



West Coast Ocean Acidification and Hypoxia Science Panel

2014-2015 Work Plan

Introduction

Ocean acidification and hypoxia are incompletely understood processes and conditions that may significantly affect the future of West Coast ocean ecosystems and biological resources. The interdisciplinary West Coast Ocean Acidification and Hypoxia Science Panel (OAH Panel) will advance decision makers' understanding of drivers and impacts of ocean acidification and hypoxia by synthesizing and translating knowledge from this scientifically diverse and rapidly evolving field of research. The OAH Panel will also identify research and monitoring priorities that will augment our knowledge of these complex issues in the future.

Mandate

High-level policymakers, elected officials, resource and water quality managers and regulators at multiple levels of government are calling for science-informed action on ocean acidification and hypoxia. At its September 13, 2012 meeting, the California Ocean Protection Council, a cabinet level body chaired by the Secretary for Natural Resources John Laird, formally charged the California Ocean Science Trust with convening an Ocean Acidification and Hypoxia Science Panel.

Recognizing the value of a coast-wide collaboration, the governments of Oregon¹, Washington, and British Columbia then joined California in advancing the OAH Panel. Adding to the growing political momentum across the West Coast, high-level regional policy bodies are also leading the way by affirming the need for collaborative, science-based solutions:

- The West Coast Governors' Alliance on Ocean Health has cited² ocean acidification as a priority ocean and coastal health issue.
- The Pacific Coast Collaborative (including the Governors of California, Oregon and Washington, and the Premier of British Columbia) recently identified³ ocean acidification as a priority issue, and directly cited the work of the OAH Panel in a letter⁴ to President Barack Obama and Prime Minister Stephen Harper as key to establishing greater regional partnerships.

¹ Memorandum of Understanding between California and Oregon re the Ocean Acidification and Hypoxia Science Panel

² West Coast Governors Alliance on Ocean Health, [Memorandum of Understanding](#), October 2012

³ Pacific Coast Collaborative, [Pacific Coast Action Plan on Climate and Energy](#),

⁴ Pacific Coast Collaborative, [Letter](#) to President Obama and Prime Minister Stephen Harper

The timing for this effort is particularly opportune - the State of Washington Blue Ribbon Panel on Ocean Acidification released its final report⁵ on November 27, 2012. The knowledge base established in Washington provides a robust foundation for the work of the OAH Panel.

Decision Making Audiences

Reflecting the complex nature of the drivers and impacts of ocean acidification and hypoxia, these issues span management and policy jurisdictions across state, regional and federal levels (Table 1.). Drawing on expertise throughout the West Coast, the Panel will work to serve decision-makers across these scales of management and governance.

Table 1. Current management and policy audiences for the work of the OAH Panel. This table may grow as the Panel continues to engage decision makers.

FEDERAL	President Obama’s Council on Environmental Quality U.S. Environmental Protection Agency National Oceanic and Atmospheric Administration			
	WEST COAST			
STATE/PROVINCE	Pacific Coast Collaborative			
	West Coast Governor’s Alliance on Ocean Health			
	CALIFORNIA	OREGON	WASHINGTON	BRITISH COLUMBIA
	Governor’s Office Ocean Protection Council State Water Resources Control Board Department of Fish and Wildlife Air Resources Board State Legislature	Governor’s Natural Resources Office Department of Fish and Wildlife Department of Environmental Quality Department of Agriculture Department of Land Conservation and Development Department of State Lands State Legislature	Governor’s Office Department of Ecology Marine Resources Advisory Council	Ministry of Environment Province of BC

Panel Goals

The OAH Panel will develop products and participate in management and policy dialogues to address decision makers’ science needs on these complex issues. Before the full panel was convened, the Ocean Science Trust and the Institute for Natural Resources (INR) at Oregon State University engaged state, regional and federal decision makers to establish the scientific knowledge gaps that are inhibiting thoughtful management and policy action. Ocean Science Trust then worked with panelists to translate these needs into five key science questions:

⁵ WA State Ocean Acidification Blue Ribbon Panel [Final Report](#)

1. What are the naturally occurring variations in acidification and hypoxia parameters in both space and time?
2. To what extent have, or are, we going to deviate from “naturally occurring variations” as identified in Q1?
3. How much do regional and local inputs affect the deviations identified in Q2?
4. What are the consequences of the deviations identified under Q2 for uses or ecological resources of our coastal oceans?
5. What research and monitoring would efficiently fill critical information gaps encountered by the Panel in answering these questions?

While these questions are a valuable foundation for the work of the OAH Panel, they do not define it. Driven by institutional mandates, processes, and the needs of the public, the priorities of decision-makers are regularly evolving. At the same time, academic knowledge and research on these topics is rapidly advancing. Thus, the Panel will build and refine a body of scientific knowledge from which decision makers can continually draw as they develop management and policy actions. This new body of knowledge will synthesize the latest scientific information, draw out new insights, identify innovative solutions, and envision the research and monitoring needed over the coming years to inform policy and management decisions.

With the support of the Ocean Science Trust and INR, the Panel will construct this body of knowledge as a series of published scientific papers, translational and communications documents connecting science to policy and management. Via communications and outreach, and in depth dialogue with decision makers, we will build a shared understanding of ocean acidification and hypoxia and identify opportunities to use scientific information to guide decisions.

The Panel has embraced an iterative process to evaluate and incorporate input from decision makers, other scientists and thought leaders throughout its tenure. Below, the work of the Panel is organized under three overarching goals. For each goal we provide an intended outcome describing a vision of successfully achieving the goal, measures of progress, and associated activities. This work plan is intended to encompass activities led by panelists, Ocean Science Trust and INR in direct support of meeting the panel mandate, and will be updated periodically.

GOAL I: To link science with decision-making at multiple levels of government

Intended Outcomes

Decision-makers ranging from agency resource managers to regional policy makers and funders are actively engaged with panel products and using the body of scientific knowledge developed by the Panel to inform funding decisions, develop or refine policy guidance, or alter management actions, among other decisions. To measure progress, we will seek demonstrable examples of decisions informed by the knowledge developed and shared from the Panel. We will actively maintain our engagement with local, state and federal decision-makers to iteratively seek their feedback on the credibility and salience of the work of the Panel.

Activities

1. ***Convene working groups to build and refine a body of scientific knowledge across key management themes***

Ocean acidification and hypoxia are issues rife with complexity and uncertainty. To confront these challenges, decision makers must be able to trust that their sources of scientific information are credible and represent the current best thinking of the scientific community. The Panel has broken into a series of working groups established around topical themes raised by managers (and captured in the five primary science questions), and are pursuing a set of peer-reviewed publications in various scientific journals:

- *Ecosystem and food web impacts (expected mid-2015)*: will develop a practical and actionable framework for managers to think about ocean acidification and hypoxia in an ecosystem-based management context.
- *Coastal ocean dynamics (expected mid-2015)*: will address the links between open ocean dynamics and near-shore processes as they relate to ocean acidification and hypoxia; and using multiple data sets to explore changes in water chemistry along the U.S. West Coast.
- *Impacts on physiology (expected early 2015)*: will summarize the existing scientific information on the interacting impacts of hypoxia, ocean acidification, and changes in temperature on the physiology of West Coast species and projecting how these physiological effects may translate into biogeographic and ecological changes.
- *Opportunities for management action around ocean acidification and increased hypoxia (expected early 2015)*: Will look for nexuses between emerging scientific information around these environmental changes and management frameworks for addressing water quality, land use, and marine ecosystems.

2. Develop translational summaries tailored to specific decision-makers' needs

While the publications will serve as rigorous, scientific resources, academic articles are not always accessible or useful to decision-makers. Thus Ocean Science Trust and INR will work with the OAH Panel to produce translational documents drawn from the publications as well as the many conversations occurring within and among the working groups. The format and timing of these summaries will be driven by decision-makers and/or the timing of management or policy processes.

Completed products:

- [*Today's Need for a Coast-Wide Approach \(released October 2014\)*](#): requested by California Ocean Protection Council, this analysis builds on the WA State Blue Ribbon Panel effort by discussing how best to confront the challenges posed by ocean acidification to ecosystems along the entire west coast, and drawing together knowledge and resources across jurisdictional and management boundaries.

Ongoing products:

- *Scientific approaches to making a 303(d) assessment for near coastal acidification (expected Spring 2015)*: developed and scoped in response to needs expressed by the U.S. EPA and California water quality managers, the Panel will develop recommended analysis approaches for assessing whether water quality standards are being achieved using existing data, and provide recommendations for how to improve the monitoring programs where the existing data are found to limit such an assessment. When monitoring data indicate water quality standards are not being met, water quality agencies have the option under Section 303d of the Clean Water Act to list the water body as impaired. This product

will enable water quality managers to consider if the science is adequate to make such an assessment, and pinpoint the priority data gaps that inhibit action.

- *Biological standards update (expected Spring 2015)*: a companion product to the Scientific approaches to making a 303(d) assessment, federal and state water quality managers will use this analysis to inform the development of biological indicators for water quality standards.
- *Ocean acidification & hypoxia research priorities (expected early 2015)*: drawn from across the working group publications, the Panel will develop a list of research priorities targeted at key gaps in knowledge in the field that inhibit thoughtful decision making. This product will help research program managers and directors at the state and federal levels make more strategic funding decisions.
- *Tracking ocean acidification & hypoxia: approaches to monitoring (expected early 2015)*: requested by the ocean acidification working group of the Pacific Coast Collaborative, and the State of California, Ocean Science Trust will work with the Panel to develop a summary of approaches to monitoring along the west coast. This product will envision ways to build upon monitoring for physical and chemical parameters by recommending approaches to including impacts from ocean acidification and hypoxia, and ways to link that to economy and society.
- *Envisioning future science landscapes (expected January 2015)*: targeted at high-level federal policymakers at the Council on Environmental Quality, the U.S. EPA, NOAA, and the west coast states, Ocean Science Trust is working with panelists and other experts and thought leaders in the field to develop a vision for the role of science in decision-making, including the state of scientific knowledge, the functioning of the scientific community (through innovative partnerships and collaborations), and how science interfaces with industry and management so that research and monitoring are more salient, credible, and efficient.

3. Engage in dialogue with decision-makers to foster the salience of Panel products

For Panel products to be useful to decision makers, it is important that they are provided in useful formats, timed carefully, and often accompanied by contextual information and discussion. The Panel, alongside Ocean Science Trust and INR, will engage decision makers in dialogue, and answer follow up questions as needed. While many conversations are ongoing, facilitated by Ocean Science Trust and INR, key prior and currently planned discussions include:

Federal & regional venues:

- *Meeting with the President's Council on Environmental Quality (CEQ) (expected January 2015)*: In December 2012, California, Oregon, Washington and British Columbia under the umbrella of the Pacific Coast Collaborative sent a letter to President Obama and Prime Minister Stephen Harper highlighting the challenges of ocean acidification, including mention of the Panel as a key source of rigorous scientific knowledge. President Obama responded requesting a meeting with the three states and province. The agenda is currently being prepared by the PCC, and the Panel stands ready to work with the PCC as needed, and provide its Envisioning future science landscapes to call attention to the need for more innovative collaborations across the science policy and industry landscape to fill critical science needs now and into the future.

- *Briefing the Pacific Coast Collaborative (expected December 2014)*: In preparation for the federal meeting, the Pacific Coast Collaborative requested a briefing from the Panel. Panel leadership will provide an update on all panel products, including the development of the Envisioning future science landscapes product.

State venues (Oregon & California):

- *Oregon update meeting: progress on the West Coast Ocean Acidification & Hypoxia Science Panel, August 18, Salem, OR*: INR brought together panelists, OR state agency staff, and the OR governor's office to build a shared understanding of the progress of the OAH Panel, and brainstorm a coordinated strategy to harness Panel products in support of OR management needs, as well as inform and advance the broader West Coast region.
- *California manager briefings (early 2015)*: Ocean Science Trust will convene a series of briefings for state managers to update them on the progress of the Panel, and receive feedback on ongoing panel products. Building upon the science needs surveys that preceded the full Panel launch, these briefings will be an opportunity to update managers on Panel progress, discuss how science information needs have evolved, and brainstorm how panel products continue on a course of impact and relevance. Participating state entities to date include the OPC, the CA Department of Fish and Wildlife, and the State Water Boards.

GOAL II: To engage with the ocean acidification and hypoxia research communities to foster management-relevant research and monitoring

Intended Outcomes

Effective integration of science and management at multiple levels of natural resource governance includes durable and sustained tools and approaches by which academic scientists, science-policy integrators and decision-makers are building shared understanding and mutually beneficial partnerships. While the Panel itself will have a defined tenure, processes can be put in place to foster continued relationships and dialogue. These serve to align cutting edge research and efficient useful monitoring programs with the most urgent information needs.

It is always hard to quantify capacity building at the science-policy interface, and the relationships that build trust and accountability into the uptake and use of science information. However, during the tenure of the panel we will seek to identify decisions that impact the role and functioning of the scientific landscape that are informed by the work of the panel. New funding streams, new partnerships and collaborations, new or refined research and monitoring programs that incorporate guidance from the OAH Panel are steps towards sustainable and productive science integration into policy and management.

Activities

- 1. Inform parallel research efforts to effectively and efficiently fill knowledge gaps***

The Panel will collaborate with, inform, and learn from other research endeavors related to these issues. Through this engagement, the Panel will continue to bring together the best thinking of the scientific community on behalf of decision makers, as well as potentially promote greater collaboration among researchers along the West Coast and elsewhere. Current examples include:

- [*Modeling in Support of Management of Coastal Hypoxia and Acidification in the California Current Ecosystem*](#): sponsored by the California Ocean Protection Council, the Southern California Coastal Water Research Project, the Center for Ocean Solutions, and the Ocean Science Trust, panelists are among some of the principal investigators in this group, and other panelists also attended the [*kickoff workshop*](#) for this effort in December 2013.
- [*Wendy Schmidt Ocean Health XPRIZE*](#): supported by the Ocean Science Trust as well as a host of other partners in government, academic and NGO sectors.

GOAL III: To effectively translate and communicate ocean acidification and hypoxia science to broad audiences

Intended Outcomes

The knowledgeable public, including interested citizens, stakeholders, industry, and non-governmental organizations will have access to and be empowered by panel products. Through communications summaries, two-pagers, videos etc, they will be able to use information to more productively engage in the policy and management dialogues. Outreach channels, including the environmental media will seek panelists as the 'go-to' credible sources of scientific information. As we track progress towards this outcome we will measure instances of uptake and use of panel products by an engaged citizenry in public venues, and track media coverage that incorporates scientific information from panelists.

Activities

1. *Build and implement a strategic communications plan on behalf of the Panel*

A communications strategy has been developed to help direct Ocean Science Trust communications and outreach on behalf of the Panel through 2015. The plan is organized according to the fundamentals of strategic communications: establishing goals and objectives on behalf of the Panel, determining what objectives need to be pursued in order to reach each of the goals, mapping out the audiences that have the ability to update panel outcomes, crafting messages tailored to resonate with the targeted audiences, identifying the most appropriate messengers, and strategizing on tactics to put the plan into motion. Ocean Science Trust and INR are also actively collaborating to ensure broad outreach and dissemination of panel products, and coordinated online presence for the Panel's work.

2. *Develop and share communications products using a range of communications channels*

The Panel values transparency and making science accessible to broad audiences, including the interested and knowledgeable public. Thus the Panel will work with Ocean Science Trust and INR to develop communication-friendly products that clearly convey and translate the complexities of ocean acidification and hypoxia science.

This may include summaries, FAQs, fact sheets and blog posts as appropriate. They also may be products of the OAH Panel, or affiliate products by panelists and other colleagues (that undergo full Panel review). Examples include:

Completed communications products:

- *Affiliate Panel product - [Ocean Acidification in the Pacific Northwest factsheet](#), R. Feely, M. Chadsey, J. Newton, T. Klinger, B. Hales and J. Mathis (2014): Produced in affiliation with NANOOS, NOAA Ocean Acidification Program, Ocean Carbon and Biogeochemistry Project, University of Washington, and Washington Sea Grant.*

Ongoing communications products:

- *OAH Panel communications product - [Frequently Asked Questions on the West Coast \(expected early 2015\)](#): a living document that will be updated as new scientific information becomes available, this will be an overview of ocean acidification and increased hypoxia, including potential impacts to marine resources along the west coast.*
- *Response to Oregon Managers' Questions (expected early 2015): Oregon panelists are engaged with INR in developing a summary that synthesizes the science around questions crafted by decision-makers from Oregon's natural resource departments. From this, INR will work with state managers to develop derivative products that demonstrate how Oregon is using the OAH Panel's work.*

3. Foster Panelist engagement as ambassadors for the work of the panel

Panelists will be ambassadors for the Panel's work at events and in the media. Journalists, bloggers, and key staffers from governmental offices may contact panelists about their individual research, or their work on behalf of the Panel. These provide opportunities to highlight upcoming products and direct these audiences to Panel resources. Ocean Science Trust and INR stand ready to support panelists in these efforts, and will work to create venues (e.g., briefings or other events) as appropriate. Examples include:

- *Key events - [AAAS 2015 Conference, San Jose](#): Working with Ocean Science Trust, panelists will lead a session, "Challenges of Ocean Acidification and Hypoxia: Planning For Regional Action."*
- *Key events – [CERF 2015 Conference, Portland, OR](#): Ocean Science Trust, panelists, and INR will lead a session, "Ocean Acidification & Hypoxia: Linking Science to Management."*
- *Online resources and collateral materials - Panel website: www.westcoastoah.org*

Appendix I: Panel Composition

Name	Affiliation	Area of Expertise
Dr. Alexandria Boehm (chair)	Stanford University	Coastal Water Quality
Dr. Jack Barth	Oregon State University	Physics of Oceans and Atmospheres

Dr. Liz Chornesky	Independent Consultant	Science to Policy and Management
Dr. Francis Chan	Oregon State University	Hypoxia
Dr. Andrew Dickson	Scripps Institution of Oceanography	Chemical Oceanography
Dr. Richard Feely	NOAA Pacific Marine Environmental Laboratory	Chemical Oceanography
Dr. Burke Hales	Oregon State University	Ocean Ecology, Biogeochemistry
Dr. Tessa Hill	University of California Davis	Biogeochemistry
Dr. Gretchen Hofmann	University of California Santa Barbara	Marine Biology
Dr. Debbie Ianson	Fisheries and Oceans Canada, Institute of Ocean Sciences, University of Victoria	Physical Oceanography
Dr. Terrie Klinger	University of Washington	Ecology, Science to Policy and Management
Dr. John Largier	University of California Davis	Coastal Physical Oceanography
Dr. Jan Newton	University of Washington	Ecology, Science to Policy and Management
Dr. Thomas Pederson	Pacific Institute for Climate Solutions, University of Victoria	Geochemistry
Dr. George Somero	Stanford University	Ecological Physiology
Dr. Martha Sutula	Southern California Coastal Water Research Project	Hypoxia, Nutrient Pollution
Dr. Waldo Wakefield	Oregon State University, NW Fisheries Sciences Center, NOAA Fisheries	Fisheries Science
Dr. George Waldbusser	Oregon State University	Ocean Ecology, Biogeochemistry
Dr. Steve Weisberg	Southern California Coastal Water Research Project	Water Quality, Science to Policy and Management
Dr. Liz Whiteman	California Ocean Science Trust	Marine Ecology, Science to Policy and Management

Appendix II: Roles and Responsibilities

Convened by Ocean Science Trust Executive Director and Ocean Protection Council Science Advisor Skyli McAfee, the OAH Panel is chaired by Dr. Alexandria Boehm, Associate Professor at Stanford University. Ocean Science Trust is collaborating with the Institute for Natural Resources at Oregon State University to coordinate the Panel's work, and link to state, regional and federal decision makers.

Panel Chair & Executive Committee:

- Work regularly with Ocean Science Trust to design and guide panelists through the generation of products and other Panel processes, provide updates, and direct in-person meetings.
- Provide guidance to Ocean Science Trust in ensuring the Panel is functioning smoothly as a whole, and that panelists are properly supported.
- Be the lead ambassador for the Panel, engaging with decision makers and the media as needed, or delegating this to other panelists when appropriate.

Panelists:

- Participate collaboratively in working groups via email and in meetings (including in-person meetings and conference calls scheduled as needed) to produce Panel products. Panelists will help to write the products, and provide constructive input verbally and in writing as drafts emerge from across the working groups.
- Engage in thorough review of all final drafts of products to ensure they are scientifically rigorous, represent the best thinking of the scientific community, and are relevant across the West Coast.
- Be ambassadors for the work of the Panel – engaging with decision makers and the media (as requested by the chair) to explain products and answer follow up questions, as well as take opportunities to highlight the Panel's work in the course of engaging with broad audiences in their research.

Ocean Science Trust:

Led by Skyli McAfee, Executive Director, Ocean Science Trust is the lead convener of the Panel, thus will work to advance all elements of the full Panel process:

- Develop a deep understanding of decision makers' science needs on behalf of the Panel, including key knowledge gaps, management and policy processes where new scientific information could have impact, and the timing and format of Panel products that would be most useful.
- Be accountable to both the scientific and decision making communities by serving as an honest broker between the Panel and relevant managers, regulators, legislators and policymakers, identify opportunities to strengthen collaboration and promote mutual understanding across the science policy landscape.
- Design and implement inter-Panel processes (e.g., review etc.) that support panelists in producing rigorous, objective products that are useful to decision makers at multiple levels of government. This entails working regularly with the chair to provide staffing support to panelists, and be responsive to their ongoing needs.

- Take the lead in drafting technical summaries and other translational type documents (to be reviewed by the Panel) that draw from the Panel’s scientific publications and link to relevant decision makers and other broader audiences.
- Put in place communications plan for the Panel (see Appendix III). Through this plan, identify or create outreach opportunities to connect panelists to decision makers and media, produce communications materials as needed to translate the Panel’s work to broad audiences, and maintain the Panel’s online presence.
- Provide administrative and staff support to panelists throughout the process. Manage and staff in-person workshops and remote meetings to bring the Panel together, as well as invite the input of other experts and thought leaders in the field.

Institute of Natural Resources at Oregon State University (INR):

- INR will support Ocean Science Trust in staffing the Panel, and provide insight and expertise into the science needs of state decision makers in Oregon.
- Facilitate the production of products (summaries, and other communications materials) that are relevant and useful to Oregon decision makers.
- Conduct outreach on behalf of the Panel’s work in Oregon, including facilitating meetings, briefings and other events as needed, and the Panel’s online presence.