Snapshot of Decision Makers' Science Needs
Coastal Dynamics Working Group

Introduction

The need for greater understanding of ocean acidification and hypoxia (OAH) along the Pacific West Coast has arisen at multiple levels of government. The scope of decision making audiences for the West Coast Ocean Acidification and Hypoxia Science Panel (the Panel) includes managers, policymakers, and legislators at the state, regional, federal and international levels. This document provides a summary of decision maker information needs which the Panel's Coastal Dynamics Working Group aims to address through their work.

Conversations with Decision Makers

To identify priority information needs related to the issues of OAH, Ocean Science Trust, in collaboration with the Institute for Natural Resources in Oregon, conducted a series of interviews with decision makers across the natural resource management and policy landscape. From these interviews, the Panel gained insight into core information needs relating to ocean acidification and hypoxia dynamics in coastal and offshore ecosystems. Beyond shaping the work of the Panel, the science needs identified here can help focus research and funding priorities for those with an interest in producing policy and management-relevant science to track and address these critical issues going forward.

Core Information Needs

Science needs have been divided by decision making audiences:

- Water Quality Managers
- Fishery and Wildlife Managers
- Land Use and Park Managers
- Air Quality Managers

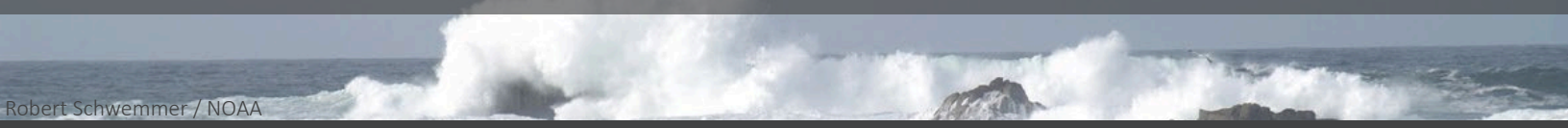
Managers need to understand open ocean dynamics and the transition from oceanic to near shore processes, with a focus on the main driving factors, categorizing diverse water systems along the West Coast. In assessing naturally occurring variations in acidification and hypoxia parameters, the Panel should explicitly address spatial, and depth-related patterns, as well as temporal variations, including daily, seasonal and annual variability. The OAH Panel should work to identify which local and regional inputs are important (e.g. stormwater runoff, nutrient inputs, local emissions etc.) and their significance relative to global inputs and processes.

Key Science Needs

- *Understand naturally-occurring variation and patterns ("baseline" conditions)*
- *Differentiate open ocean acidification from the processes occurring in the near shore zone*
- *Local, regional and global drivers (land and air) of ocean acidification and hypoxia*
- *Spatial and temporal patterns*
- *Identify geographic hot spots and vulnerable habitats*
- *Impacts to food webs*
- *Near shore processes in saltmarsh, eelgrass, and estuarine communities*
- *At-risk fisheries*

Compiled by California Ocean Science Trust and Institute for Natural Resources on behalf of the West Coast Ocean Acidification and Hypoxia Science Panel

"Differentiation from open ocean acidification and the processes occurring in the near shore zone is key. What is the contribution of runoff and discharge in coastal waters? Is it as simple as a tracer study, or is it years away?"
-Federal Environmental Protection Manager



Robert Schwemmer / NOAA

Water Quality Managers

"It is important for us to understand what natural conditions are, and what the variability is around that well enough so that we can further engage in discussion of what is abnormal."

-Federal Environmental Protection Manager

- Gaining an understanding of natural conditions of pH and oxygen levels across a spatial, temporal, and depth gradient, and the associated variability around natural
- Ability to identify major spatial and temporal factors that contribute to variability, and how much of the variation is attribute to anthropogenic-induced acidification and increasing hypoxia
- Develop a scientific basis for "baseline" conditions as a reference point
- An understanding of a site-by-site baseline (e.g., individualized baseline unique to each area)
- Identifying a threshold level of pH and oxygen level beyond which a management action may be necessary
- Identifying which local and regional inputs are important (e.g., stormwater runoff, nutrient inputs, local emissions, etc.) and their significance relative to global inputs and processes
    - Local, regional and global drivers of ocean acidification and hypoxia
    - Spatial and temporal patterns
    - Contributions of land and air pollutants
    - Identify geographic hot spots
- Key parameters to monitor beyond CO_2, oxygen, and pH
- Differentiation from open ocean acidification and the processes occurring in the near shore zone
- Identifying hotspots for acidification and increasing hypoxia in order to help prioritize cost-effective mitigation efforts
- Identifying areas where acidification and increasing hypoxia intersect
- The economic impacts of acidification and increasing hypoxia
- Development of models that would let resource managers estimate losses as a consequence of acidification in order to prioritize responses (e.g., cost-benefit analysis)

Fish and Wildlife Manager

- High resolution (hourly) understanding acidification and oxygen parameters in estuaries
- Understanding and interpreting natural conditions and natural contributions to the processes of ocean acidification and hypoxia
- Understanding the relationship between acidification and hypoxia parameters in the open ocean and those in nearshore areas (e.g., coastal zones, estuaries, and bays)
- Identifying key ecosystems and species that may be most vulnerable to acidification and increasing hypoxia

"What is the global anthropogenic contribution to ocean acidification and hypoxia? What is the local anthropogenic contribution?"

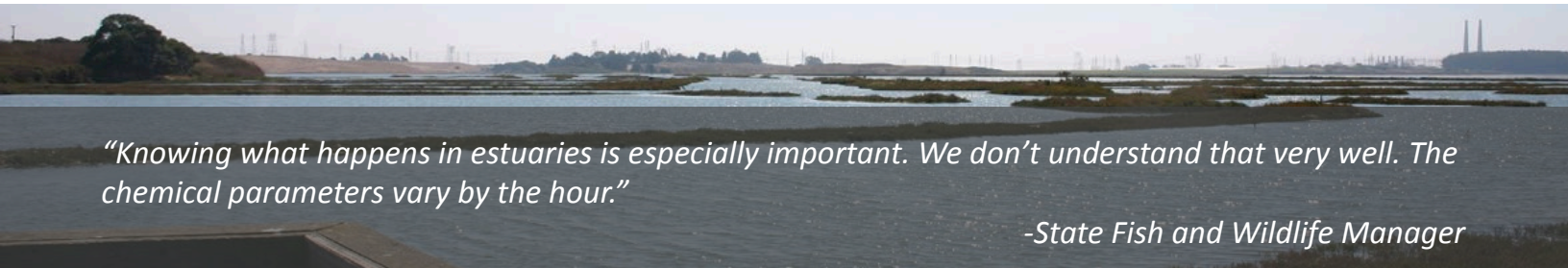
-State Water Quality Manager

Land Use and Park Managers

- Understanding local inputs contributing to acidification and increasing hypoxia in relation to the global inputs
- Determining areas that may be more prone to impacts
- Identifying impacts to marine food webs and shifts in community structure
- Ability to predict impacts to major fishing areas, salt marshes, estuaries, and eelgrass communities
- Understanding how acidification and increasing hypoxia may affect the quality and quantity of consumed seafood
- How acidification and increasing hypoxia may impact water quality at ocean beaches

Air Quality Managers

- Identifying key parameters to monitor given the many pollutants potentially contributing to the problems



"Knowing what happens in estuaries is especially important. We don't understand that very well. The chemical parameters vary by the hour."

-State Fish and Wildlife Manager

Conclusion

We are moving forward identify the appropriate format and timeline for addressing the science needs identified here. We seek opportunities to align potential Panel products with management and policy processes. All decision makers expressed the need for a product that presents the "state-of-the-knowledge," however they also recognized the need for that product to be dynamic. The products should not only bring together what is known, but provide a path forward to track ocean acidification and hypoxia into the future.

> *"'What is natural?' is a very relevant question. When we pursue things like a bacterial policy, reference conditions are critical. We need to understand these issues across spatial and temporal gradients."*
>
> *-State Water Quality Manager*

The Panel will:

- **Provide a snapshot of ocean acidification and hypoxia on the west coast** with an eye toward identifying information that is transferable to other regions across the U.S. and more broadly
- **Define research and monitoring priorities** that will address decision makers' needs
- **Strengthen partnerships between the academic community and decision makers**
- **Build a new body of scientific knowledge** from which decision-makers across state, regional, and federal levels may draw to develop more thoughtful management action

For more information on the Science Needs Assessment approach, visit here.
For additional snapshots of decision maker science needs, see also:

Ecosystem and Food Web Working Group

Organismal Physiology Impacts Working Group

About the West Coast Ocean Acidification and Hypoxia Panel

The West Coast Ocean Acidification and Hypoxia Panel, convened by California Ocean Science Trust, is funded by the California Ocean Protection Council, Department of the Interior, Coastal Impact Assistance Program, and the California Ocean Science Trust. The Institute for Natural Resources in Oregon, working in collaboration with California, is supported by the Oregon Governor's Office, the Oregon Department of Fish and Wildlife, the Oregon Department of Agriculture, the Oregon Department of Environmental Quality, the Oregon Department of Land Conservation and Development, and the OSU Research Office.

Steve Lonhart / NOAA MBNMS