SOUTHEAT ALASKA TRIBAL TOXINS

A Partnership to Monitor Harmful Algal Blooms

SITKA

Projects and Programs

- Southeast Alaska Tribal Toxins (SEATT)
- Southeast Alaska Regional Ocean Acidification Monitoring (SEAROAM)
- Sitka Tribe of Alaska Environmental Regulatory Lab (STAERL)
- Integrated *Alexandrium* Cyst bed Mapping in Southeast Alaska (IACSEA)

WHY DO WE NEED SEATOR

- Support SE partnered Tribes working on climate change related impacts on the marine environment
- Outreach, community access to data, training
- **UNIFIED CREDIBILITY**

WHY A PARTNERSHIP?

A ***Common Concern*** about subsistence clam resources

→ No assistance from AK state agencies

⇩

STA reached out to SE Tribes

↓ ↓

FY 15 EPA IGAP funds for baseline phytoplankton

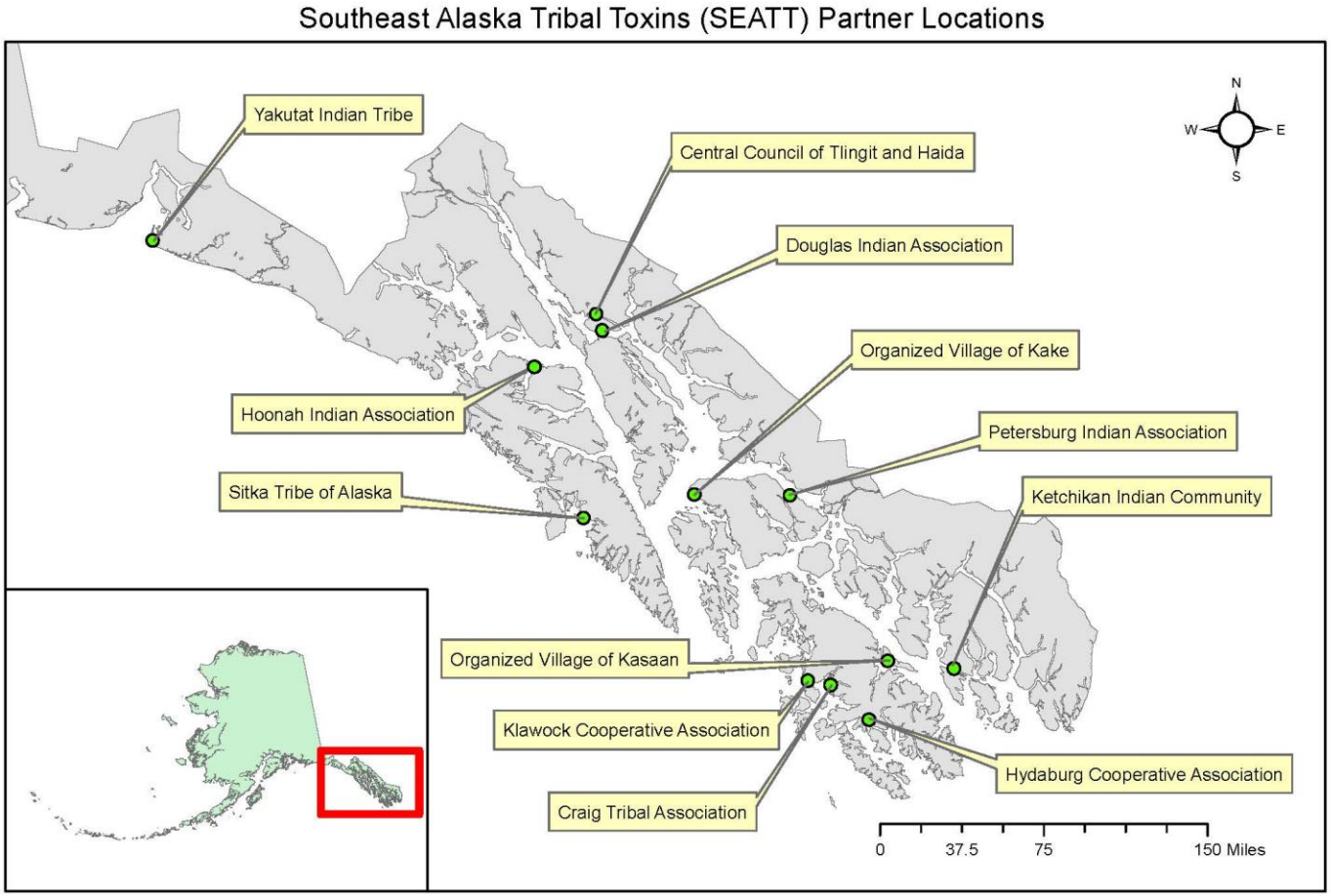
→ Create an early warning system

⇩ ⇩

South**E**ast **A**laska **T**ribal **T**oxins

November 2013

SOUTHEAST TRIBAL PARTNERS



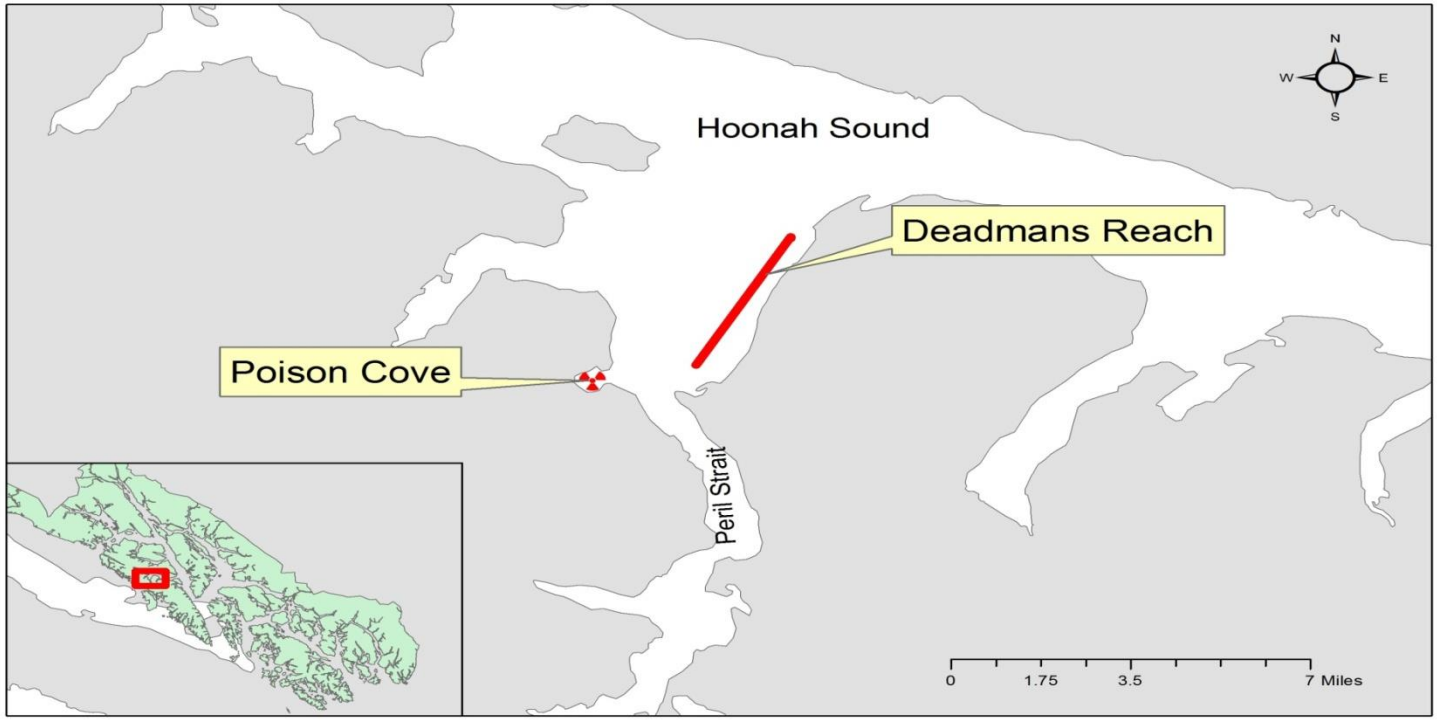
Traditions and Culture

- Subsistence user groups play **toxin roulette** when harvesting bivalves in Alaska.
- Coastal Alaskan Native populations are 12 times more likely to be affected by PSP than the Caucasian community because of the greater use of subsistence foods (Gessner and Schloss, 1996).

The Clam Diggers. REPRODUCED FROM THE COLLECTIONS OF THE LIBRARY OF CONGRESS

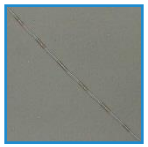
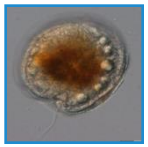
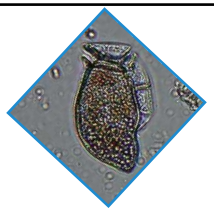
Poison Cove Party

PSP was first acknowledged as an environmental problem in 1799 when the crew of Alexander Baranof from the Russian American Trading Company ingested blue mussels containing high levels of PSP in southeast Alaska (Fortuine 1975).



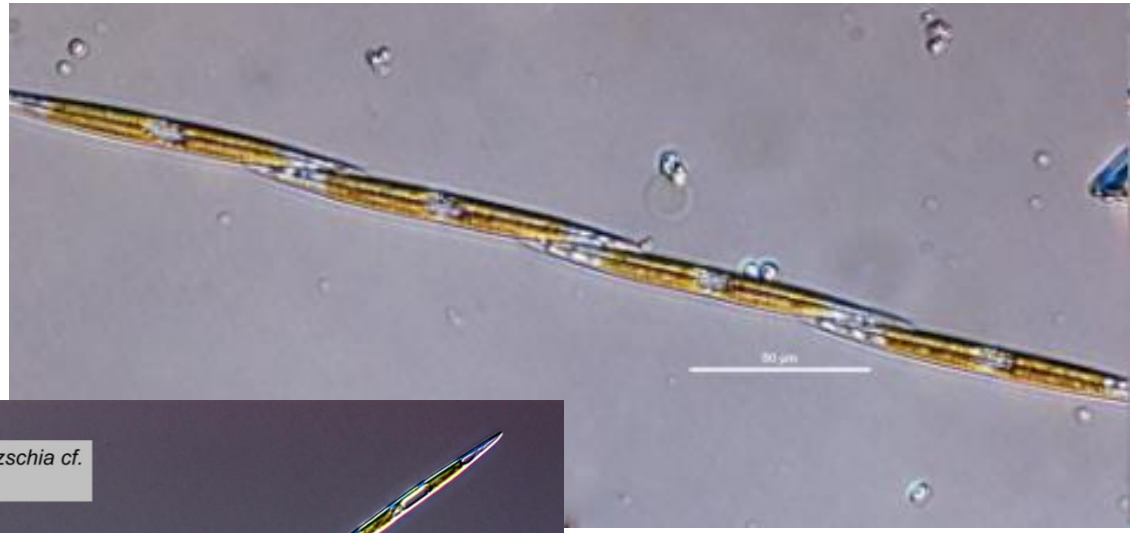
Not all HAB blooms are Toxic

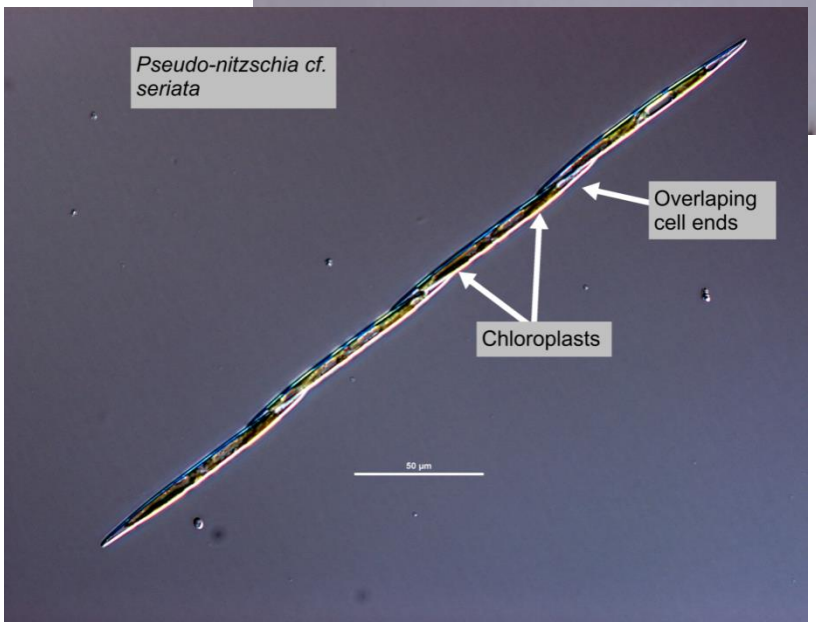
HUMAN HEALTH SYNDROMES – *Associated with Phytoplankton*

SYNDROME	SPECIES AND TOXIN	SYMPTOMS
Amnesic Shellfish Poisoning **(ASP)**	 *Pseudo-nitzschia* **Domoic acid**	Permanent short term memory loss
Ciguatera **Fish** Poisoning **(CFP)**	 *Gambierdiscus toxicus* **Ciguatoxin & Maitotoxin**	Temperature Sensation Reversal
Diarrhetic Shellfish Poisoning **(DSP)**	 *Dinophysis* **Okadaic acid**	Diarrhea Nausea Vomiting
Neurotoxic Shellfish Poisoning **(NSP)**	 *Karenia brevis* **Brevetoxin**	Gastrointestinal and Neurological Problems
Paralytic Shellfish Poisoning **(PSP)**	 *Alexandrium* **Saxitoxin**	Loss of motor control

Diatoms

Genus: *Pseudo-nitzschia*





Domoic Acid

"the Staircase"

Dinoflagellates

Alexandrium spp.

"Hamburgers"

Dinoflagellates

Genus: *Dinophysis*

“Evil Princess” or

“Evil Kool-Aid Man”

Comparative Lethality of Selected Toxins & Chemical Agents in Laboratory Mice

	AGENT	LD_{50} (μg/kg)	MOLECULAR WEIGHT	SOURCE
	Botulinum toxin	0.001	150,000	Bacterium
	Shiga toxin	0.002	55,000	Bacterium
	Tetanus toxin	0.002	150,000	Bacterium
	Abrin	0.04	65,000	Plant (Rosary Pea)
	Diphtheria toxin	0.10	62,000	Bacterium
#5	**Maitotoxin**	**0.10**	**3,400**	***Gambierdiscus***
#7	**Palytoxin**	**0.15**	**2,700**	***Ostreopsis***
#8	**Ciguatoxin**	**0.40**	**1,000**	***Gambierdiscus***
	Textilotoxin	0.60	80,000	Elapid Snake
	C. perfringens toxins	0.1 - 5.0	35-40,000	Bacterium
	Batrachotoxin	2.0	539	Arrow-Poison Frog
	Ricin	3.0	64,000	Plant (Castor Bean)
	alpha-Conotoxin	5.0	1,500	Cone Snail
	Taipoxin	5.0	46,000	Elapid Snake
	Tetrodotoxin	8.0	319	Puffer Fish
	alpha-Tityustoxin	9.0	8,000	Scorpion
#17	**Saxitoxin**	**10.0 (Inhal 2.0)**	**299**	***Alexandrium* & *Gymnodinium***
	VX	15.0	267	Chemical Agent
	SEB (Rhesus/Aerosol)	27.0 (ED_{50}~pg)	28,494	Bacterium
	Anatoxin-A(s)	50.0	500	Blue-Green Algae
	Microcystin	50.0	994	Blue-Green Algae
	Soman (GD)	64.0	182	Chemical Agent
	Sarin (GB)	100.0	140	Chemical Agent
	Aconitine	100.0	647	Plant (Monkshood)
	Brevetoxin	**180.0**	**1,000**	***Karenia brevis***

Who Regulates for PSP and toxins in Alaska?

- Alaska Department of Environmental Conservation follows FDA regulations for all commercially harvested shellfish in Alaska under the National Shellfish Sanitation Program

- Turn around time---data lag

What about subsistence users?

- Alaska has **NO SUBSISTENCE OR RECREATIONAL** regulatory testing.
- ADEC will not certify any intertidal harvest for subsistence use.

What does monitoring look like?

Other Partnerships doing HAB Monitoring

Olympic Region Harmful Algal Bloom **(ORHAB)** Partnership

- Tribes
- NOAA
- Volunteers
- Non-Profits
- Shellfish Growers

www.orhab.org

SoundToxins Partnership

- Tribes
- NOAA
- Volunteers
- Non-Profits
- Shellfish Growers

www.soundtoxins.org

Equipment and Training

Equipment

- Digital Microscope with Camera
- Refractometer and Thermometer
- Phytoplankton Net
- Filtering apparatus
- Identification tools

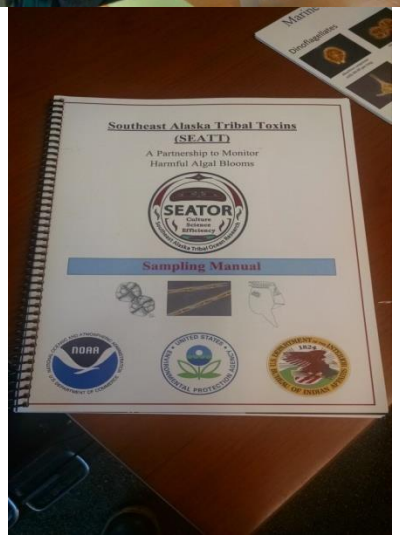
Training

- Workshops in Sitka

- Sampling Manual

- Videos
- Site Visits

Updates to www.seator.org



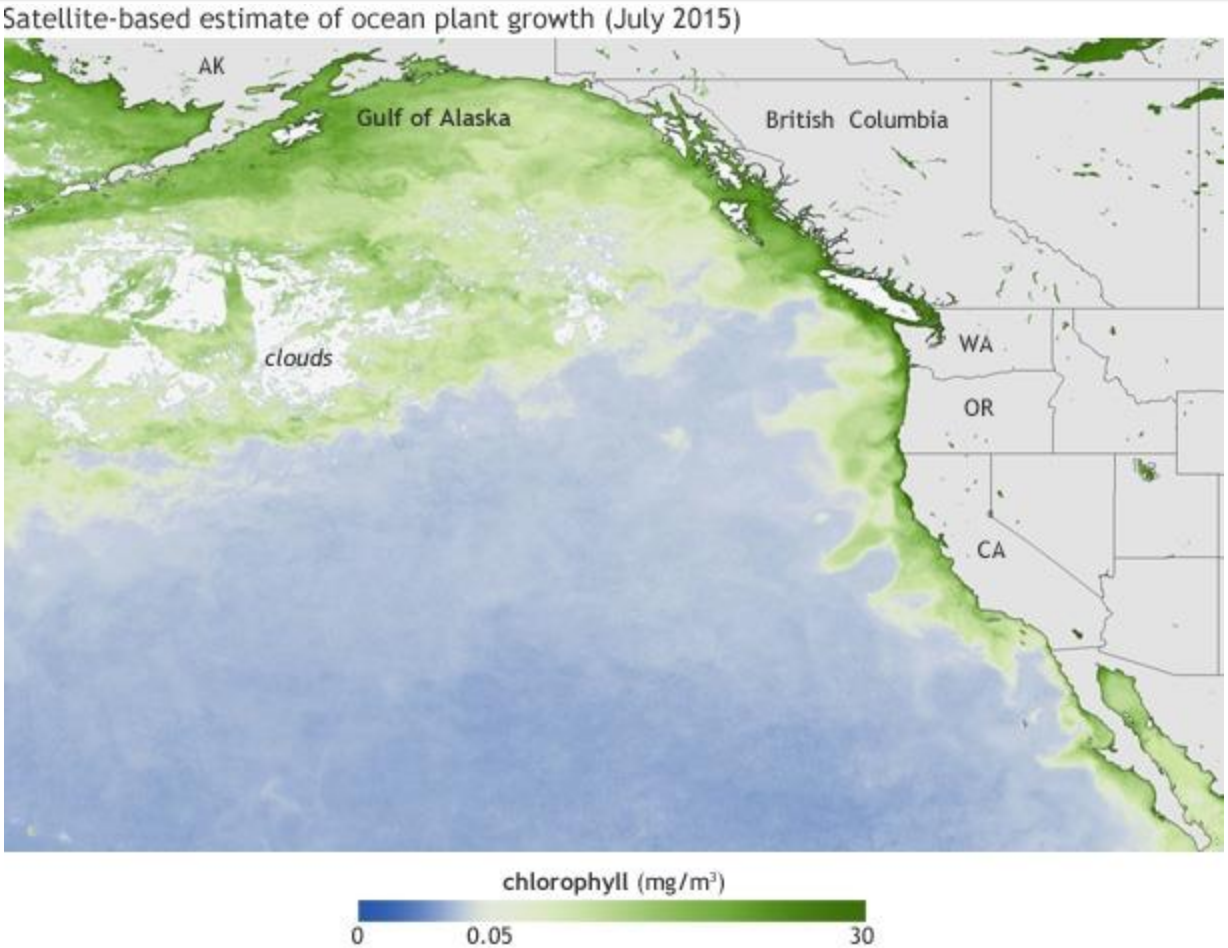
2015 PN bloom

Began in early May 2015

Largest bloom spatially to date

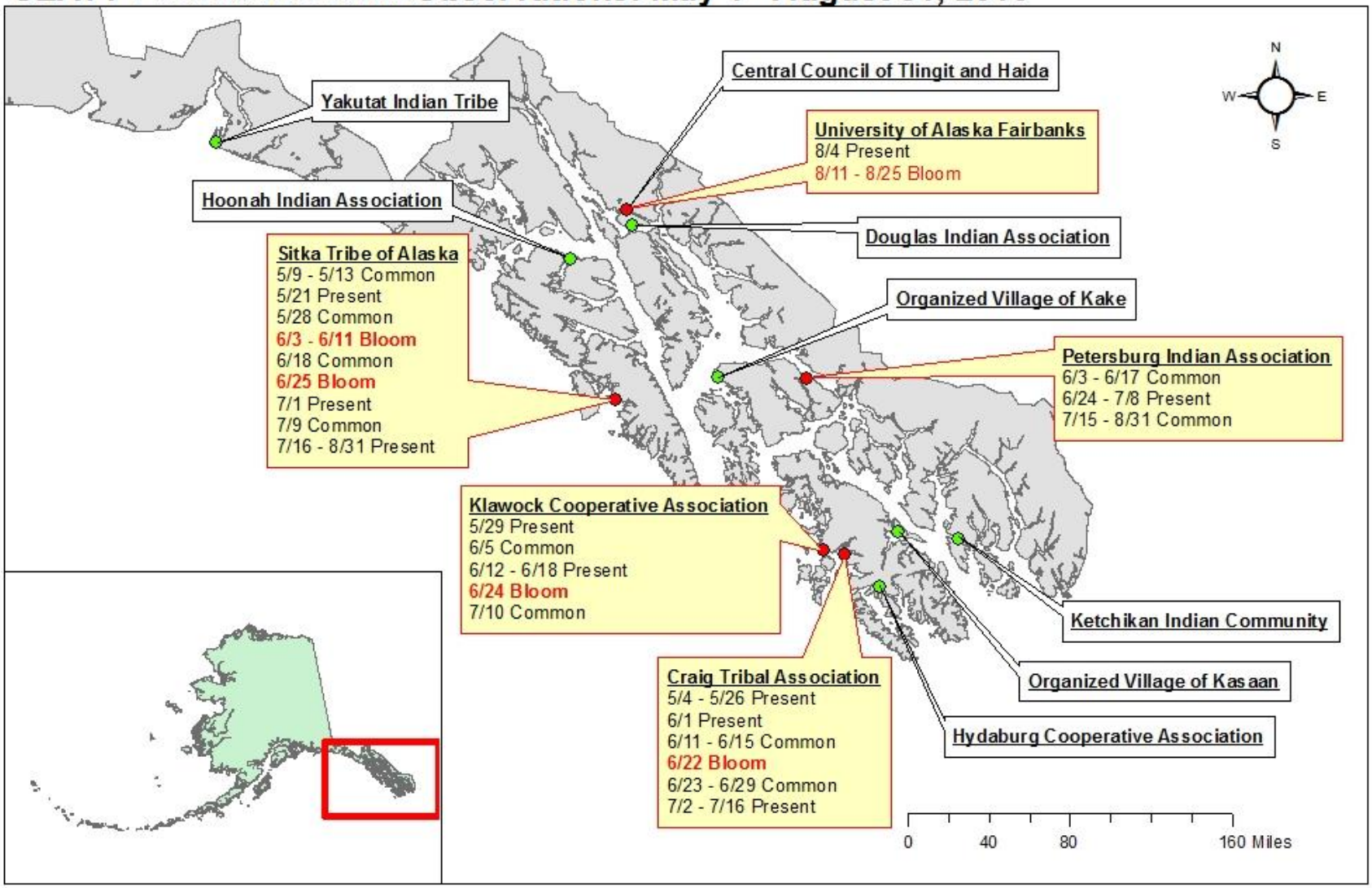
Lasted months instead of 1-2 weeks

Closed shellfish beds in all 4 west coast states



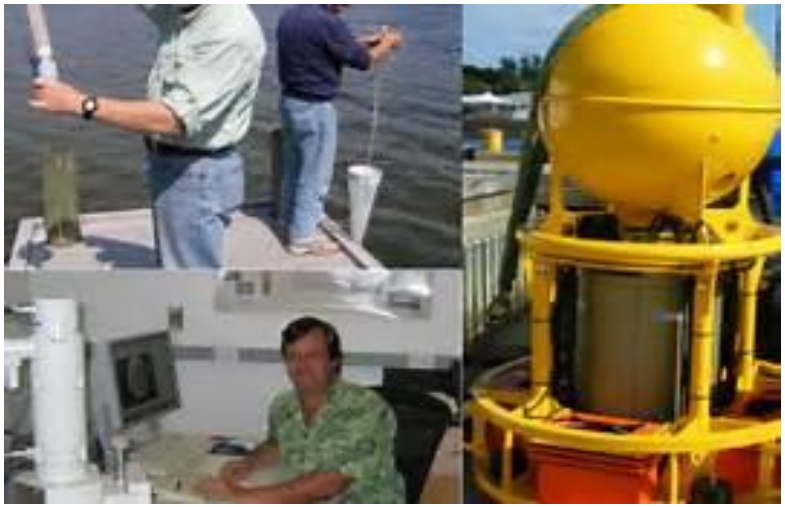
Average chlorophyll concentrations (milligrams per cubic meter of water) in July 2015. The darkest green areas have the highest surface chlorophyll concentrations and the largest amounts of phytoplankton—including both toxic and harmless species. NOAA Climate.gov map based on Suomi NPP satellite data provided by NOAA View.

SEATT *Pseudo-nitzschia* Observations: May 1 - August 31, 2015



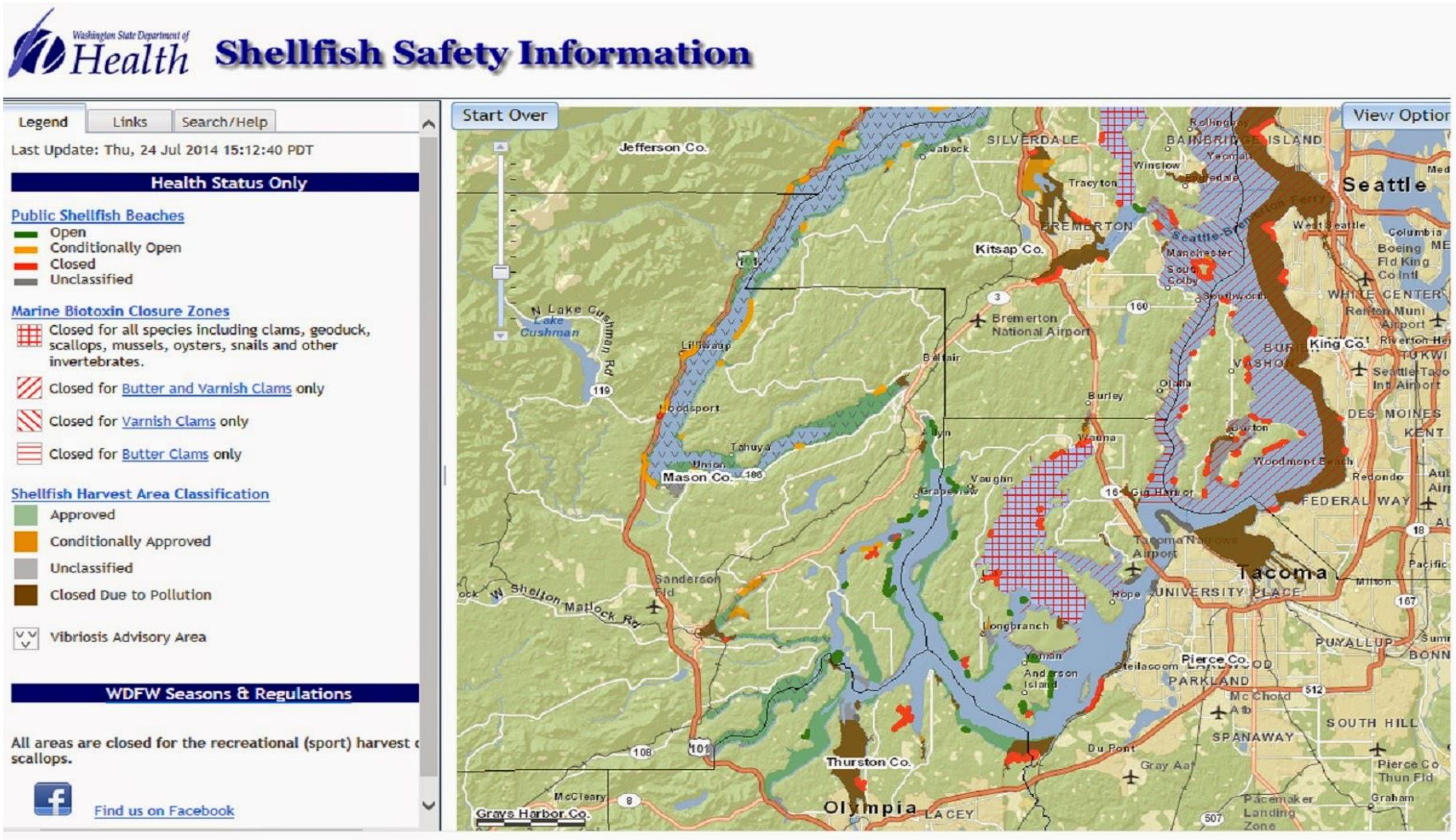
Where does all the data go?

- SoundToxin Database and Phytoplankton Monitoring Network (NOAA)
  - National database for all monitoring groups
  - Used by researchers, shellfish growers, and resource managers for early warning system



http://www.seator.org/

Interactive Mapping Tool



Benefits for REAL Time Monitoring

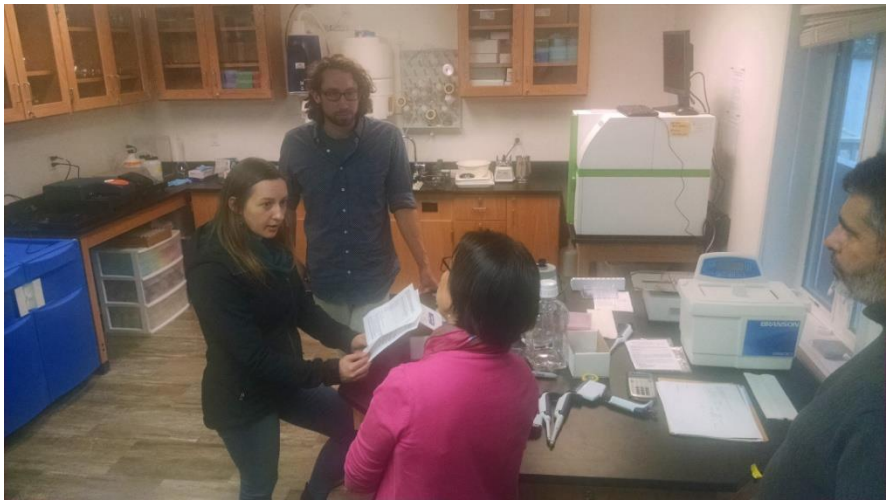
- EARLY WARNING system
- Develop forecasting tools
- Provide outreach to Tribal and Non-Tribal Citizens about the potential for health risk related to subsistence harvest.
- Coordinate with local and state health departments

Credibility

Ketchikan *noctiluca* bloom 2009

Sitka Tribe of Alaska Environmental Regulatory Lab (STAERL)

- Developed to support SE Tribes (SEATT) with shellfish toxin analysis.
- Provide **regulatory** data to Tribes and communities to assess their vulnerability to risk associated with biotoxins.
- **Tribes can use STAERL to develop subsistence shellfish management plans**



FUNDING

- **SEATT**: EPA IGAP -$20K/Tribe/year (~$250/yr)
- **SEATT:** EPA IGAP workshops-$150K (STA)
- **SEAROAM**: BIA Climate Change Program-$210K (STA)
- **SEATOR** site/SEATT training: BIA Climate Change Program-$50K (STA)
- **STAERL**:ANA Environmental Regulatory Enhancement Program-$580K (STA)
- ***IACSEA**: NOAA Coastal Resilience Program-$860K (STA/UAF) (pending)

$1.5 million as of FY16 (*or $2.4 million)

Other Partners

- NOAA –Northwest Fisheries Science Center and Charleston Marine Biotoxin Program/PMN
- University of Alaska Fairbanks School of Fisheries and Ocean Science
- Southeast Alaska Regional Dive Fisheries Association (SARDFA)
- Washington State Department of Health Marine Biotoxin Program
- Alaska Department of Environmental Conservation (EHL)

Questions or Comments?

Chris Whitehead
Environmental Program Manager
Sitka Tribe of Alaska
Resource Protection Department
907-747-7395
chris.whitehead@sitkatribe-nsn.gov
www.seator.org