

Lessons Learned for the Columbia from Puget Sound Estuary Restoration

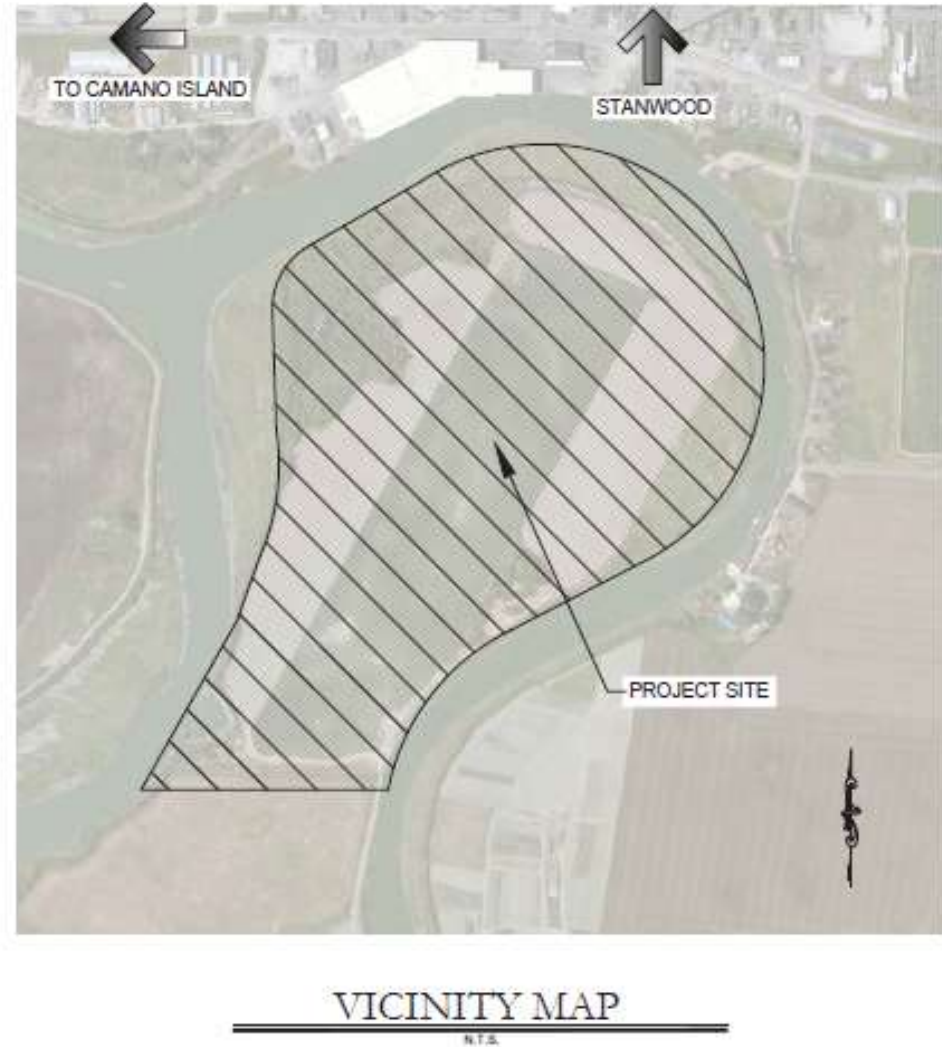


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**Presenting author*

zis a ba Estuary Restoration



Proposed Camano Bank

Stanwood WA

Leque

zis a ba 1

Lower Stillaguamish River

TNC

zis a ba 2



Google Earth

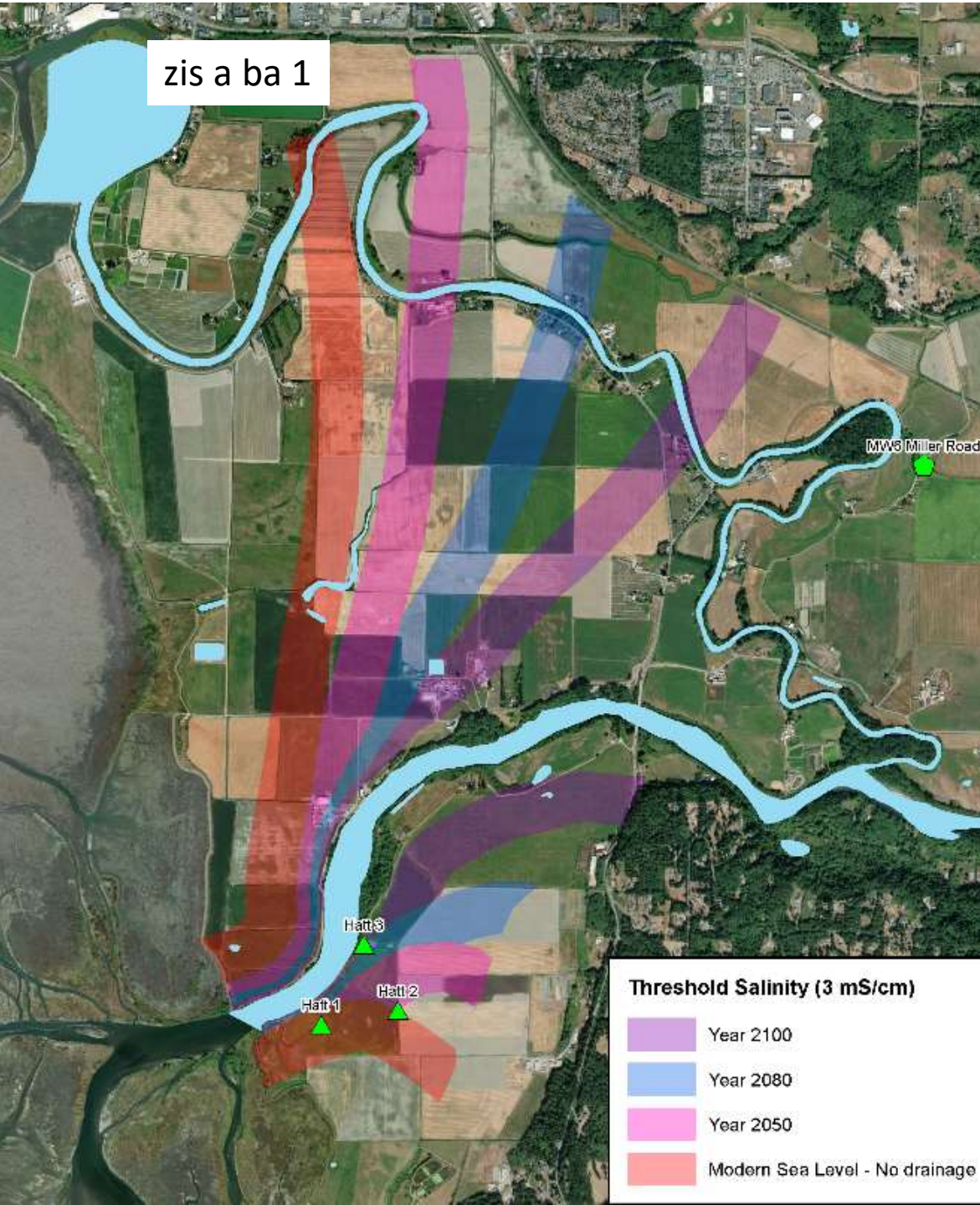
Imagery Date: 8/7/2022 48°12'39.42" N 122°21'19.04" W elev 4 ft eye alt 23704 ft

Lesson: Address Stakeholder Concerns early and thoroughly

- New Floodgate: 3000 CFS when Florence Island Inundates
- New Cross-dike
- Main channel sedimentation analysis
- Avulsion prevention
- Pipeline protection



zis a ba 1



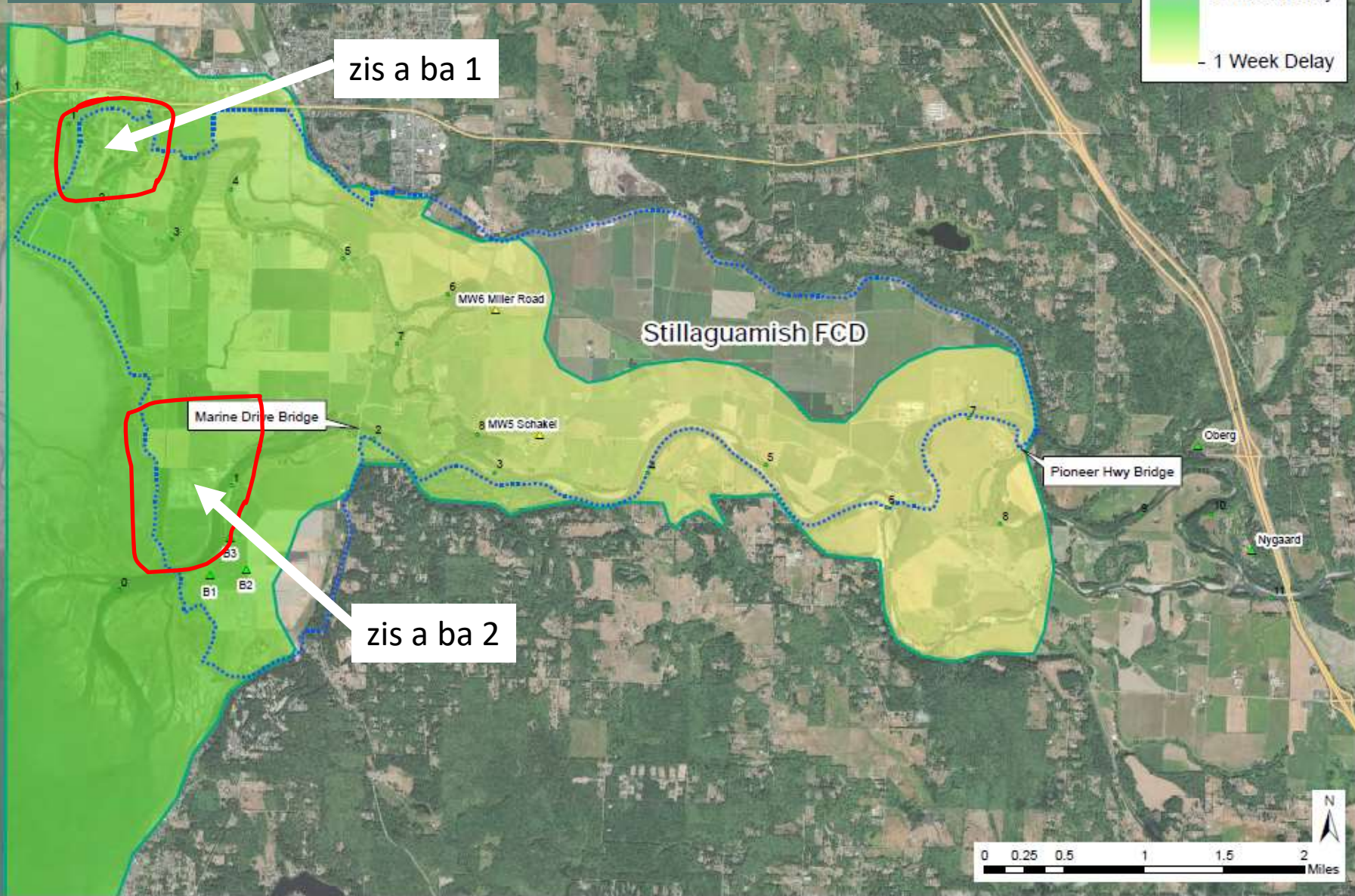
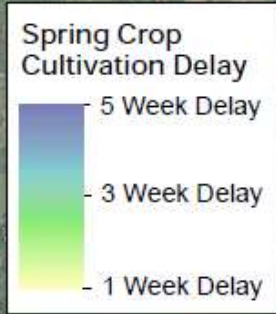
Root zone salinity thresholds will move landward with SLR. Restoration impacts?

1. Florence Island
2. 3mS/cm Threshold – “sensitive plants may have restricted growth”
3. PDF Maps are available

Snohomish Conservation District Ag Resilience: [Agricultural Resilience Plan](#) — Snohomish Conservation District (snohomishcd.org)

ESA

Collaboration with ag community to develop Spring Crop Cultivation Delays: 3 weeks for YR 2050 (Model based on well data)



Work in the dry as long as possible and still haul with a conscience (no haul near pipeline).



Zia a ba
DURING (2017)

Minimize construction impacts ...

- Require “Morooookas!” (tracked hauling equipment, 7psig max)
- Site haul routes along channel alignments and dike removals only
- Work in the dry.
 - TNC’s 2012 restoration created 2 breaches and insufficient dike removal ... now we’re in the wet to fix it





18" to 24" of storm surge is common in the PNW

zis a ba: hydraulics risk assessment → cross dike, floodgate, spur dike, and habitat/infrastructure protection berm



zis a ba Phases 2 and 3 under current design!

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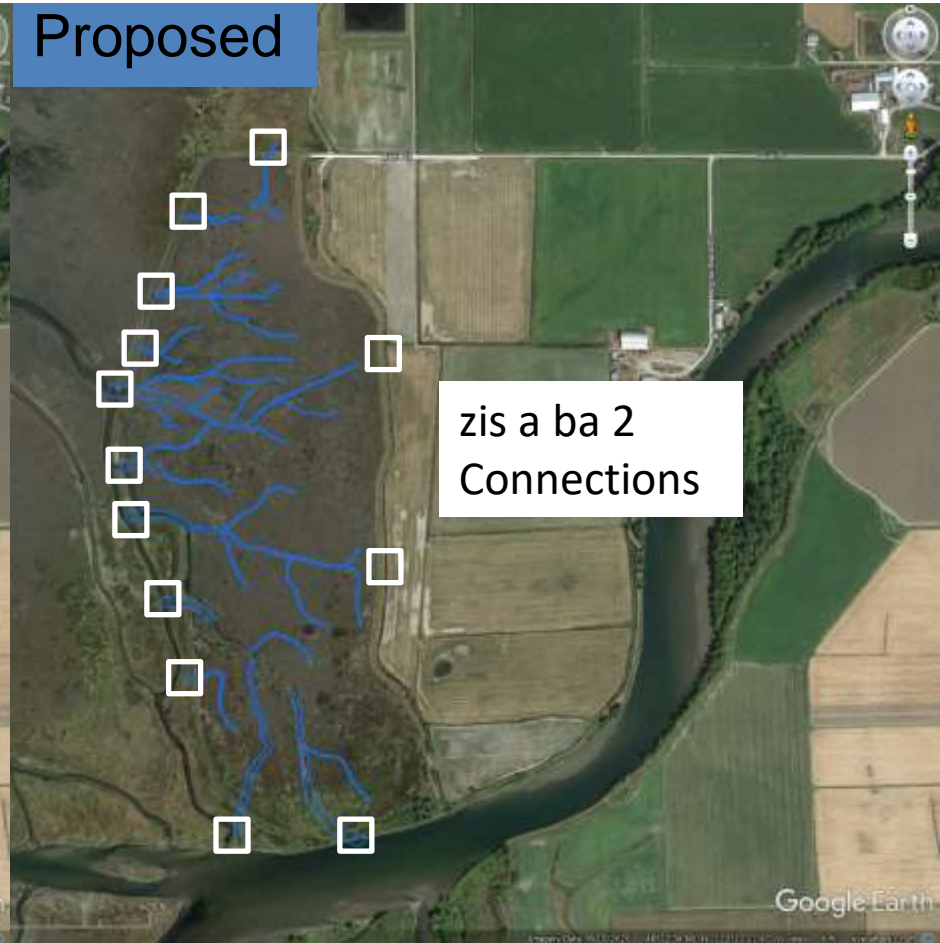
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TNC's Port Susan Bay Preserve – Adaptive Management in the wet ...

Existing



Proposed



Lessons: tide channels will not form on their own, create oversized breaches, strategize levee removals, & plan for subsidence, marsh evolution, and SLR.



Shameless plug for my lightning talk ...



Simulation of the Port Susan Bay blast on August, 11, 2022. Illustration by Erica Simek Sloniker / The Nature Conservancy.

Can blasting minimize construction impacts?

The Strait

Dungeness
River WA

3 Crabs
Estuary Restoration



3 Crabs existing conditions before restoration

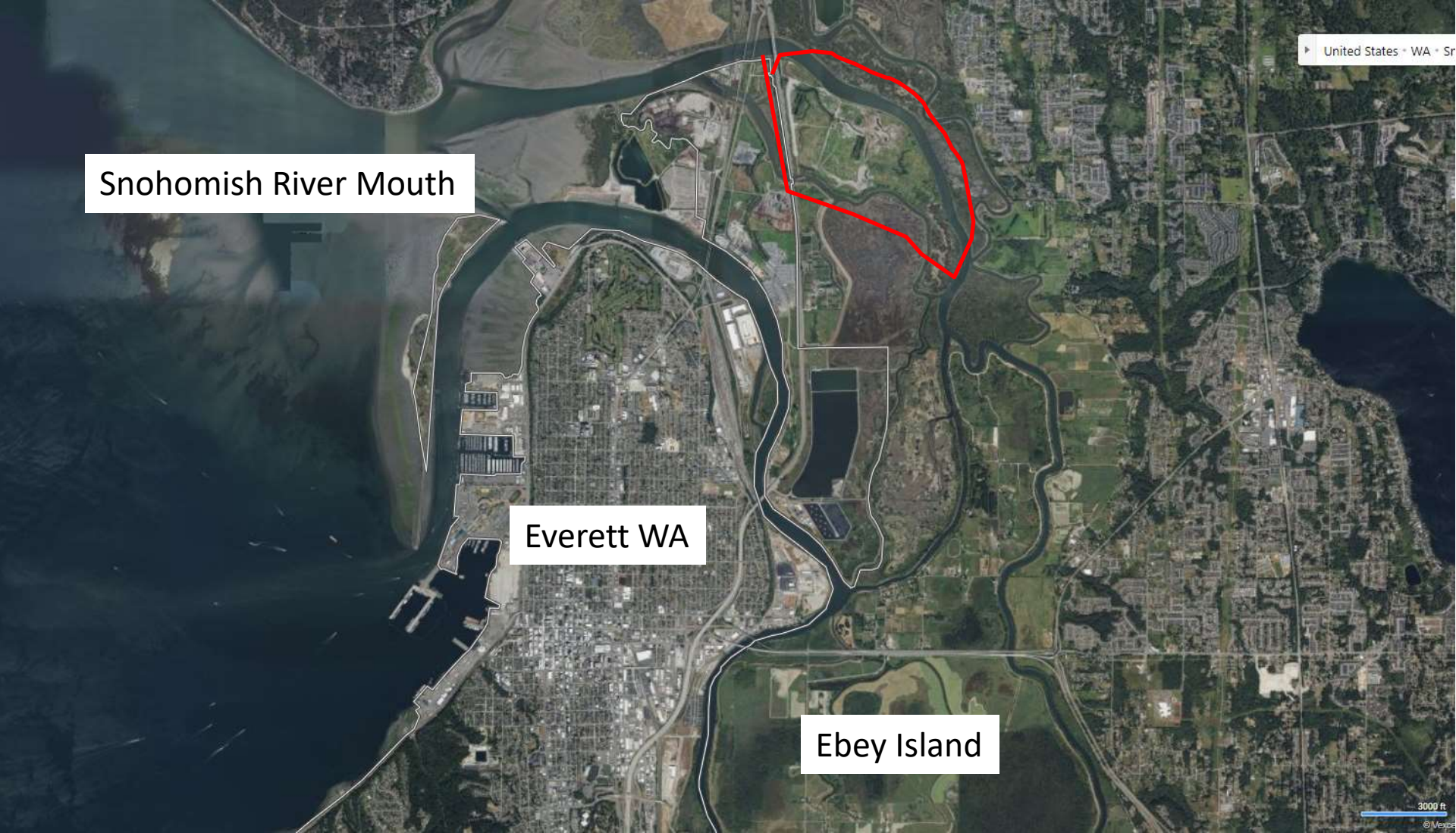


Lesson: communicate existing conditions flooding ...



So that project conditions with king tides don't surprise folks.

Blue Heron Slough Location



364 Acre Blue Heron Slough – Estuary Restoration and Mitigation Bank (2007 Concept to 2023 Construction)



Lesson: Big projects take time!



Lesson: Expect levee failures



Lesson: Excavators sink quickly, know the site



Lesson: Use amphib where applicable?



Lesson: 2023 near completion, distributaries for reduced swim distance, and breaches for subsided tidal prism 

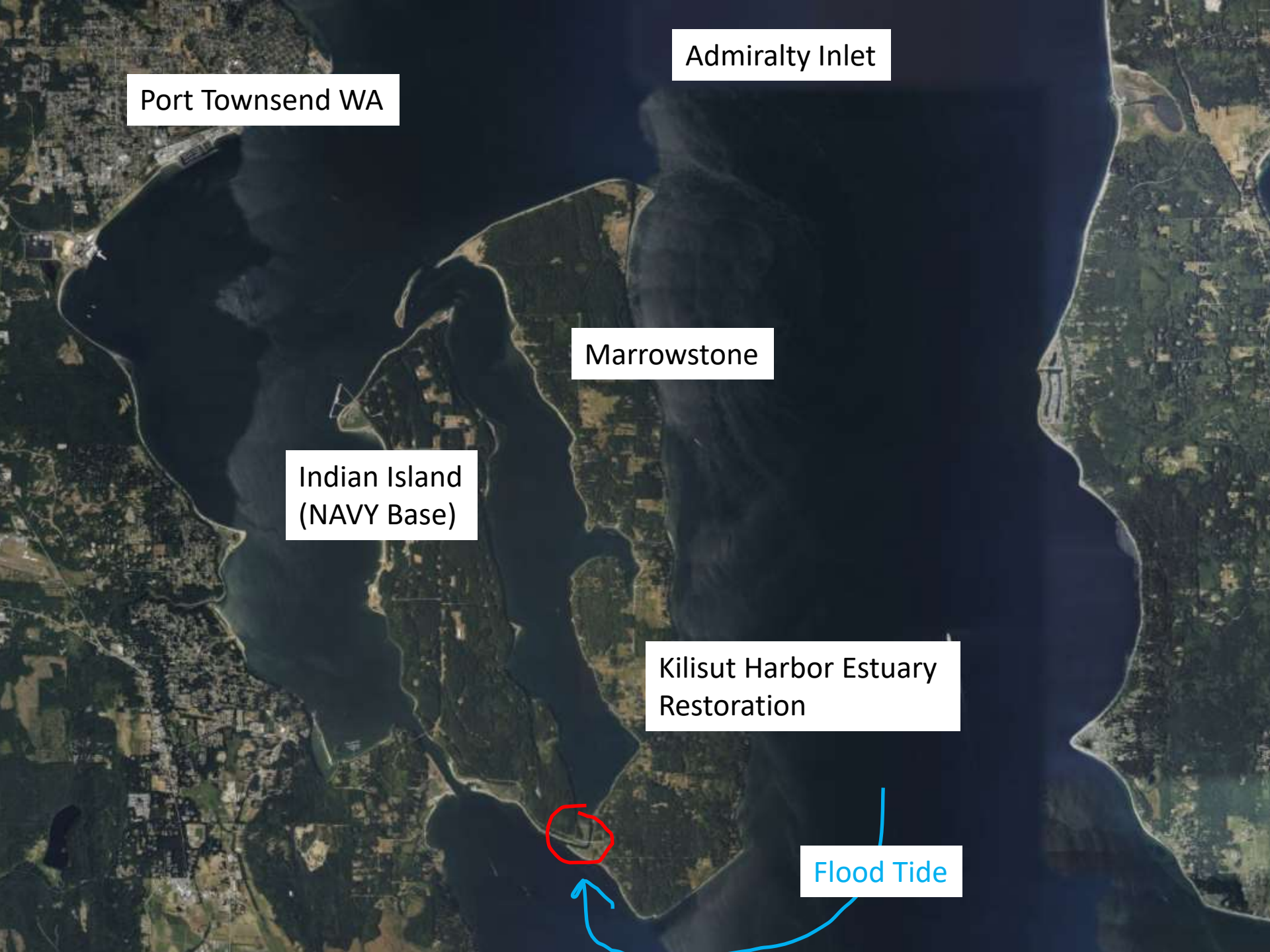
Success and Challenges

- **Successes**

- Completion of regionally significant mitigation bank
- Restores tidal exchange to 364-acre site
- Increases tidally-influenced area in Snohomish Estuary by 13%
- Generated 10,200 chinook salmon credits and 240 wetland credits
- Complex permitting, many project partners
- Rapid recruitment of driftwood, vegetation change after breaching

- **Challenges**

- Construction delays & difficult conditions
 - Flooding/overtopping levee during construction
 - Extremely soft sediments – stuck equipment
- Breach timing, in-water work windows
- Working in the dry vs wet
- Achieving/verification of grades after breach
 - Seasonal tide constraints (wintertime low tides) – safety
- Construction access after breaching



Port Townsend WA

Admiralty Inlet

Marrowstone

Indian Island
(NAVY Base)

Kilisnoo Harbor Estuary
Restoration

Flood Tide



Want to save \$\$, protect native marsh, and use water-filled coffer dams (aka Aquadams)?



Kilisut water dam example ... contractor neglected to pull dam 2 months into fall season. Storm surge failure.



Lesson: Redundancy saved the project



Kilisut after construction



Lesson: Plan for channel migration through full
Span of the bridge (3500 CFS at max flood tide)

Kilisut after construction



Lesson: Finished bridge looks just like the renderings