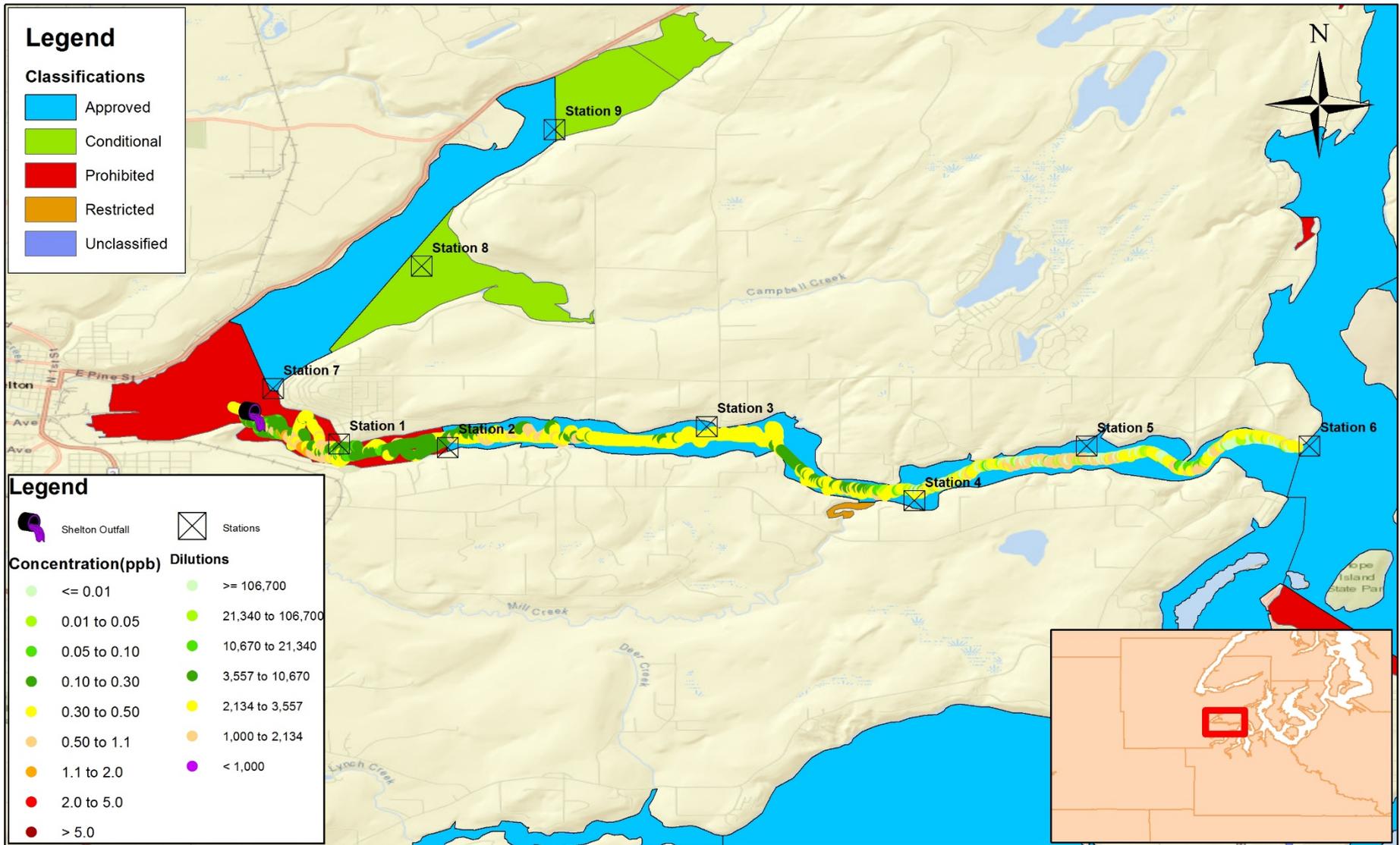
Shelton, WA, December 1, 2017 - Day 1 Flooding (Seabird)



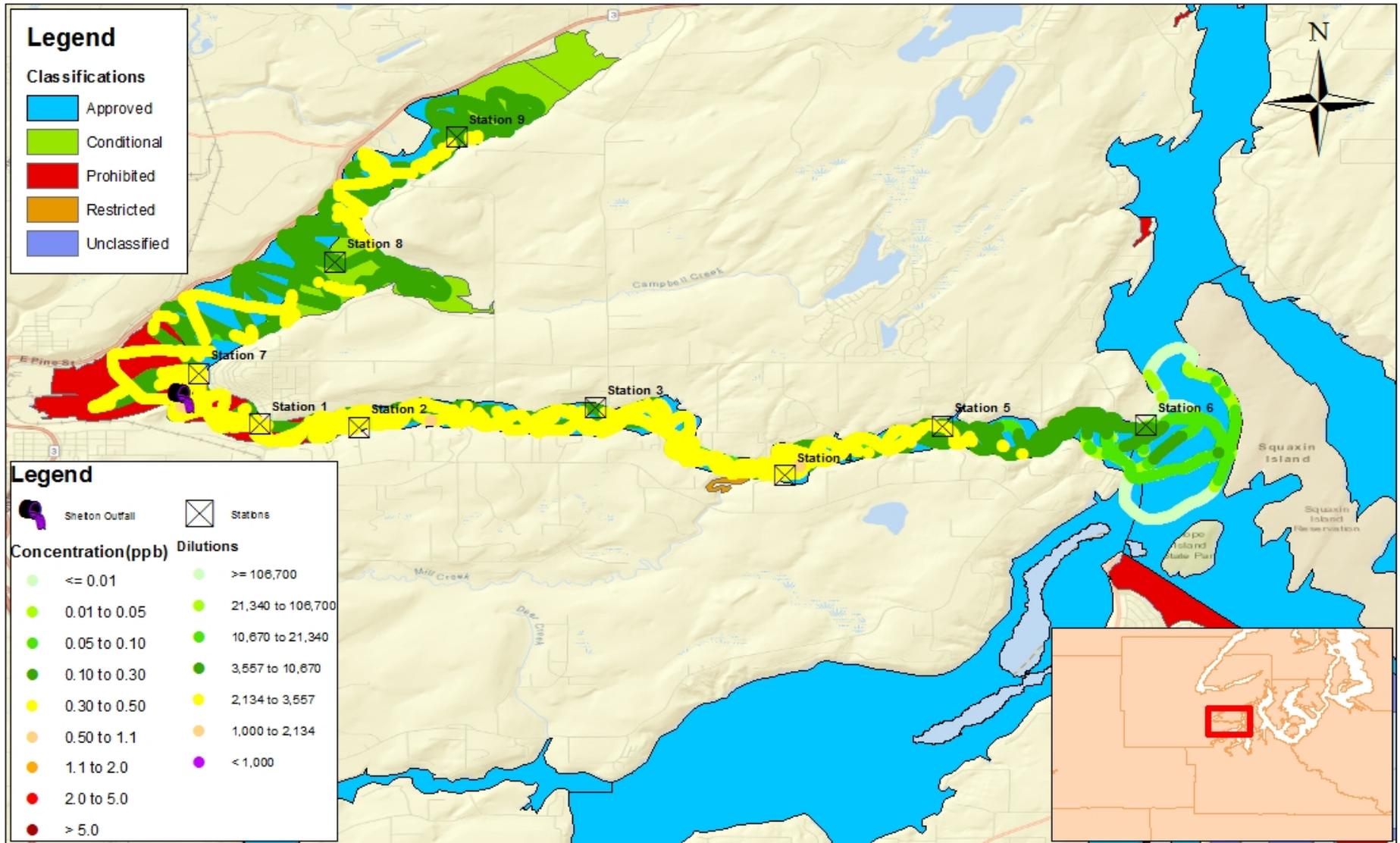
Shelton, WA, December 1, 2017 - Flooding



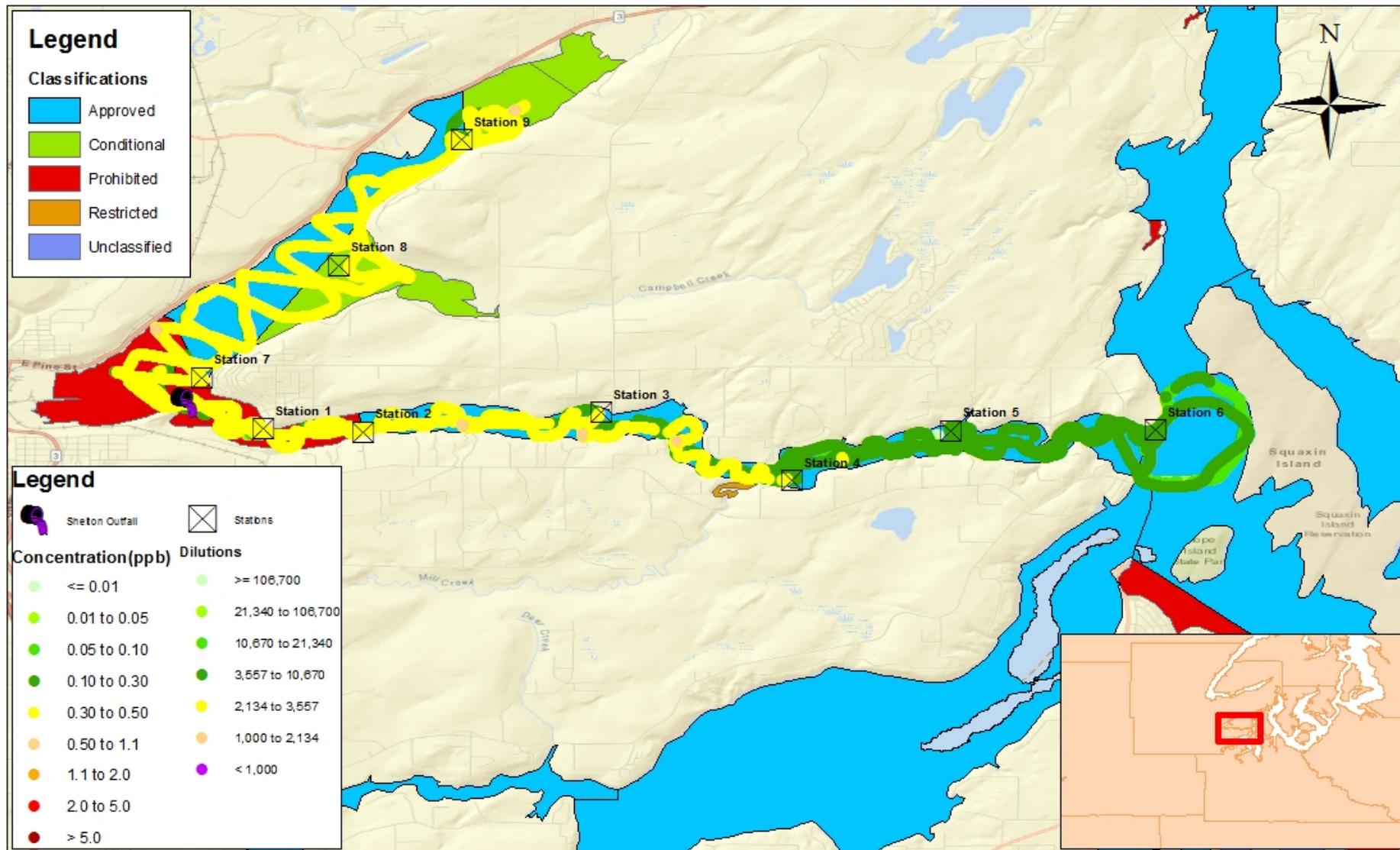
Shelton, WA, December 1, 2017 - Major Ebbing



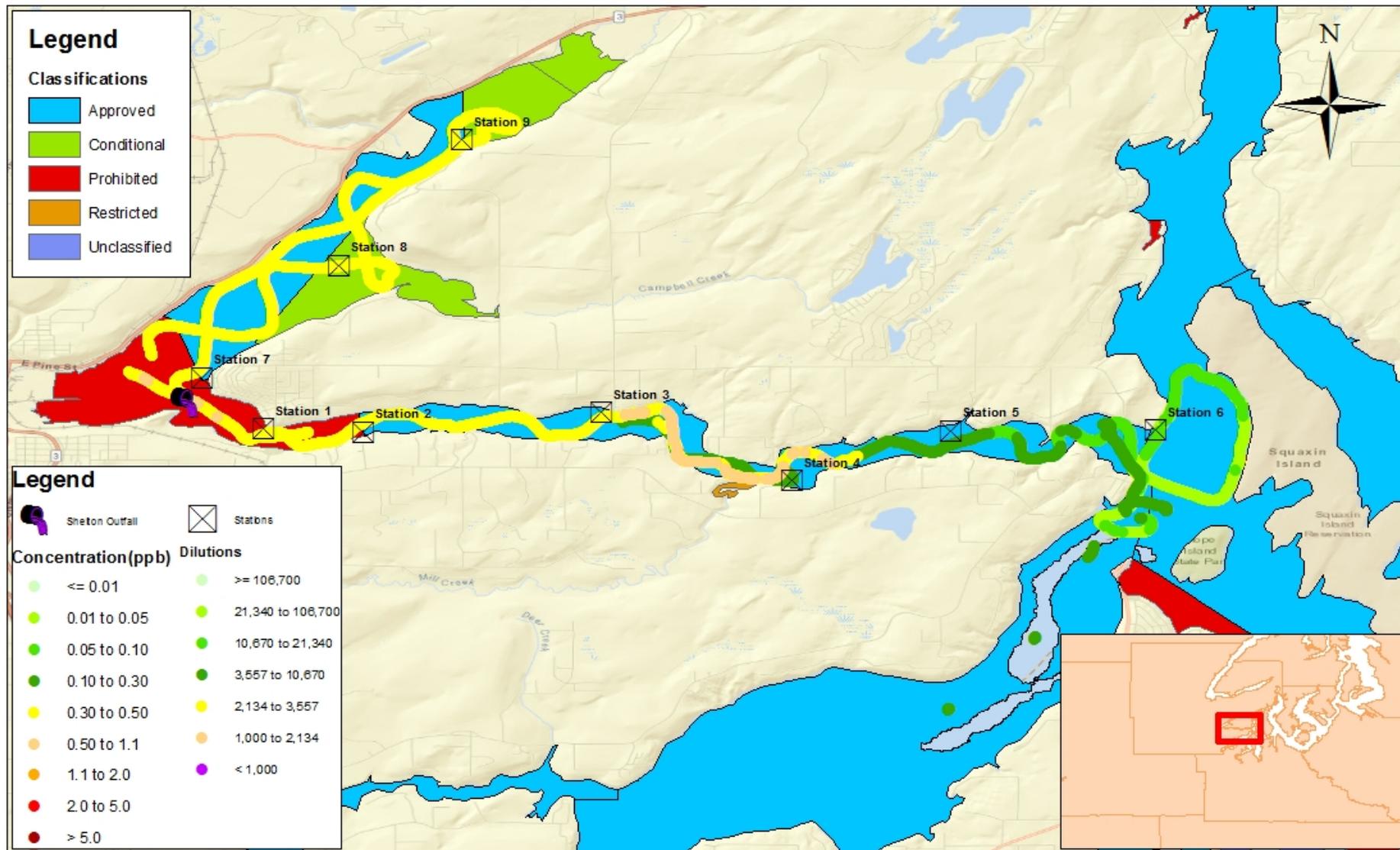
Shelton, WA, December 2, 2017



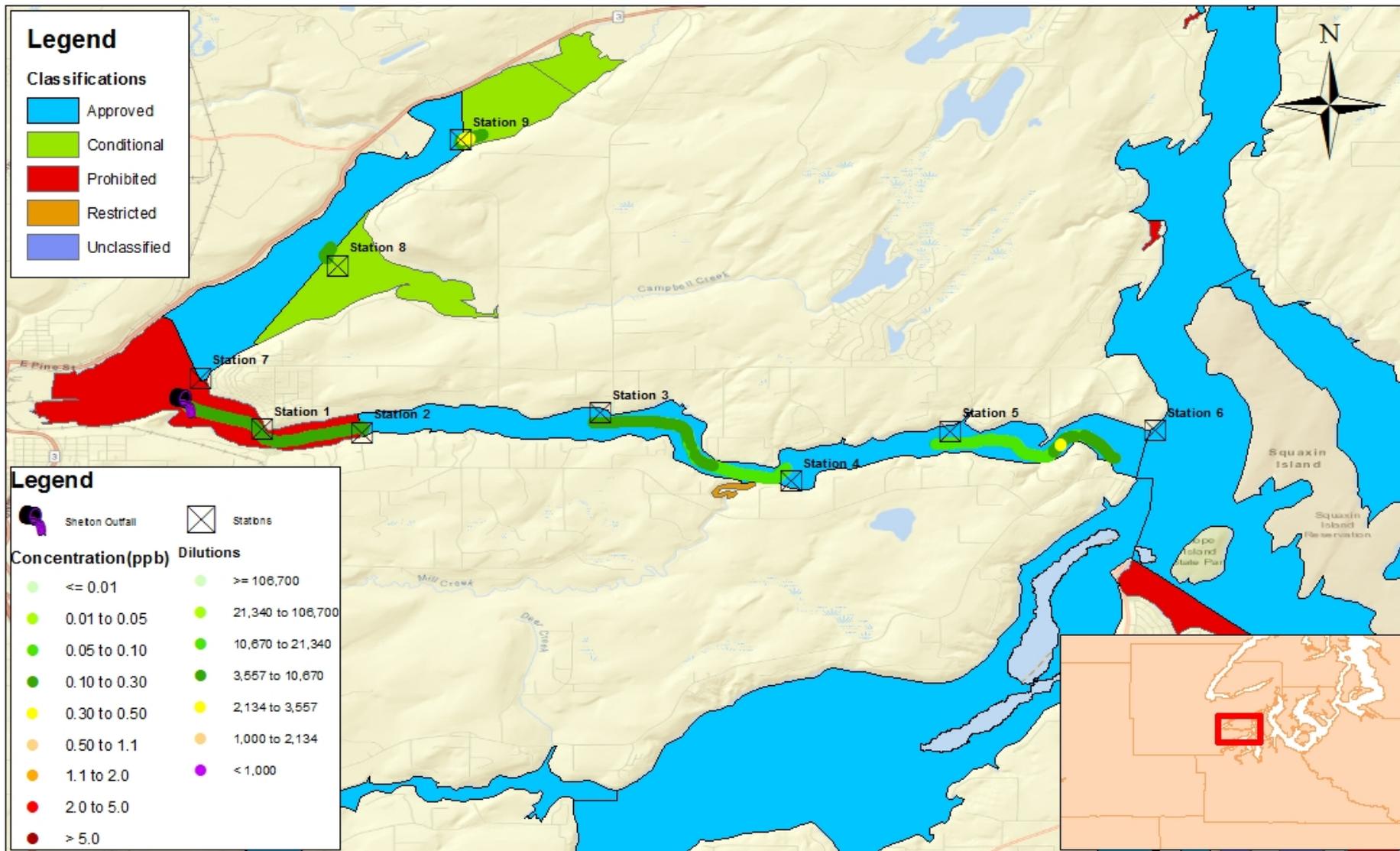
Shelton, WA, December 3, 2017



Shelton, WA, December 4, 2017

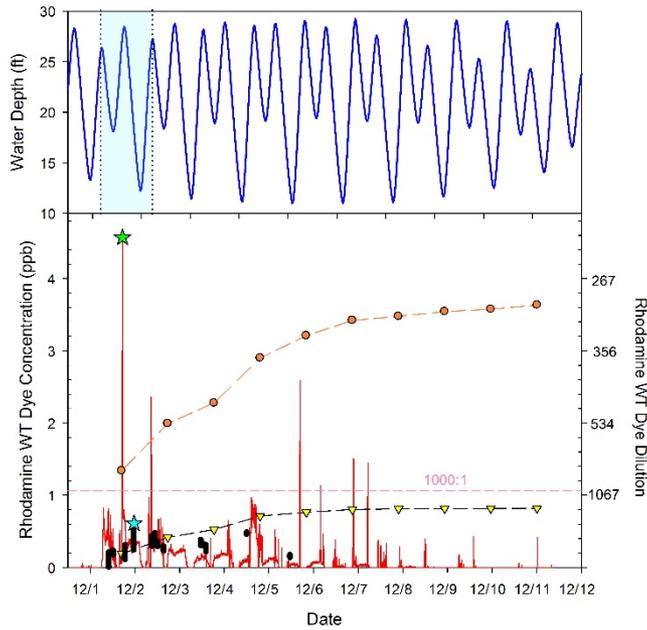


Shelton, WA, December 5, 2017

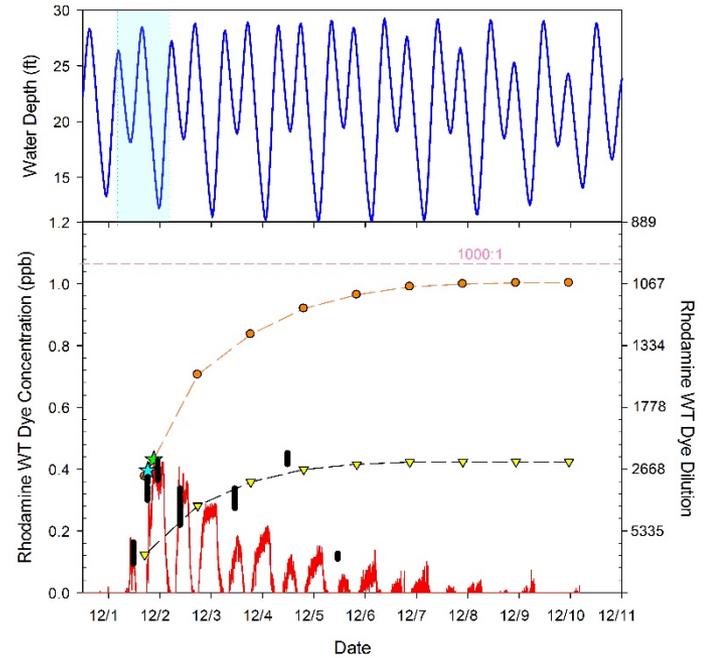


Hammersley, WA - Station 3

Hammersley, WA Station 2

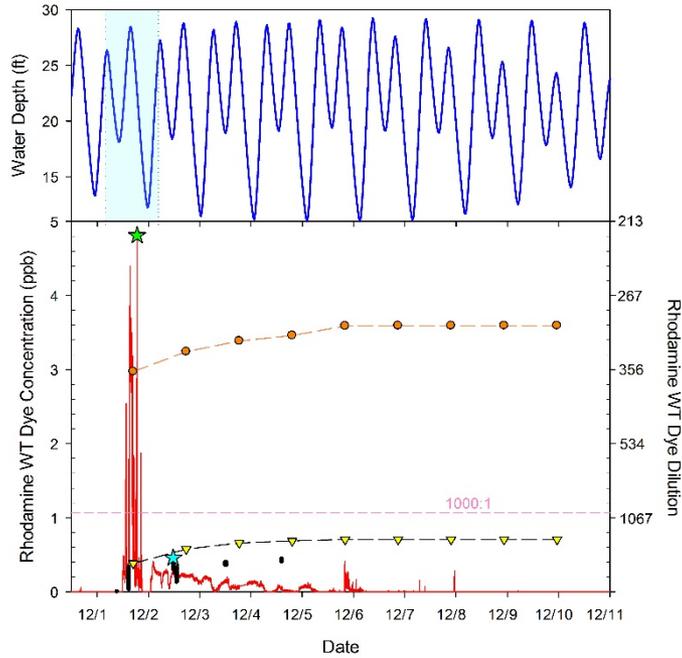


- Continuous readings submersible fluorometer
- one full tidal day steady state concentration - Peak 1 hr
- ▽— one full tidal day steady state concentration - Avg
- Readings of tracking fluorometer - 200 meters buffer
- ★ Peak concentration of submersible fluorometer
- ★ Peak concentration of tracking fluorometer (200m buffer)



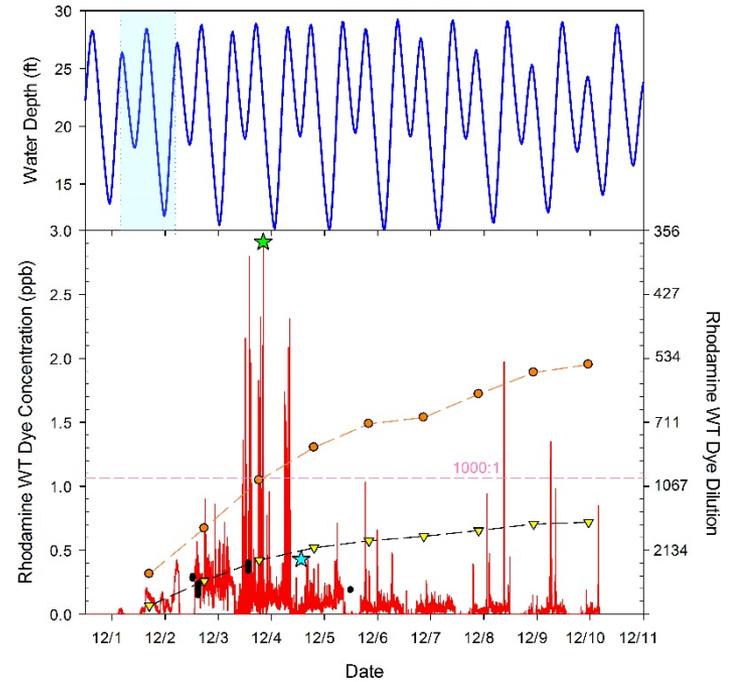
- Continuous readings submersible fluorometer
- one full tidal day steady state concentration - Peak 1 hr
- ▽— one full tidal day steady state concentration - Avg
- Readings of tracking fluorometer - 200 meters buffer
- ★ Peak concentration of submersible fluorometer
- ★ Peak concentration of tracking fluorometer (200m buffer)

Hammersley, WA - Station 7



- Continuous readings submersible fluorometer
- one full tidal day steady state concentration - Peak 1 hr
- ▽— one full tidal day steady state concentration - Avg
- Readings of tracking fluorometer - 200 meters buffer
- ★ Peak concentration of submersible fluorometer
- ★ Peak concentration of tracking fluorometer (200m buffer)

Hammersley, WA - Station 8



- Continuous readings submersible fluorometer
- one full tidal day steady state concentration - Peak 1 hr
- ▽— one full tidal day steady state concentration - Avg
- Readings of tracking fluorometer - 200 meters buffer
- ★ Peak concentration of submersible fluorometer
- ★ Peak concentration of tracking fluorometer (200m buffer)

Observations

- ▶ Reflux 'bathtub' effect – vulnerable to pollution
- ▶ Good WWTP performance
- ▶ Higher concentrations in Oakland Bay
- ▶ Surprisingly high dye readings in some locations/times

Next Steps

- ▶ Microbial Testing
- ▶ PIC work
- ▶ Continue to evaluate data and (if necessary) re-evaluate growing area classification

Thank You

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Website: <https://www.doh.wa.gov/CommunityandEnvironment/Shellfish/GrowingAreas>



Public Health – Always Working for a Safer and Healthier Washington