5 Reduce Local Land-Based Contributions to Ocean Acidification

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Jefferson Marine Resources Committee has installed several raingardens in Port Townsend to address pollution concerns in marine waters. Photo credit: Northwest Straits Commission

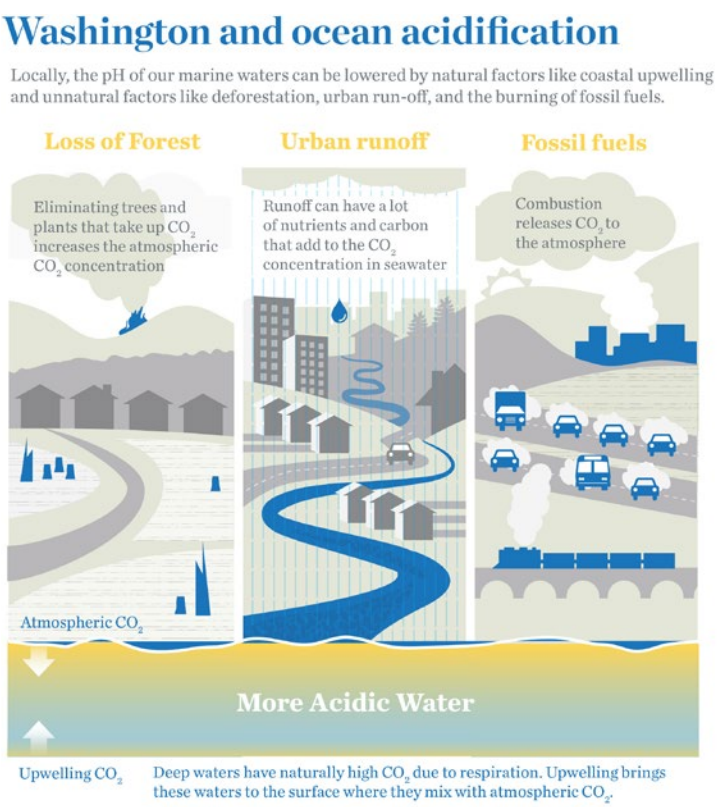
Chapter 5 of the original 2012 Blue Ribbon Panel report outlined the importance of reducing inputs of nutrients and organic carbon from local sources. Given the impacts of ocean acidification and the multiple benefits of nutrient and carbon source reduction, the Panel recommended enhanced actions to control and reduce local sources. To achieve this, the Panel set forth a two-tier approach for moving forward on nutrient and carbon reductions.

- The first tier (Strategy 5.1) constitutes a set of actions that build on existing programs to reduce nutrient and organic carbon inputs in ways that provide near-term economic and environmental benefits.
- The second tier (Strategy 5.2) recognizes that more stringent controls of nutrients and organic carbon pollutants will be required if additional data confirm that these inputs are contributing significantly to ocean acidification.

This chapter describes accomplishments related to reducing local-land based contributions since 2012, revised and new actions, and key next steps to continue progress in this area. Refer to Chapter 5 in the original 2012 Panel report for a full summary of why reducing local contributions is critical and for descriptions of each original action in this area.

Land use and changing local conditions

Locally, the pH of our marine waters can be lowered by natural factors like coastal upwelling, as well as human factors such as loss of forest cover, wastewater, and runoff from cities and farms.



Credit: The Nature Conservancy

5.1 Accomplishments since 2012

Nutrient and carbon reduction programs: Many nutrient and organic carbon reduction programs are being implemented across Washington state. These programs focus on multiple water quality concerns, and implementing these programs will reduce the severity of acidifying conditions. Examples include the Environmental Protection Agency's Best Management Practices (BMP) for stormwater and nutrient reduction strategies within the National Pollution Discharge Elimination System (NPDES).

Ocean acidification in planning: Ocean acidification is starting to be more broadly incorporated into various planning efforts focused on addressing impacts of nutrients and organic carbon, including: the Puget Sound Action Agenda, the Washington Department of Health's Marine Recovery Planning Areas, and Washington Department of Ecology's Nonpoint Source Control Plan and Voluntary Stewardship Program. This complements the work of several local jurisdictions working to protect and expand natural shorelines and fish habitat.

Ocean acidification indicators: Research is underway on the West Coast to develop better ocean acidification indicators to answer questions regarding natural versus anthropogenic sources of ocean acidification.

How are we reducing nutrient inputs in our waterways?

A central driver of nutrient reduction in our waterways is Washington state's Water Quality Program, in which the U.S. Environmental Protection Agency (EPA) delegates the Washington Department of Ecology to control point source pollution (from cities and industrial users, for example) through permitting. EPA and Ecology work together to encourage the use of best management practices (BMPs) for nonpoint pollution sources, offering guiding principles for individuals and businesses that engage in activities such as boating, yard care, human and animal waste disposal, and agricultural practices, among others.

In addition to the statewide efforts, King County and other jurisdictions are working locally to improve septic systems and stormwater infrastructure with the goal of reducing nutrient inputs.

Research now suggests that local land-based contributions are a likely significant driver of marine conditions in some locations of Puget Sound

The 2017 Salish Sea Model demostrates that while variability exists, overall, local nutrient sources significantly contribute to local ocean acidfication conditions in certain areas of Puget Sound. This is an advancement in our undestanding of what drives acidfying conditions at the local level. The 2012 Blue Ribbon Panel knew that the land-based nutrient and carbon reduction programs would be important in addressing ocean acidification, but it didn't know how significant local actions would be. The model provides new rationale for focusing on state and local nutrient and organic carbon control programs in the fight against ocean acidicification.

Ocean acidification and agriculture: The agricultural community now has access to funds from the Washington State Conservation Commission to incorporate ocean acidification actions and best management practices, and groups like the Northwest Straits Commission have been working to engage farmers on ocean acidification issues.

Local source attribution model: Where adjacent land cover is highly urbanized or agriculturally developed, ocean acidification is likely to be a result of combined effects of various processes: nutrient inputs, respiration, nitrogen oxide and sulfur oxide inputs, local atmospheric sources of carbon dioxide, and dissolved and particulate carbon loadings. The Panel called for the development of a quantitative estimate on how much local individual processes contribute to ocean acidification in Washington waters to help determine if more stringent programs to address local sources are needed. This was codified as Action 7.2.1.

Since 2012, the Washington Department of Ecology has worked in collaboration with Pacific Northwest National Laboratory to develop a numerical model of hydrodynamics and biogeochemical processes in the Salish Sea, including prediction of carbonate system variables. The Department of Ecology published a report in June 2017 documenting the addition of the ocean acidification module to the Salish Sea Model (fortress.wa.gov/ecy/publications/SummaryPages/1703009.html). This 2017 report also describes the results of using the model to evaluate the changes in carbonate system variables that are due to regional anthropogenic nutrient sources.

5.2 Updated Actions

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

Action	Original Language	Updated Language	Rationale
5.1.1	Implement effective nutrient and organic carbon reduction programs in locations where these pollutants are causing or contributing to multiple water quality problems	Implement, support, and enforce existing and effective nutrient, sediment, and organic carbon reduction programs in locations where these pollutants are causing or contributing to multiple water quality problems	• Includes sediment loading as a local contributor to ocean acidification • Highlights implementation alone is not enough; programs need support and enforcement to achieve results • Clarifies action focusing on existing programs
5.1.2	Support and reinforce current planning efforts and programs that address the impacts of nutrients and organic carbon	Support and reinforce current planning efforts and programs that address the impacts of nutrients, sediment loading, and organic carbon	• Includes sediment loading as a local contributor to ocean acidification
5.1.3	Assess the need for water quality criteria relevant to ocean acidification	Support research efforts for developing water quality criteria relevant to ocean acidification in collaboration with new and existing monitoring efforts	• It has been determined that state water quality criteria and standards should be developed for ocean acidification; new language focuses on next steps required to start developing criteria • The criteria should consider the biological responses of multiple species
5.2.1	If it is scientifically determined that nutrients from small and large on-site sewage systems are contributing to local acidification, require the installation of advanced treatment technologies	If it is scientifically determined that nutrients from sewage systems are contributing to local acidification, identify opportunities to reduce stress on or improve treatment of sewage systems	• Clarifies intent of action to minimize nutrient loading due to sewage systems and provide leeway to look at various methods to achieve effective results rather than prescribe a set solution

5.3 New Actions

Action	Language	Rationale
5.2.3	If determined necessary based on scientific data, establish new programs to reduce nutrient, sediment, and organic carbon loading from nonpoint sources	• Action 5.1.1 focuses on existing programs; new action focuses on new programs which could be implemented if determined necessary • Recognizes that local contributions to ocean acidification will likely differ by geography; certain areas may require more concentrated or targeted efforts to reduce pollutants
5.3.1	Identify and share key findings from local land-based contributions actions with ocean acidification communicators to support outreach and communication efforts designed to raise public awareness of ocean acidification *(Related to New Action 8.1.6)*	• As part of developing a strong ocean acidification outreach and communications strategy, each topic area is charged with sharing key findings, success stories, and relevant information to ensure communicators can successfully develop accurate key messages

5.4 Continuing Progress

In reviewing accomplishments and updated and new actions, the following were identified as key steps to reduce local land-based contributions over the next five years:

- Continue research efforts to better understand the natural versus anthropogenic biological impacts from ocean acidification, and use results to determine whether new programs or geographically targeting existing programs will achieve the greatest benefit
- Continue support for existing nutrient, sediment, and organic carbon reduction programs, including:
  - Working with the agricultural and forestry communities and others to respond to ocean acidification information needs
  - Implementing effectiveness monitoring to determine best management practices
  - Targeting projects together to maximize limited resources and enhance results in key locations where pollutants are causing or contributing to multiple water quality problems
  - Considering how to address seasonal variation of local-source contributions when implementing existing programs
  - Supporting nutrient reduction plans and strategies
- Continue to support current planning efforts and work to clarify how nutrient loading can contribute to ocean acidification. Specifically consider opportunities to better incorporate ocean acidification into planning efforts, such as:
  - The Puget Sound Action Agenda
  - Update to the Puget Sound Partnership's Vital Signs
  - Washington Department of Commerce's update on rules and guidance to local governance for critical areas ordinances
  - Puget Sound Nutrient Source Reduction Project
- Where appropriate, use Washington's existing water quality standards rule to reduce and control local-based nutrient sources
- Collaborate and build on California's efforts related to developing water quality criteria relevant to ocean acidification
- Consider the benefits and disadvantages of requiring sewer connections in rural areas and which locations in the state would be appropriate for such legislation
- Increase coordination with the Washington Department of Health on their efforts to address septic tanks in rural areas