



Concerns and priorities in the context of changing ocean conditions

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Project Goals

Washington marine waters are changing due to ocean acidification, ocean warming, and hypoxia, and there's a need to incorporate changing ocean conditions into future resource management and policy decisions

GOALS:

- 01 | Identify concerns and information needs re: changing ocean conditions
- 02 | Inform future priorities based on management and policy implications
- 03 | Improve linkages and coordination among partners
- 04 | Connect results to broader efforts



2-Phase Approach

- 1 Informational interviews with State and Tribal resource managers
- 2 Use interview information to develop an online survey for distribution to wider group

Deliverables: Summarize qualitative and quantitative results from interviews and survey into presentation and summary document

Phase I

Conduct and Transcribe Interviews

Phase II

Create and Distribute Survey

Summarize and Present Recommendations



Phase I: Interviews

Interview Process



- Conducted and recorded interviews with tribal and state agency natural resource managers:
 - 27 resource managers (19 state, 8 tribal)
 - 3 state agencies, 5 individual tribes
- Transcribed interviews and coded qualitative interview data (ATLAS.ti) to identify themes to guide survey design

Interview Themes: Priority Needs

- Plankton
 - Abundance, composition, species recruitment
- Identifying species tolerances and thresholds
- Downscaling models to local areas of concern (e.g., IPCC)
- Increasing monitoring stations (river and marine)
- Reducing nutrient loading



“There’s no way of exactly identifying the type of consequences when the rubber hits the road - the on the ground consequences for the fishermen in 5 years, 20 years... but **what’s causing the anxiety is the unknown**. We don’t know the type of impact or magnitude”

Phase II: Survey

Survey Process

Google forms survey of 13 questions

Survey Question Themes:

- Demographic Data
- Resources/Habitat Managed
- Concerns
- Data Uses and Gaps
- Barriers
- Priorities for Data, Research, & Monitoring

Concerns and Priorities in the Context of Changing Ocean Conditions

Ocean acidification, ocean warming, and hypoxia are changing Washington's marine waters, posing a variety of immediate and future challenges for natural resource and tribal managers and associated industries. Pressing needs and concerns must be identified today to help better prepare for an uncertain future. The intent of this survey is to gather data that can be used to help improve coordination amongst and between natural resource managers, industry, and researchers to enhance short and long-term resource management strategies in light of changing ocean conditions.

The results of this survey will be summarized and disseminated to natural resource managers, academics, and researchers. Results will be used to identify and catalogue information needs, data gaps, and obstacles as a means to guide research, advance resource management, and improve collaboration among partners. In short, by taking a few minutes out of your day to complete this survey, you are helping us help you.

This survey consists of 13 questions and should take approximately 10 minutes. It has been developed in collaboration with two students from the Program on Climate Change at the University of Washington and representatives from Washington State Departments of Fish and Wildlife (WDFW) and Natural Resources (DNR). The survey results are not intended to promote or refute specific research projects or funding requests to the Washington State Legislature or Federal agencies.

We sincerely thank you for your time. If you have any questions, comments, or concerns, please don't hesitate to contact either:

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or

Nyssa Baechler: nyssab@uw.edu

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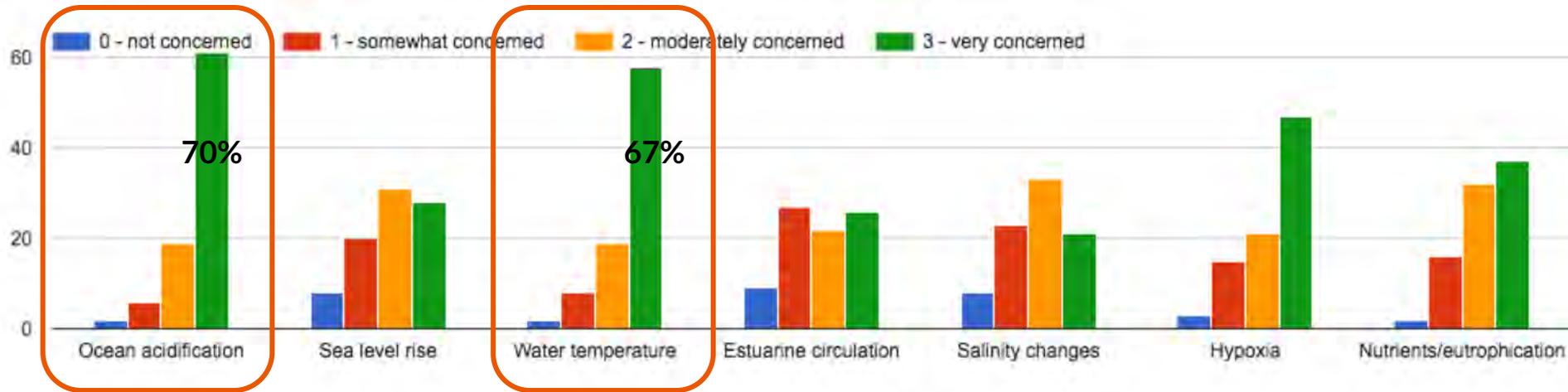
Survey Participants

92 responses from 45 entities

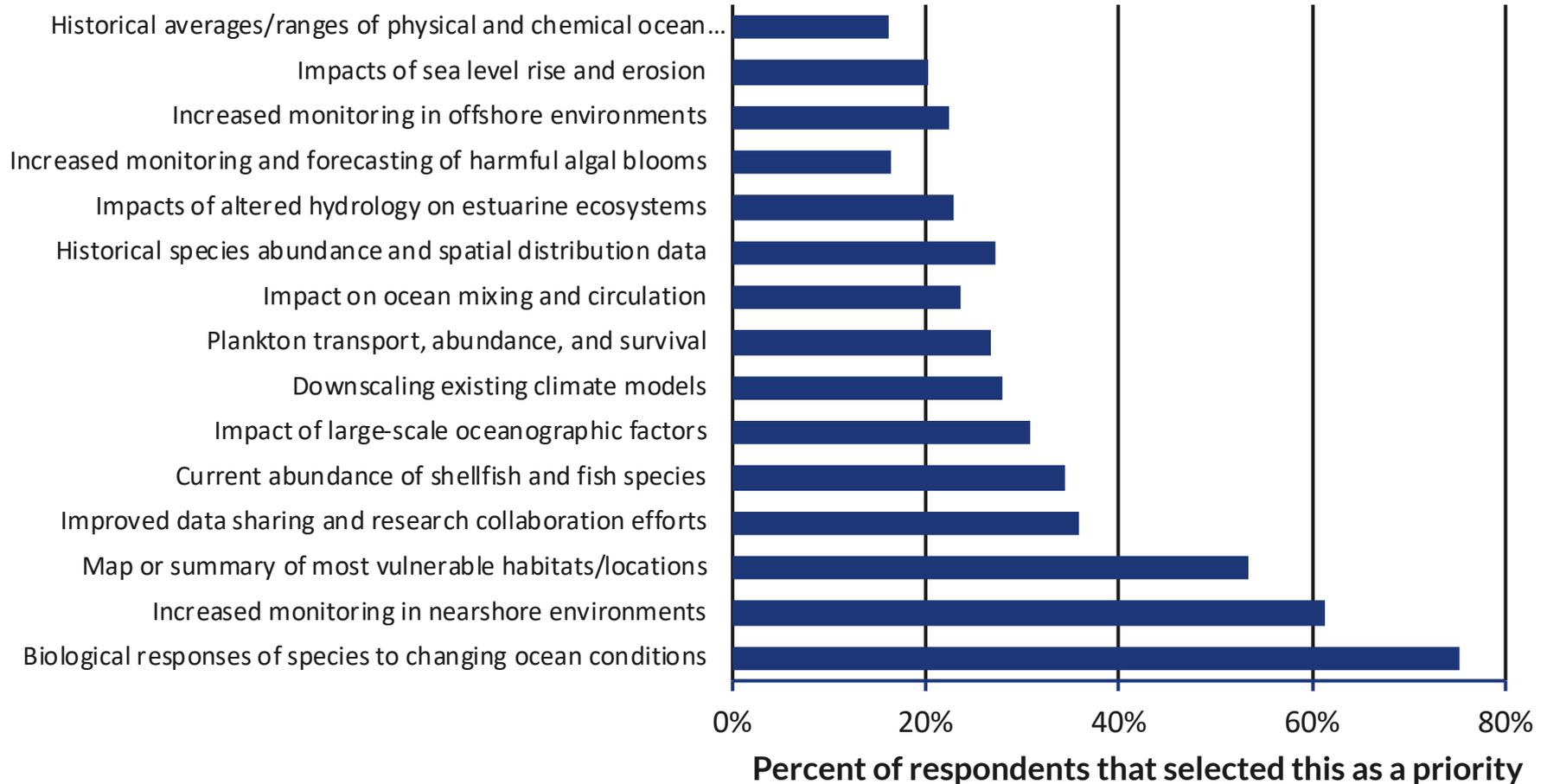
- Coalition of Coastal Fisheries (1)
- Columbia River Crab Fisherman's Association (1)
- Department of Natural Resources (2)
- Department of Health (1)
- Duna Fisheries, LLC (1)
- Global Ocean Health (1)
- Ilwaco Charter Association (1)
- Jamestown S'Klallam Tribe (3)
- King County (2)
- Makah Tribe (3)
- Nisqually Indian Tribe (1)
- NOAA Ocean Acidification Program (1)
- Nooksack Tribe (1)
- North Olympic Salmon Coalition (2)
- Northern Oyster Company (2)
- Northwest Straits Commission (1)
- Ocean Associates/NMFS (1)
- Office of the Governor (1)
- Olympic Coast National Marine Sanctuary (2)
- Pacific County (1)
- Padilla Bay National Estuarine Research Reserve (1)
- PMEL/NOAA/Dept of Commerce (1)
- Point No Point Treaty Council (1)
- Port Gamble S'Klallam Tribe (1)
- Port of Ilwaco & Port of Chinook (1)
- Puget Sound Crab Association (1)
- Puget Sound Shrimp Association (1)
- Quileute Indian Nation (1)
- Quinault Indian Nation (2)
- RE Sources for Sustainable Communities (1)
- Skagit Watershed Council (1)
- Skokomish Indian Tribe (2)
- Snohomish County (2)
- Suquamish Tribe (1)
- Surfrider Foundation (1)
- Swinomish Indian Tribal Community (2)
- Taylor Shellfish Farms (4)
- The Tulalip Tribes of Washington (1)
- U.S. EPA (1)
- University of Washington (2)
- Washington Environmental Council (1)
- Washington Sea Grant (2)
- Washington State Department of Ecology (4)
- Washington Department of Fish and Wildlife (19)
- Westport Seafood Inc. (1)
- ... and 3 fishermen

Concerns

5. How concerned is your research/management group about changing ocean conditions affecting the resource(s) you work with?



Ranking Priorities



Respondent Insights + Suggestions



“There needs to be a **clearinghouse** for information with authority and protocol to make final decisions so stakeholders can make progress on a solid foundation using relevant and solid data

“More **face to face workshops between industry, resource manager and agencies** where FACTS and SOUND SCIENCE are presented and a "Final and Agreed Upon Interpretation" comes out of the workshop and all state agencies, resource managers, etc. agree to use those interpretations and data points moving forward in their decision making.”

“For the outer coast, an **Ocean Acidification Sentinel Site** could assist in all aspects... It is a holistic approach of resource management where science is integral to education, outreach, management and public engagement campaigns to address these changing ocean conditions.”

Separate climate change from natural variation i.e. link observed changes in species abundance and distribution to climate change and ocean acidification

Conclusions



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1

Determine Species Thresholds-Tolerance

Need to prioritize laboratory or in situ study identifying survival thresholds of vital organisms, such as plankton and commercially important fish

Continue to actively link monitoring and research results to resource management , protection, and policy discussions



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2



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3

Improve Collaboration and Communication

Coordinate and share monitoring efforts and research within and among entities and compile in accessible database

Final Project Deliverable

2 page summary report

- Background
- Core questions
- Noted concerns
- Recommendations
- Distribution expected spring 2019
- Available <http://oainwa.org/mrac/>

Institute for Natural Resources

March 2014



What science and information is needed to plan for and mitigate the effects of ocean acidification and hypoxia?

A Snapshot of Oregon Agency Responses

Background

In summer 2013, Governor Kitzhaber's Office signed a Memorandum of Agreement aligning Oregon and California efforts to implement the *West Coast Ocean Acidification and Hypoxia Science Panel*. The OSU Institute for Natural Resources (INR) is working with the California Ocean Science Trust (CalOST) to convene a panel of 20 west coast oceanography experts. The Panel is charged with synthesizing and interpreting knowledge from the diverse and rapidly evolving fields of ocean acidification and hypoxia science, and prioritizing research and monitoring critical to the west coast's future.

To help meet this charge and to better link research and science to management-relevant questions, CalOST and INR approached state and federal agencies in California and Oregon to provide input about their science and information needs related to ocean acidification and hypoxia. Driven by interviews with state and federal managers in spring 2013, CalOST oversaw the development of five core science questions for the Panel (see box at right). In fall 2013, INR asked Oregon state agency staff to consider these core questions in the context of Oregon, and to identify any additional or more specific science information needs that would better enable these agencies to meet their charges and goals.

What follows is a synthesized and condensed snapshot of initial responses from seven state agencies – Oregon Department of Fish and Wildlife, Department of Agriculture, Department of Land Conservation and Development, Department of Environmental Quality, Department of State Lands, the Oregon Health Authority and Oregon Parks and Recreation Department. This synthesis of Oregon feedback is intended to be revised and refined in coming months as INR solicits and receives further input. CalOST and INR are also working to incorporate all feedback received from west coast state and federal agencies into a more detailed synthesis document for the Panel.

Panel's core science questions

Q1: *What are the naturally occurring variations in acidification and hypoxia parameters in both space and time?*

Q2: *To what extent have, or are, we going to deviate from "naturally occurring variations" as identified in Q1?*

Q3: *How much do regional and local inputs affect the deviations identified in Q2?*

Q4: *What are the consequences of the deviations identified under Q2 for uses or ecological resources of our coastal oceans?*

Q5: *What research and monitoring would most efficiently fill critical information gaps encountered by the Panel in answering these questions?*

Oregon scientists on the West Coast Science Panel

Jack Barth, OSU; Francis Chan, OSU; Burke Hales, OSU; Waldo Wakefield, OSU, NW Fisheries Science Center, NOAA Fisheries; and George Waldbusser, OSU

Partnerships in Monitoring Resource Impacts from Changing Ocean Conditions



ANeMoNe

Acidification Nearshore Monitoring Network

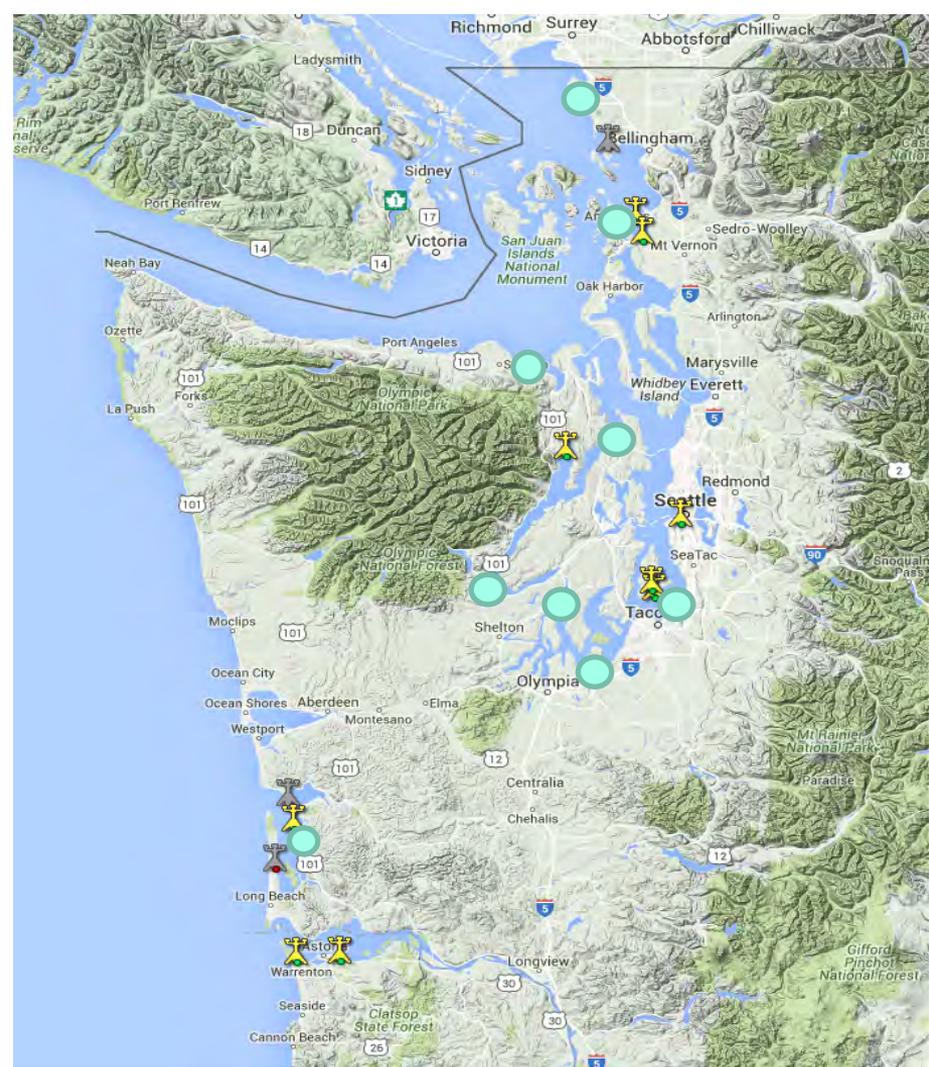


NOAA/shellfish growers monitoring site

 DNR monitoring site
Instruments measure pH,
salinity, temperature, dissolved
oxygen, chlorophyll every 10
minutes

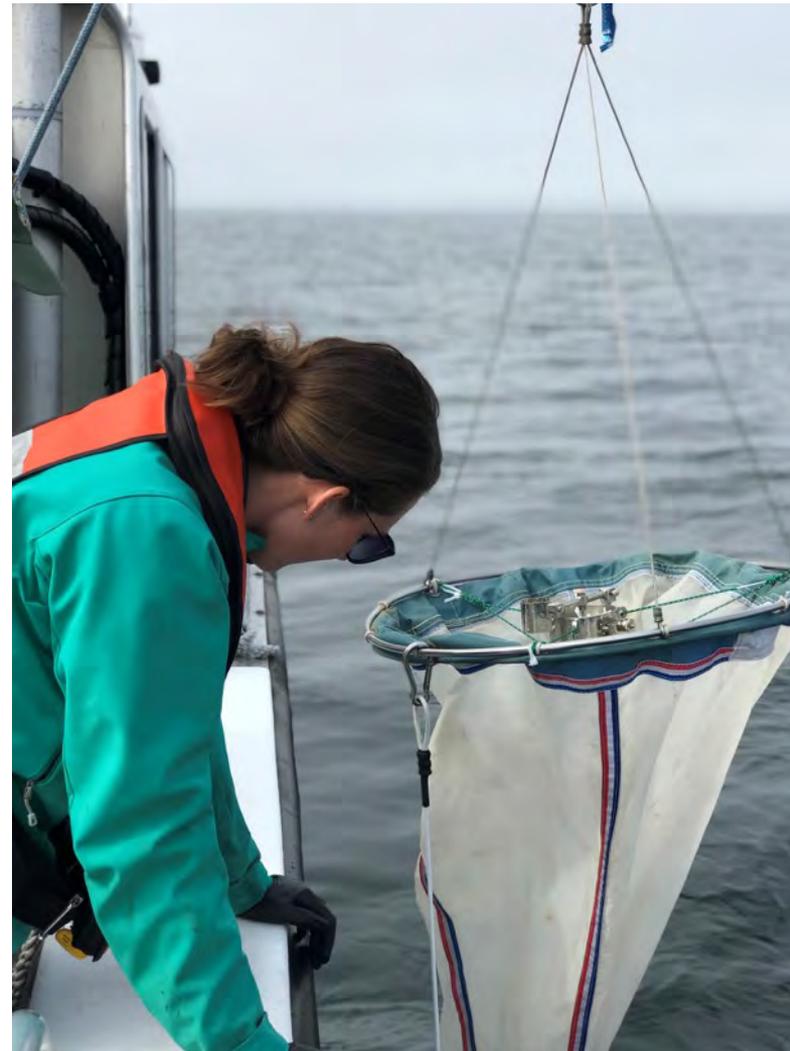


Contact: Micah Horwith, DNR
micah.horwith@dnr.wa.gov



Puget Sound Zooplankton Monitoring Project

- A component of the Salish Sea Marine Survival Project;
- Established in 2014 by Long Live the Kings and the Pacific Salmon Foundation;
- 10 Partners, 16 index sites; sampled bi-monthly except in winter;
- Vital project for monitoring impacts and long term trends to early life stages to wild stocks species;
- Goal is to continue project long term



Ken Chew Shellfish Conservation Hatchery

- NOAA/PSRF Partnership;
- Unique opportunity to investigate OA remediation strategies;
- Vital to species restoration efforts;
- Research and production focus Olympia oysters, pinto abalone, sea cucumbers, and kelp.



Aquatic Vegetating Strategies

- Monitoring, experiments and modeling that are testing the use of vegetation-based systems for remediation;
- Kelp cultivation, eelgrass restoration and protection are potential adaptation tools



Hood Head Kelp/OA Investigation: *Can growing seaweeds assist in mitigating OA?*

- PSRF/HCM: One hectare kelp cultivation pilot project;
- Measure net production and change in biomass of kelp over season prior to harvest;
- UW/PMEL/WDNR: measures upstream and downstream changes in carbonate chemistry (pCO₂, pH, DOC, DIN, TA, DO₂, salinity);
- WA Sea Grant: providing communication strategy for scientific findings;
- UW/PMEL Biology: measures rates of shell dissolution in pteropods within, upstream, and downstream of site;
- NOAA/NMFS: measures fish utilization;
- SSA: models changes in seawater chemistry as kelp grows, using kelp sampling data.

Funders: The Paul G. Allen Family Foundation Ocean Challenge and U.S. Navy



How we're adapting

Species restoration efforts:

- Shellfish production
- Eelgrass monitoring/restoration
- Kelp monitoring and recovery
- Native oyster habitat Restoration



Monitoring Resource Impacts

- West coast resource monitoring inventory;
- Evaluating WDFW long term monitoring data;
- WA coast OA sentinel site;
- Vulnerability assessment of pelagic and benthic organisms;
- Coast wide PH and carbonate system monitoring;
- Modeling impacts to inform management of human impacts.



Bivalve Clam Shell Length/Weight Monitoring Project

- Research objective: track long term changes in the length/weight relationship of five clam species in Puget Sound;
- Physiological stressors on bivalves from OA conditions will likely impede calcification rates resulting in thinner shells;
- Research initiated in 2018 and designed as a on-going long term project;
- Clam samples are collected during WDFW annual bivalve surveys
- 5 beaches were selected for on-going monitoring from several “regions” within Puget sound;
- Similar research/data collection on WA coast and Willapa bay



Marine Recourse Advisory Council (MRAC) and Ocean Acidification in Washington



MRAC: Who we are

MRAC Chair: Martha Kongsgaard

Current Members:

Brian Allison, Puget Sound Commercial Crab Assoc.

Maia Bellon, Ecology

Mike Cassinelli, City of Ilwaco

Mark Clark, WA State Conservation Commission

Rich Childers, WDFW

Mindy Roberts, Washington Environmental Council

Garrett Dalan, WCMAC

Tom Davis, Washington State Farm Bureau

Bill Dewey, Taylor Shellfish Farms

Norm Dicks, Van Ness Feldman LLP

Tony Floor, Northwest Marine Trade Association

Hilary Franz, DNR

Gus Gates, Surfrider Foundation

Lisa Graumlich, UW College of the Environment

The Honorable Dave Hayes, WA State House of Representatives

Libby Jewett, NOAA

Jay Manning, Puget Sound Partnership

Nan McKay, Northwest Straits Commission

Erika McPhee-Shaw, Western Washington Univ.

The Honorable Kevin Ranker, WA State Senate

Marilyn Sheldon, Coastal Shellfish Grower

Douglas Steding, Assoc. of WA Business

Terry Williams, Tulalip Tribes of Washington

MRAC: What we do

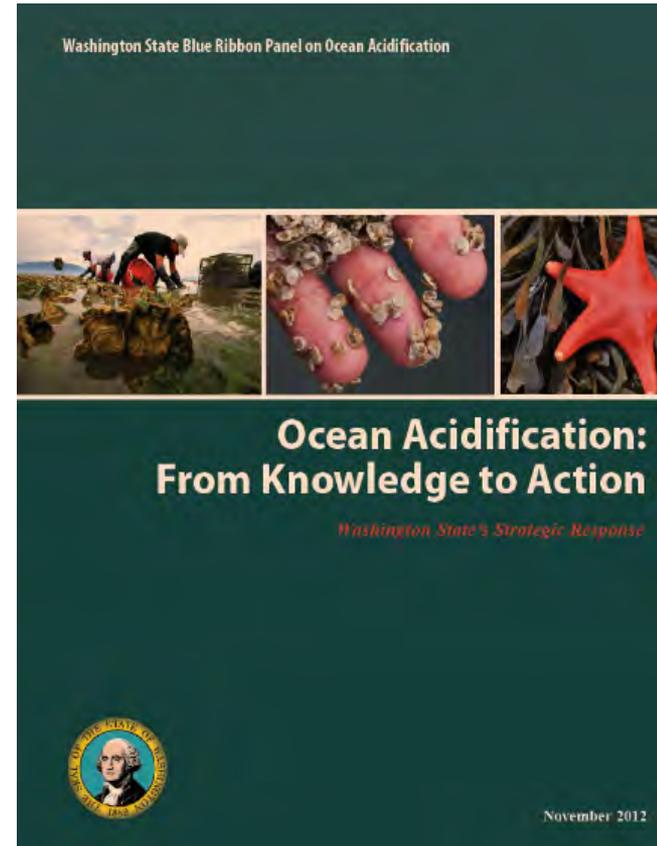
- Ensure OA work is efficient, leveraged, and integrated into key programs across the state
- Coordinate with WOAC to ensure science is at the heart of everything we do
- Deliver recommendations to the Governor and Legislature on OA
- Seek public and private funding to support recommendations
- Assist in conducting OA outreach activities



MRAC's guiding strategy

2012 Blue Ribbon Panel Report: *Ocean Acidification: From Knowledge to Action* from Comprehensive strategy for addressing OA in WA

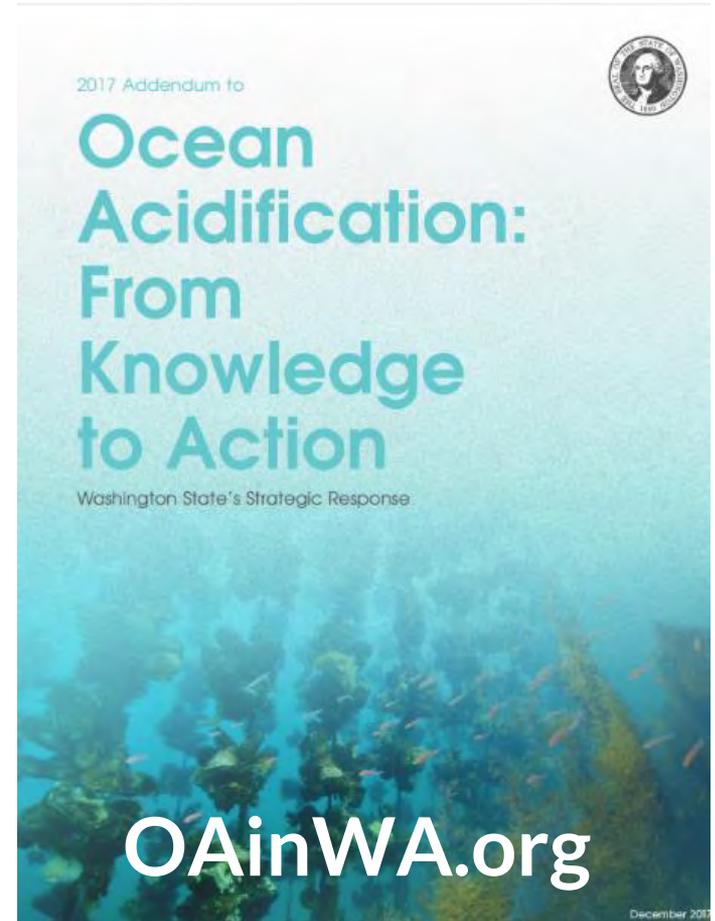
- First of its kind
- Recommends 42 actions across six focus areas



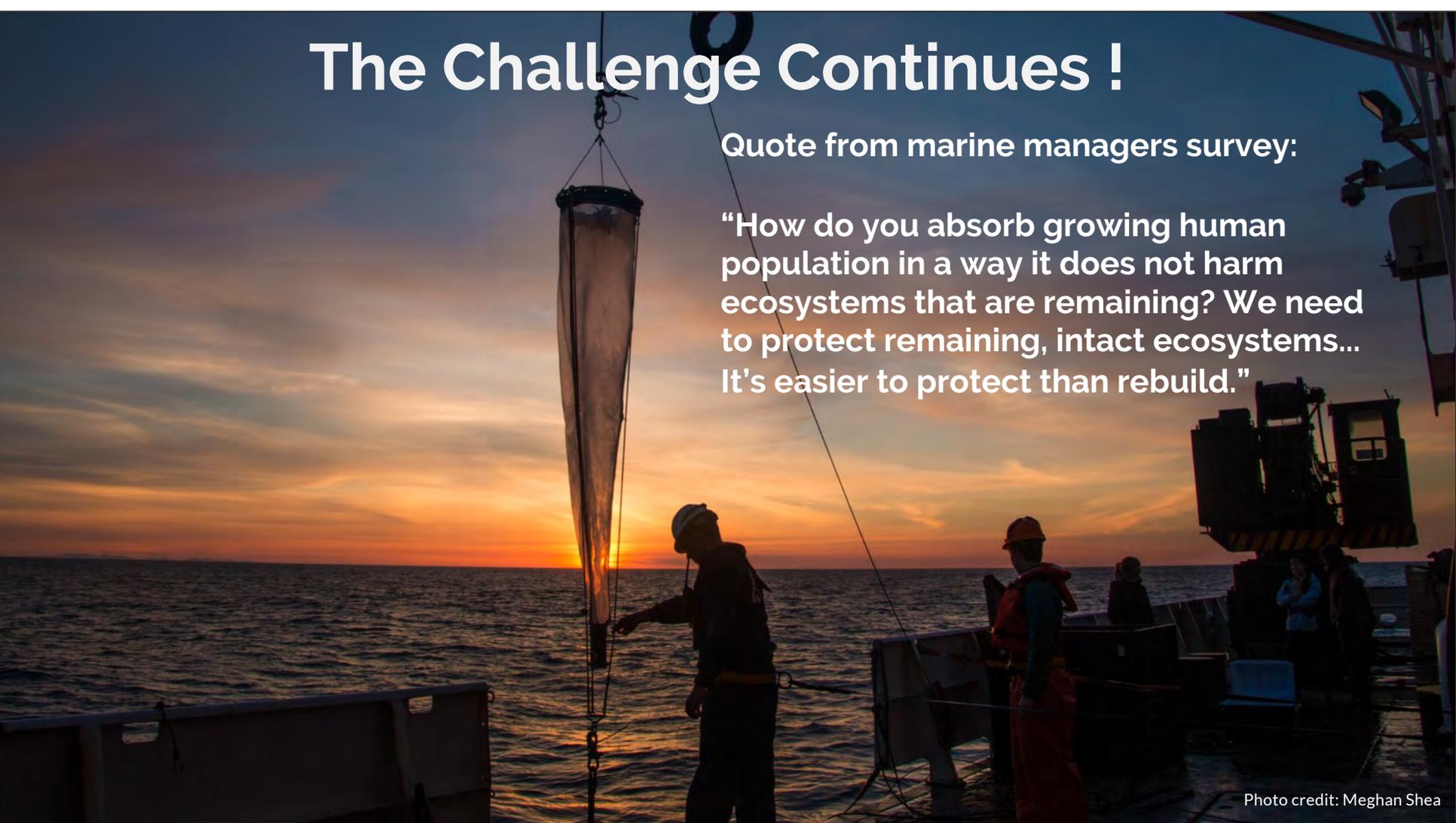
Recent update to the strategy

2017 Addendum to the Blue Ribbon Panel Report

- Learns from emerging science
- Incorporates new management needs
- Highlights opportunities for action



The Challenge Continues !



Quote from marine managers survey:

“How do you absorb growing human population in a way it does not harm ecosystems that are remaining? We need to protect remaining, intact ecosystems... It’s easier to protect than rebuild.”