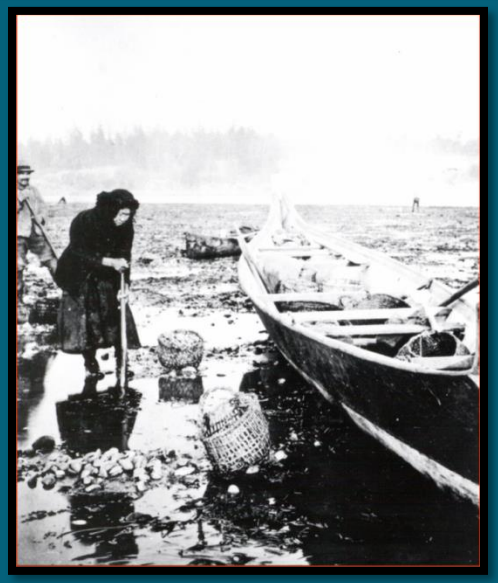
HAB Monitoring in Sequim Bay Improves Tribal Shellfish Safety

By: Neil Harrington, Environmental Biologist, Jamestown S'Klallam Tribe

Jamestown S'Klallam Tribe Background

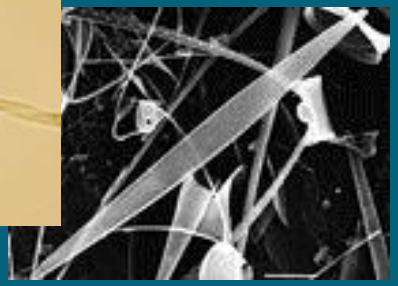
- Tribe retained fishing and shellfish harvest rights in the 1855 Treaty of Point No Point
- Shellfish remain important subsistence, ceremonial and economic resource



General Review of Harmful Algal Blooms (HABs) in Sequim Bay

- Paralytic Shellfish Poisoning
  - *Alexandrium cattenella*- dinoflagellate
  - Reoccurring blooms in SB since 1957
  - Saxitoxins: high doses lead to paralysis

- Amnesiac Shellfish Poisoning
  - *Pseudonitszchia spp.* of diatoms
  - Event in Sequim Bay 2005
  - Coast-wide bloom in 2015
  - Domoic acid- loss of short term memory

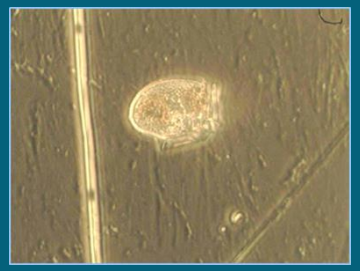


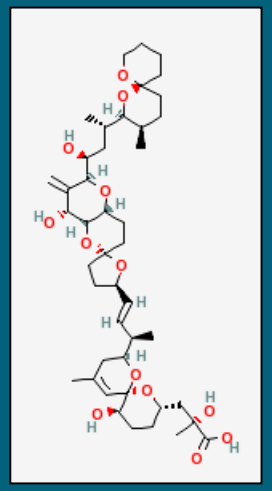
Monitoring efforts 2008-2011

- Soundtoxins 2008
- Intensive study of PSP and ASP in 2009-2010
  - No major blooms of PSP or ASP in those years
- 2011 Marine nutrient study in Dungeness and Sequim Bay (with an eye toward eelgrass health and macroalgae)
- AND THEN DSP!

Response to a new threat to health: Diarrhetic Shellfish Poisoning (DSP)

- Diarrhetic Shellfish Toxins (DTXs)
- Causes severe gastrointestinal distress
- 1st confirmed US cases at Sequim Bay S.P. in 2011
- Tribe worked with NOAA and WDOH in response

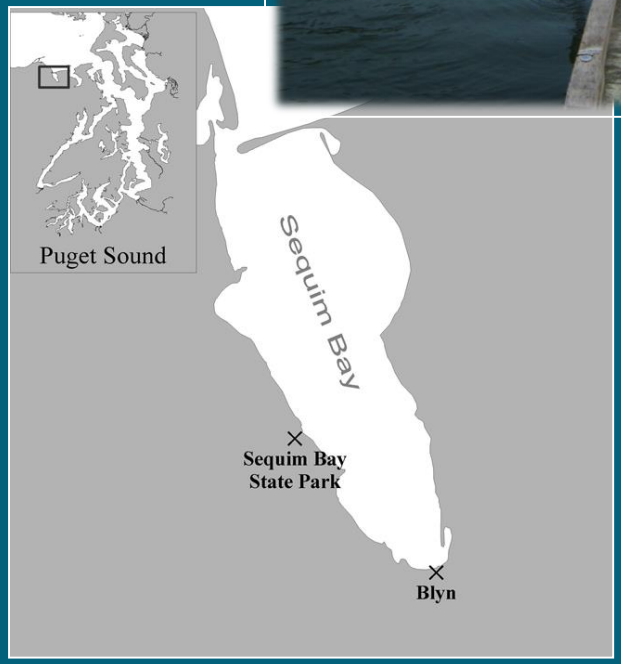




What did we need to know (fast)

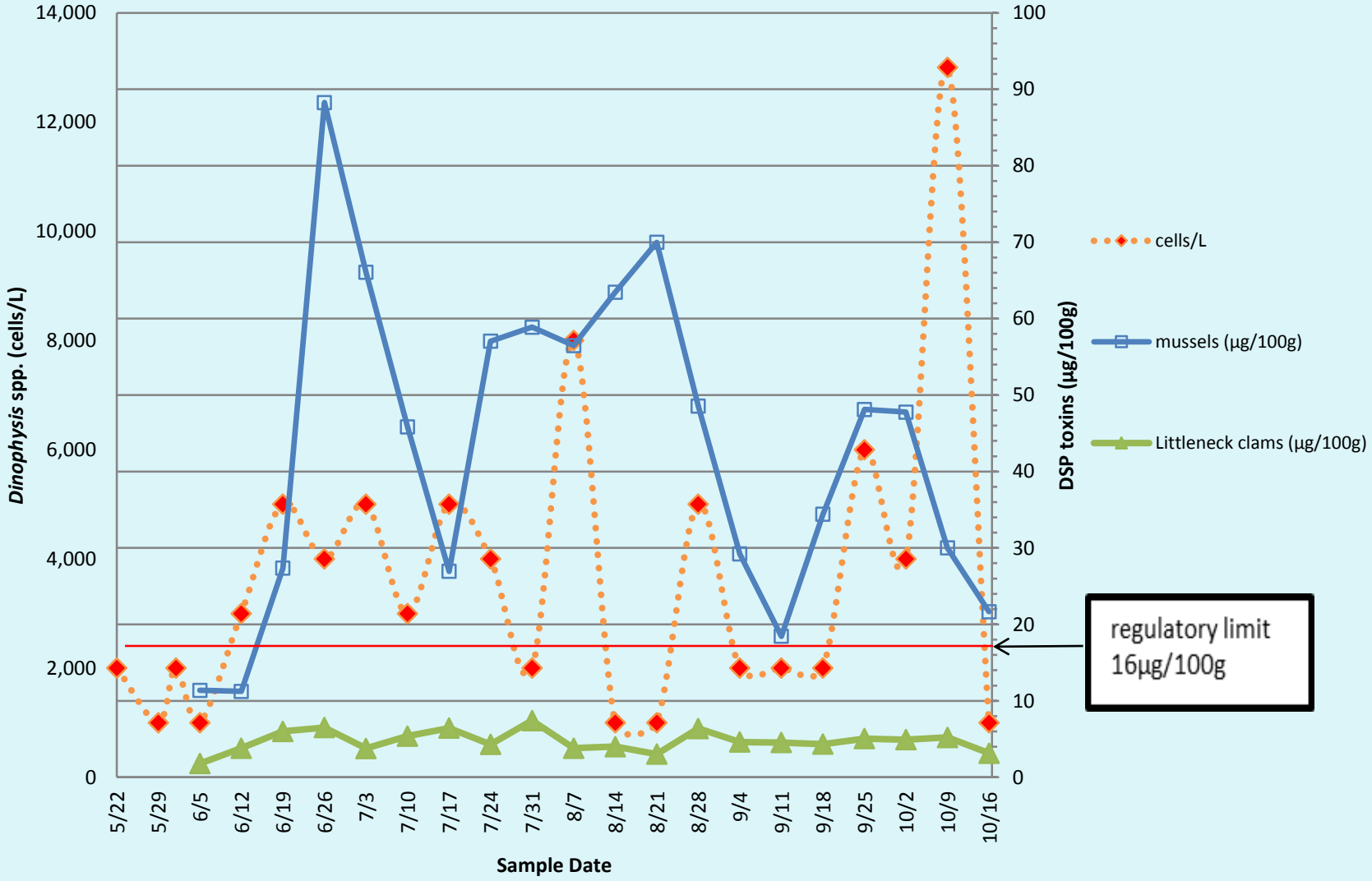
- Can *Dinophysis* abundance give a warning of toxic events? Are some species more toxic than others?
  - Work with NOAA and Soundtoxin partnership
- How do we know if shellfish are toxic? If so are different species more affected?
  - We evaluated Jellett rapid test strips
  - NOAA and WDOH LC-MS

2012-2015 DSP Studies

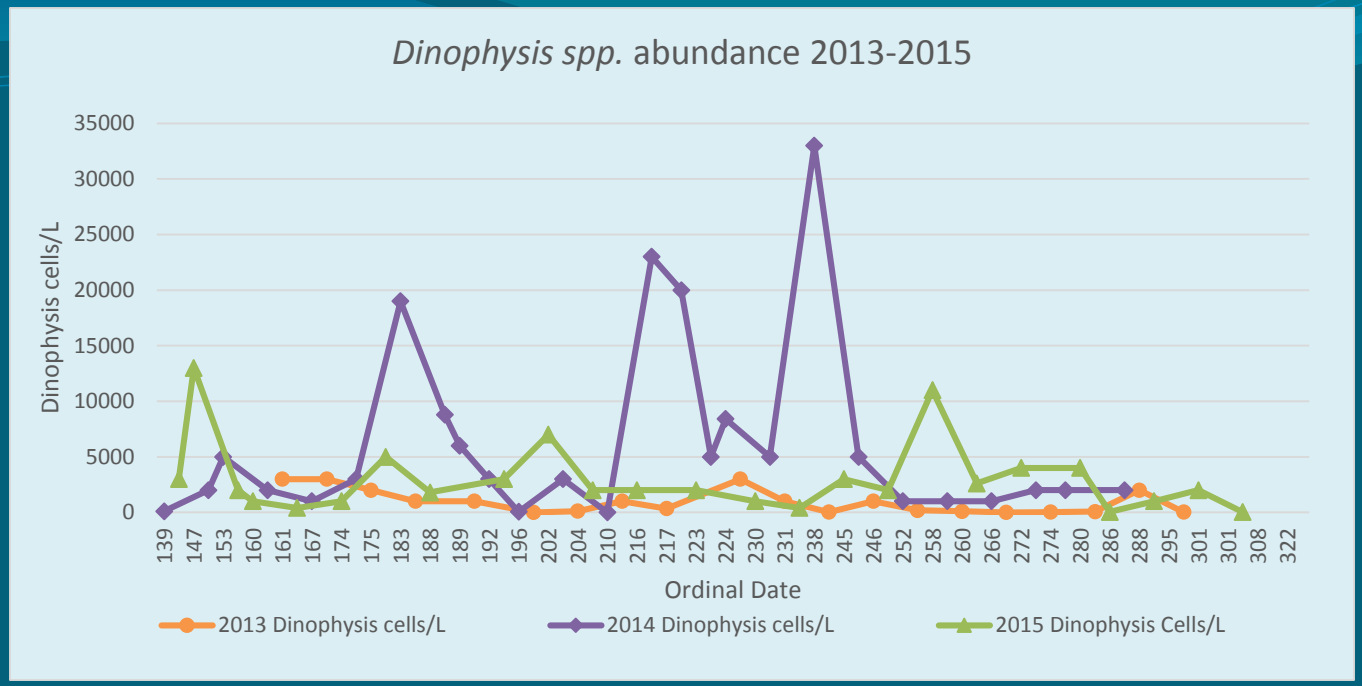


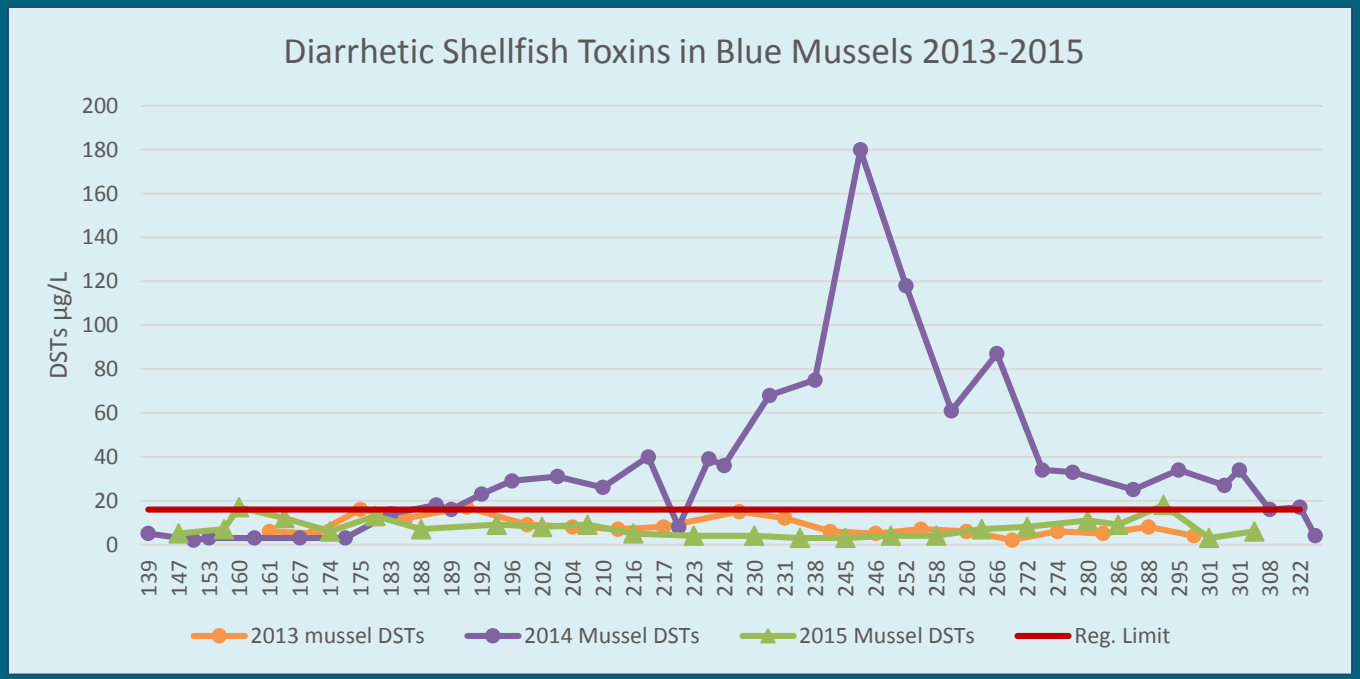
- Sampled weekly May-Oct. at two sites for:
  - Phytoplankton
  - Shellfish
  - Temperature, salinity, chlorophyll, pH
  - Evaluated shellfish DSP rapid-test kits in 2012
  - Nutrients

Sequim Bay State Park 2012
Dinophysis vs shellfish toxicity

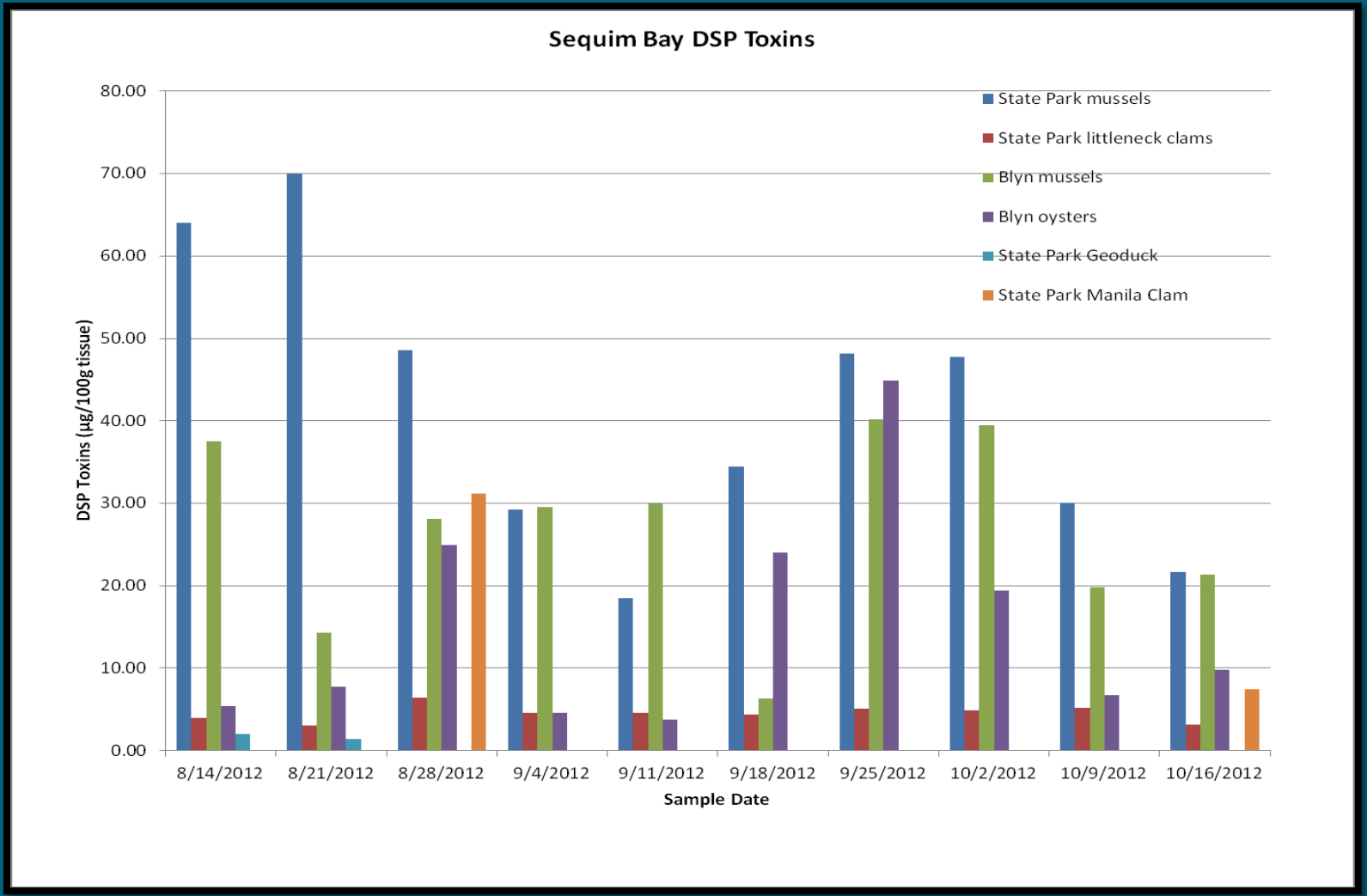


Shellfish harvest closures due to DSP every year since 2011





Toxin vs. type of shellfish



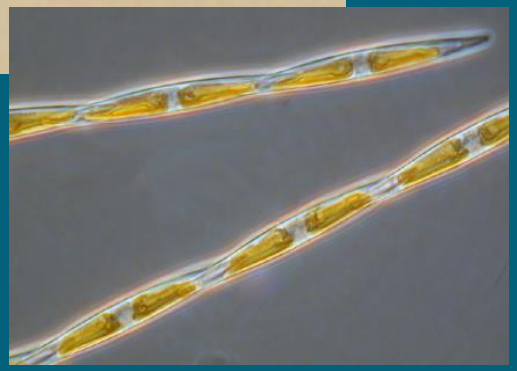
Geoduck< Littleneck clams< Manilas clams and Oysters < Mussels

What did we learn about DSP?

- Dinophysis cell density proceed increases in DSTs in shellfish
- Dominant toxin is DTX1
- *Dinophysis acuminata* was the dominant species of *Dinophysis* during toxic events
- Different species of shellfish uptake toxin in different amounts
- The rapid test strips were not accurate enough for management decisions

Other HABs in Sequim Bay

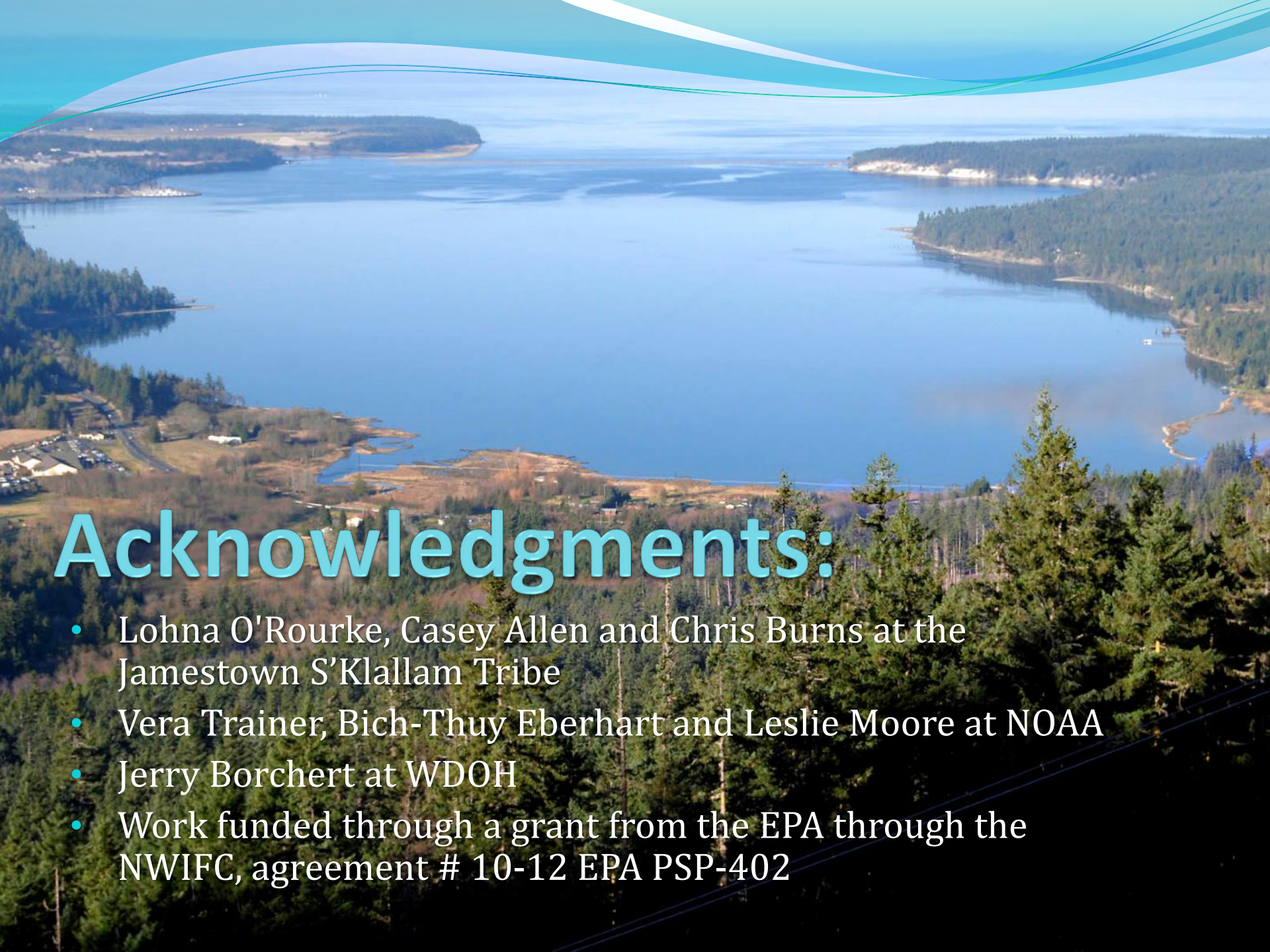
- 2012-2015 PSP
  - Peaking at 1595µg/ 100g in 2012
  - Also high in *December* 2012
  - Bloom tipped us off to high shellfish toxicity in 2015
- ASP: Some toxicity (below action level) in 2015
- *Heterosigma* blooms in 2014
  - Killed adult summer run chum salmon (ESA listed)



Goals of Future Research

- Protect public health through early warning of HAB events
  - Monitor for bloom events
  - Working with NOAA and WDOH on MERHAB project focused on possible emerging HAB: Azaspriacid Shellfish Poisoning
- Protect treaty resources by understanding and ameliorating causes of HABs
  - Analyses of ancillary oceanographic data and phytoplankton data over last 8 year

Photo by Katie Campbell



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Questions?