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**Inform,
Educate,
and Engage
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Addressing
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Inform, Educate, and Engage Stakeholders, the Public, and Decision Makers in Addressing Ocean Acidification



Students learning about ocean acidification. Photo credit: Washington Sea Grant

Chapter 8 of the original 2012 Panel report outlined the importance of connecting Washingtonians to the problem and impacts of ocean acidification and empowering citizens and businesses to help develop and implement solutions. Increasing understanding of ocean acidification and its consequences among policy leaders, marine industries, interested organizations, and the public is essential to implementing appropriate response measures. The Panel recognized that educating these groups is a prerequisite to action.

To improve understanding of ocean acidification and engage stakeholders in solutions, information needs to:

- Communicate that ocean acidification is already affecting jobs and resources here in Washington state
- Emphasize the importance of the ocean to our health, coastal economies, and well-being
- Explain the rapid change in ocean chemistry, the consequences of this change for marine life in Washington, and what it means for individuals and Washingtonians collectively
- Target key audiences (e.g., policy makers, urban residents, rural communities, etc.) to show the value of early action and highlight the role that Washingtonians can play in developing and implementing solutions



Northwest School earth science students witnessed the effects of ocean acidification during a presentation by Washington Sea Grant ocean acidification specialist Meg Chadsey. Photo credit: Washington Sea Grant

This chapter describes accomplishments related to education and outreach since 2012, revised and new actions, and key next steps to continue progress in this area. Refer to Chapter 8 in the original 2012 Panel report for a full summary of why education and outreach measures are critical and for descriptions of each original action in this area.

8.1 Accomplishments since 2012

Since 2012, sustained focus by state and tribal leaders, the scientific and conservation communities, federal and state resource agencies, and shellfish growers has propelled Washington into becoming an incubator for progressive and creative ocean acidification outreach and education efforts. These efforts have brought acidification to the consciousness of the public. Compared to other areas of the country, Washingtonians have a relatively high level of ocean acidification literacy, and share a broad concern for the health of our state's marine resources. As a result, key audiences are building a strong base of ocean acidification knowledge, which provides critical support for engaging them further in innovative ways towards action.

Increased ocean acidification literacy:

- Developed ocean acidification-focused curricula adapted to meet science standards, which teachers are already beginning to use in the classroom
- Worked with existing institutions to offer trainings and information sharing opportunities
- Shared knowledge through multiple conferences, symposiums, workshops, and other events



Seattle Culinary Academy students offer tempting tastes of sugar kelp at an outreach event about the use of kelp to combat acidification. Photo credit: Washington Sea Grant

Outreach to Washington's communities, stakeholders, and legislators: Early in our education and outreach efforts, the focus was primarily on raising awareness of the threat and impacts of ocean acidification. As awareness has grown, communities and stakeholders are pushing to learn

Positive messaging: Engaging the public through food

Chefs have a unique opportunity to educate people through food. In Washington, outreach specialists are partnering with the culinary world to get the word out about ocean acidification.

- On a quarterly basis, Washington Sea Grant teaches Seattle Culinary Academy students about ocean acidification and how it may change what kinds of seafood they are able to serve.
- In April 2017, Washington Sea Grant worked with Puget Sound Restoration Fund and Seattle Culinary Academy to showcase a kelp investigation funded by the Paul G. Allen Family Foundation. Held at the Seattle-based Museum of History and Industry (MOHAI)'s Edible City Science Fair, over 200 people learned about ocean acidification, phytoremediation, the experimental kelp farm on Hood Canal, and the ways kelp cultivation could benefit the environment and shellfish growers in Washington state.
- In July 2017, Puget Sound Restoration Fund partnered with Seattle culinary icon Tom Douglas and his affiliated cooking school, Hot Stove Society, to host a class on edible kelp.
- In Spring 2018, Puget Sound Restoration Fund will partner with a community-based commercial kitchen on Bainbridge Island, Washington to experimentally prepare an array of kelp products using Washington's first licensed kelp crop.

Local collaboration for ocean acidification awareness and action

Since 2013, the Northwest Straits Initiative and affiliated Marine Resources Committees have organized over 20 forums and conference sessions in partnership with researchers, local leaders and shellfish growers. In accordance with the Blue Ribbon Panel recommendations, these events have communicated that ocean acidification is a real and recognized problem in Washington state (Strategy 8.1) and have resulted in increased ocean acidification literacy (Strategy 8.2) among those engaged in coastal issues. The message has reached more than a thousand local residents as well as target audiences, from elected officials and decision makers to chefs and restaurant owners. Volunteer-based Marine Resources Committees have also continued their on-the-ground work with projects such as eelgrass protection, rain garden installation, and Olympia oyster restoration. Projects such as these help buffer seawater, filter nutrients that exacerbate ocean acidification, and maintain native species resilient to ocean acidification.

more and understand what they can do to address the problem. Education and outreach efforts are now shifting in response to present audiences with more detailed information about actions that people can take in their own lives that seem feasible and match the scale of the problem. In these efforts, partners are engaging communities towards action at workshops, conferences, symposiums, and online information campaigns. Some examples include:

- The Northwest Straits Initiative's Ocean Acidification seminar series and volunteer restoration activities
- Public-friendly science forums (e.g., Salish Sea Ecosystem Conference, Seattle Aquarium Discover Science Weekend, NOAA Pacific Marine Environmental Lab Open House)
- Online information and action campaigns such as those put out by The Nature Conservancy and the Surfrider Foundation
- The 2016 NOAA West Coast Ocean Acidification research cruise blog

Additionally, the Marine Resources Advisory Council's efforts to educate and inform Washington legislators about the potential peril of ocean acidification and Washington's unique capacity to fight against it has allowed partners in-state to secure funding for ocean acidification projects and priorities. This has resulted in tangible action that would otherwise not have been possible without legislative outreach.

Outreach to national and international audiences:

A significant contribution of Washington's outreach and education efforts around ocean acidification has been in carrying the message to decision makers outside our boundaries and serving as a template for success to other jurisdictions under threat. Maine, Maryland, Massachusetts, New York, and Oregon have looked to Washington for guidance as they take on similar approaches and pass ocean acidification legislation in their jurisdictions.

Over the last five years, members and affiliates from the Blue Ribbon Panel and MRAC have traveled across the globe to represent ocean acidification interests and educate others less informed about changing ocean chemistry within high-profile regional, national, and international forums (e.g., West Coast Ocean Acidification and Hypoxia Science Panel, Our Ocean Conference, and the United Nations Conference of Parties [COP] climate conferences). Their representation in these platforms has elevated the issue as a concern parallel with climate change.

Outreach among tribal communities: Washington Treaty Tribes are uniquely vulnerable to ocean acidification because of their cultural, economic, and spiritual connections to place-based marine resources. Several tribes are engaging with their communities and partnering with non-tribal entities to address ocean acidification impacts to human well-being. Examples of these efforts include:

- The Squaxin Island Tribe's work with Washington Sea Grant and NOAA Northwest Fisheries Science Center to identify ocean acidification impacts to their community
- A two-year Regional Vulnerability Assessment of four Washington coastal tribes funded through the NOAA Ocean Acidification Program

Education for students and teachers: The efforts of partners to integrate ocean acidification into formal and informal education has benefitted from Washington state's receptive audiences. Educators are hungry for curricula and other resources that help them teach fundamental science concepts in the context of a highly-relevant, real-world issue like ocean acidification. Tribes have led the charge in these efforts, and the statewide adoption of the Next Generation Science Standards has facilitated adoption of new ocean acidification materials. Specific examples of these education efforts include:

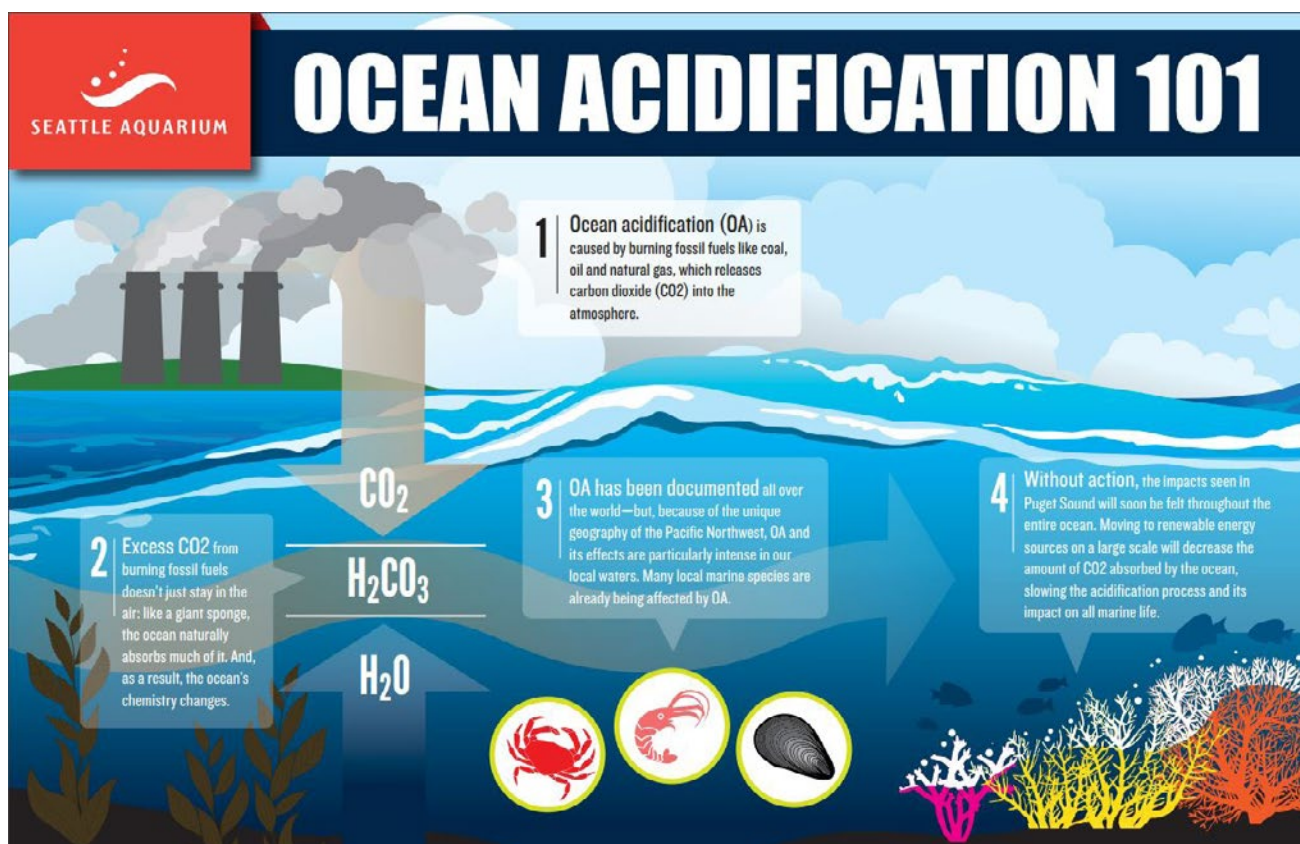
- The Suquamish Tribe maintains an online collection of ocean acidification-focused K-12 curricula materials (www.oacurriculumcollection.org). In addition, a partnership between Suquamish, the University of Washington's Oceanography Department, and Olympic Educational Services District educators provides workshops on ocean acidification and related topics to teachers from the Olympic Peninsula and surrounding areas.
- Offered teacher trainings and professional development opportunities around ocean acidification, such as the NOAA Sharing Ocean Acidification Resources for Communicators and Educators (SOARCE) webinar series, co-coordinated by Washington Sea Grant
- Advanced public education of ocean acidification through programs, exhibits, and online and print materials, such as those offered by the Seattle Aquarium, the Pacific Science Center, the Olympic Coast National Marine Sanctuary, and Washington Sea Grant

Tribal high school students learn about acidification's threats together

In 2016, students at Chief Kitsap Academy (operated by the Suquamish Tribe) participated in the Ecosystem Pen Pal program, a cultural and science exchange connecting high school students from Washington's tribal communities, Hawaii, and American Samoa. Through the program, students from the Makah, Quileute, Quinault, Muckleshoot, and Suquamish Tribes learned and shared with their Pacific pen pals how ocean acidification affects the local ecosystem and threatens their culture, economy, and traditional ways of life. The program was facilitated in partnership with the Olympic Coast National Marine Sanctuary, and was funded by the National Marine Sanctuary Foundation, Hollings Ocean Awareness Trust Fund, and NOAA's B-WET grant programs.



Michelle Marcoe (tribal educator with Puyallup School District) and Jefferson Emm (Western Washington University graduate student and Northwest Indian College graduate) at a tribal educator professional development workshop funded by a NOAA Environmental Literacy grant that has been awarded to Padilla Bay National Estuarine Research Reserve System. Photo credit: Jude Apple



In collaboration with five other aquariums, the Seattle Aquarium developed a strategic Ocean Acidification narrative as well as a comprehensive workshop and toolkit. These have been used both regionally, nationally and globally as an online webinar, reaching the “OA unaware.” Photo credit: Seattle Aquarium

Empowering stories about youth taking action

Together with many partners, Philippe Cousteau and his EarthEcho Expeditions team produced *Shell Shocked*, an online ocean acidification module investigating the problem in the Pacific Northwest and featuring stories of high school students from Neah Bay, Suquamish, Seattle, and Bainbridge Island. Among the many efforts featured, some of these students are monitoring seawater chemistry while others have shared about the threat of ocean acidification to tribal fish resources. The module is available at earthecho.org/expeditions/shell-shocked.

Media coverage: Washington’s proactive efforts to investigate potential strategies for mitigating corrosive seawater conditions also attract considerable and ongoing media attention. The state has served as a touchstone for journalists covering ocean acidification since the oyster production failures between 2005 and 2009. Shellfish farms around the Pacific Northwest and spotlights on proactive mitigation efforts continue to feature prominently in media pieces in local and national outlets alike – among them the *Seattle Times*, the *New York Times*, *Huffington Post*, and *USA Today*. This coverage provides an effective means for amplifying outreach on ocean acidification to the public at large, allowing information to reach much broader audiences.

8.2 Updated Actions

Specific revisions to the Panel's 2012 action language are underlined for easy reference.

Action	Original Language	Updated Language	Rationale
8.1.4	Provide a forum for agricultural, business, and other stakeholders to engage with coastal resource users and managers in developing and implementing solutions	Provide a forum for agricultural, <u>forestry</u> , business, and other stakeholders to engage with coastal resource users and managers in developing and implementing solutions	<ul style="list-style-type: none"> Recognizes that forestry managers have an opportunity to support and act to address ocean acidification along with already identified key stakeholder groups Private forestlands provide environmental services such as clean water and carbon sequestration. Engaging forest managers on how their lands might also provide services in the context of ocean acidification mitigation is a critical first step towards developing and implementing solutions with this landowner group.

8.3 New Actions

Action	Language	Rationale
8.1.5	Raise awareness of available ocean acidification tools and resources	<ul style="list-style-type: none"> As new tools and resources become available, it is important for managers and users to learn of their release Provides continued learning opportunities to improve developed tools and ensure users can act based on the information these tools and resources provide
8.1.6	Develop and periodically update an ocean acidification outreach and communications strategy and an annual list of key messages and key findings	<ul style="list-style-type: none"> Recognizes that fact-based outreach and communications requires a broad outreach strategy and periodically updated key messaging Nesting outreach and communications throughout the other action areas ensures key messages can be developed to target key stakeholders and ambassadors



The Northwest Straits Commission has hosted or presented at more than twenty events throughout the region to raise awareness about the issue among community members, local leaders and other key audiences. Pictured – speakers Simone Alin, Betsy Peabody, Cindy Jayne and Jean Walat at an event in Port Townsend. Photo credit: Northwest Straits Commission



University of Washington researcher Chase Williams explaining to Federal Way middle school students how ocean acidification makes it harder for juvenile coho salmon to avoid predators. Photo credit: Washington Sea Grant

8.4 Continuing Progress

In reviewing accomplishments and updated and new actions, the following were identified as key steps to continue progress related to education and outreach efforts over the next five years:

- In pursuit of new Action 8.1.6, use strategic key messages to tell the ocean acidification story clearly and effectively. Work with the MRAC's ad hoc committees to incorporate new findings from their work and update or develop new messaging as needed. Part of these efforts may include:
 - Hiring an outside entity with communications expertise to build an outreach strategy and craft key messages to enhance current communications efforts
 - Identifying a lead to support development and implementation of the outreach strategy
 - Determining methods to measure and quantify the impacts of these activities on behavior change
 - Emphasizing specific actions individuals and communities can take to address ocean acidification
 - Conducting a public opinion poll/survey to get a baseline of the public's ocean acidification awareness
- Connect industry, organizations, and local and regional governments with the International Alliance to Combat Ocean Acidification
- Strengthen partnerships with tribes leading education, outreach, and messaging efforts
- Increase engagement of vulnerable marine industries (e.g., fishing and crabbing) to identify new champions
- Increase engagement of other industries in the position to help address the challenge (e.g., forestry, business, and agriculture)
- Leverage existing networks to access influential local leaders. Some key groups to engage may include the Forest Resource Council, PCC Farmland Trust, American Farmland Trust, and the Farm, Fish, and Floods Initiative.
- Offer training on ocean acidification tools pertinent to user groups, per new Action 8.1.5. Allow users to provide feedback for continuous improvement of tools (e.g., NANOOS and Live Ocean).