



# Sustaining National Climate Assessments of Oceans and Coasts

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**National  
Climate  
Assessment**

U.S. Global Change Research Program

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## Executive Summary

The workshop “Sustaining National Climate Assessments of Oceans and Coasts” in support of the National Climate Assessment (NCA) was held on April 22-23, 2013 in Washington, D.C. This workshop was the first-of-its-kind, focused explicitly on the sustained assessment process for a particular sector or region, and can be used as a framework for future sustained assessment workshops and discussions of other sectors/regions. The goals of this workshop were to:

- Engage select partners, stakeholders, managers, and scientists to discuss climate assessment needs and opportunities for coasts and oceans,
- Strengthen the network of coastal and ocean professionals working to understand and/or adapt to climate variability and change; begin to establish a “community of practice”,
- Share and discuss the draft findings of the 2013 NCA chapters on Coasts and Oceans,
- Identify recent knowledge advancements, opportunities for collaboration, and the most pressing research and management needs for future NCA efforts, and
- Develop options, mechanisms, and/or pathways for sustaining national climate assessments of U.S. coasts and oceans.

Nearly 60 participants from a diversity of sectors, including federal, state, and tribal governments and organizations, academic institutions, and non-governmental organizations, participated in the workshop. The workshop included plenary sessions and framing presentations, as well as small-group discussion sessions focused on:

- Existing and emerging science and information needs in support of coastal and ocean assessments,
- The evolving role of assessments in informing coastal and marine resource management and decision-making in a changing climate, and
- Mechanisms for incentivizing engagement and building capacity to conduct coastal and ocean assessments.

## Key Findings

- Top key science/information needs include understanding the adaptive capacities, synergetic impacts of multi-stressors, and tipping points of human and natural coastal and ocean systems.
- NCA products should address the ongoing need for local-to-regional-scale information through advancing coastal and ocean climatologies and projections, coupled climate-ecosystem models (at the large marine ecosystem scale), and sea-level rise scenarios.
- Many existing long-term observations and monitoring systems in coastal and ocean regions (e.g. National Estuarine Research Reserve System, Long Term Ecological Research network, regional ocean observing systems) provide valuable information that could be leveraged for the sustained NCA.
- The NCA could enhance its utility for coastal and ocean decision-makers by developing special reports on timely and relevant decision needs (e.g. integrating climate into coastal ecosystem restoration, marine spatial planning, and fisheries management).
- User-friendly derivative products of the NCA, such as one-pagers or regional summaries developed for specific audiences (e.g. coastal zone managers, fisheries managers, coastal tribal communities) are particularly useful.
- Established networks (including but not limited to the NCAnet Coasts, Oceans, and Marine Resources affinity group, Sea Grant Extension programs, Coastal Zone Management programs, Regional Integrated Sciences and Assessments programs) should be utilized for translation, dissemination, and outreach to ocean and coastal stakeholders; these networks can also help to identify and address key decision needs as they arise.

## Workshop Background

The workshop “Sustaining National Climate Assessments of Oceans and Coasts” in support of the National Climate Assessment (NCA) was held on April 22-23, 2013, at the Embassy Suites at the Chevy Chase Pavilion in Washington, D.C. This workshop was the first-of-its-kind, focused explicitly on the sustained assessment process for a particular sector or region, and can be used as a framework for future sustained assessment workshops and discussions of other sectors/regions. The goals of this workshop were to:

- Engage select partners, stakeholders, managers, and scientists to discuss climate assessment needs and opportunities for coasts and oceans,
- Strengthen the network of coastal and ocean professionals working to understand and/or adapt to climate variability and change; begin to establish a “community of practice”,
- Share and discuss the draft findings of the 2013 NCA chapters on Coasts and Oceans,
- Identify recent knowledge advancements, opportunities for collaboration, and the most pressing research and management needs for future NCA efforts, and
- Develop options, mechanisms, and/or pathways for sustaining national climate assessments of U.S. coasts and oceans.

Nearly 60 scientists and practitioners from around the country participated in the 1.5-day-long workshop. Participants represented a diversity of sectors, including federal, state, and tribal governments and organizations, academic institutions, and non-governmental organizations.

## Workshop Structure

The workshop included two plenary sessions, framing presentations, and three small-group discussions on dedicated topics. The first plenary session provided an overview of the NCA process and the key findings from the draft Coastal Zone Development and Ecosystem chapter and Oceans and Marine Resources chapter. The second plenary session described the sustained assessment process of the NCA that is currently underway, including the NCA Coastal and Ocean Climate Indicators effort and the development of the Global Change Information System. The first of three small-group discussions focused on existing and emerging science and information needs in support of coastal and ocean assessments, while the second small-group discussion focused on the evolving role of assessments in informing coastal and marine resource management and decision-making in a changing climate. The final small-group discussion solicited ideas on creative mechanisms for building the capacity to conduct coastal and ocean assessments, by brainstorming existing and new mechanisms for advancing partnerships between coastal and ocean practitioners in support of national climate assessments, discussing potential topics that would make for compelling and timely NCA special reports, and describing incentives and challenges associated with engaging in the NCA process. Each small group reported key take-away messages to the whole group, and discussion of common themes between groups followed. At the end of the workshop, the group reviewed the key outcomes from the 1.5 days of conversation.

## National Climate Assessment Overview

The Global Change Research Act of 1990 mandated the creation of the U.S. Global Change Research Program (USGCRP), a federal program that coordinates and integrates global change research across 13 government agencies to ensure that it most effectively and efficiently serves the nation and the world. USGCRP is required to conduct a National Climate Assessment (NCA) every four years. The NCA is an important resource for understanding and communicating climate change science and impacts in the United States. The NCA informs the nation about already observed changes, the current status of the climate, and anticipated trends for the future. The NCA report process integrates scientific information from multiple sources and sectors to highlight key findings and significant gaps in knowledge. The NCA also establishes consistent methods for evaluating climate impacts in the U.S. in the context of broader global change. Finally, findings from the NCA provide input to federal science priorities and are used by U.S. citizens, communities, and businesses as they create more sustainable and environmentally sound plans for the nation's future.

The first plenary session of the workshop provided an overview of the NCA process by the Director of the NCA, Kathy Jacobs. The NCA is envisioned as an inclusive, nationwide process with many key objectives, including:

- Evaluating, integrating, and assessing relevant climate science and information from multiple sources,
- Summarizing and synthesizing the findings of the U.S. Global Change Research Program,
- Increasing understanding of what is known about climate change, as well as which key knowledge gaps exist,
- Informing climate science research priorities,
- Building climate assessment capacity, including documentation of impacts in regions and sectors, and
- Supporting climate literacy and skilled use of NCA findings.

The third NCA report is currently in draft form, with an anticipated release date of spring 2014. Two previous assessments were published in 2000 and 2009. The NCA process and third report set the stage for more comprehensive and timely assessments in the future. The current (third) NCA differs from previous U.S. climate assessments in a variety of ways:

- The NCA includes climate impacts and projections, but also assesses progress in response activities such as adaptation and mitigation.
- This NCA is building partnerships and engagement across multiple scales of governance (local, state, tribal, federal), as well as with academic, non-governmental, and private sector entities.
- This NCA report will be entirely web-based, and the final report will be submitted as an e-book; this allows easier access to data for citizens and scientists and transparent “line of sight” between data and conclusions.
- This NCA is designed to support decision making processes within and across regions and sectors of the U.S. The NCA is working to advance a sustained assessment process, rather than a periodic report-writing activity.

- National indicators of change within regions and sectors are being developed as part of the sustained assessment, along with consistent and ongoing methods for evaluation of these indicators.

The third NCA report documents climate change impacts on U.S. regions and sectors, as well as society's responses to climate change. The 2009 NCA report included a Coasts chapter that discussed coastal and ocean issues, particularly physical and ecological impacts. However, with the growing recognition of the importance of both coastal and ocean issues with respect to climate change, as well as the growing body of knowledge and communities interested and invested in these issues, the third draft report includes both an Oceans and Marine Resources chapter and a Coastal Zone Development and Ecosystems chapter. This is the first NCA with a stand-alone Oceans chapter, and the Coastal chapter is broader in focus than previous NCA efforts – addressing physical, ecological, and social impacts and vulnerabilities. Presentations on these chapters were given by Laura Petes (NOAA Climate Program Office), a lead author on the Coastal Zone Development and Ecosystems chapter, and Scott Doney (Woods Hole Oceanographic Institution), convening lead author of the Oceans and Marine Resources chapter. Although subject to change in the final version of the third NCA report, the key messages from these two chapters of the draft report were provided to workshop participants as read-ahead materials:

#### **Draft Oceans and Marine Resources Chapter Key Messages**

1. The rise in ocean temperature over the last century will persist into the future, with continued large impacts on climate, ocean circulation, chemistry, and ecosystems.
2. The ocean currently absorbs about a quarter of human-caused carbon dioxide emissions to the atmosphere, leading to ocean acidification that will alter marine ecosystems in dramatic yet uncertain ways.
3. Significant habitat loss will continue to occur due to climate change, in particular for Arctic and coral reef ecosystems, while expansions of habitat in other areas and for other species will occur. These changes will consequently alter the distribution, abundance, and productivity of many marine species.
4. Rising sea surface temperatures have been linked with increasing levels and ranges of diseases of humans and marine life, such as corals, abalones, oysters, fishes, and marine mammals.
5. Altered environmental conditions due to climate change will affect, in both positive and negative ways, human uses of the ocean, including transportation, resource use and extraction, leisure and tourism activities and industries, in nearshore and offshore areas. Many marine activities are designed based on historical conditions. Thus, climate changes that result in conditions substantially different from recent history may significantly increase costs to businesses as well as disrupt public access and enjoyment of ocean areas.
6. In response to observed and projected climate impacts, some existing ocean policies, practices, and management efforts are incorporating climate-change impacts. These initiatives, such as increasing the resilience of built infrastructure or natural marine ecosystems, can serve as a model for other efforts and ultimately enable people and communities to adapt to changing ocean conditions.

## Draft Coastal Zone Development and Ecosystems Chapter Key Messages

1. Coastal lifelines, such as water supply and energy infrastructure and evacuation routes, are increasingly vulnerable to higher sea levels and storm surges, inland flooding, and other climate-related changes.
2. Climate change increases exposure of nationally important assets, such as ports, tourism and fishing sites, in already-vulnerable coastal locations, threatening to disrupt economic activity beyond the coast and incurring significant costs for protecting or moving them.
3. Socioeconomic disparities create uneven exposures and sensitivities to coastal risks and limit adaptation options for some coastal communities, resulting in the displacement of the most vulnerable from coastal areas.
4. Coastal ecosystems are particularly vulnerable to climate change because many have already been dramatically altered by human stresses; climate change will result in further reduction or loss of the services that these ecosystems provide, including potentially irreversible impacts.
5. Growing awareness of the high vulnerability of coasts to climate change increasingly leads coastal regions to plan for potential impacts on their citizens, businesses, and environmental assets. Significant institutional, political, social, and economic obstacles to implementing adaptation actions remain.

## NCA Sustained Assessment Process

The second plenary session focused on the sustained assessment process of the NCA that is currently underway; Fred Lipschultz (NCA) gave an overview. Creating and sustaining the capacity to conduct and use assessments is an essential part of the NCA process. In order to meet the deadlines for the climate assessment reports, it is beneficial to have an ongoing process that does not require a massive build-up of manpower and data collection to produce every quadrennial report. USGCRP has identified a number of ways to sustain this process, some of which are already underway. These include further developing scenarios used in assessments, establishing and implementing an Indicator system (see below), and producing a variety of reports that include technical inputs to the NCA (e.g. regional analyses and literature reviews) and special topics (e.g. food security in a changing climate). These reports are meant to supplement and build upon the quadrennial report, and allow for a deeper understanding of climate change effects on particular sectors and issues of national importance, investigation of new scientific issues of concern, enhancing capacity to conduct assessments over time, better supporting decisions that reduce risk and increase opportunities, and enabling a full review for issues of national importance in an efficient and credible way. A report already underway is the Sustained Assessment Special Report, which is currently in draft form and anticipated to be released in Fall 2013. This report lays out a vision for a sustained assessment process that provides support for science focused on solutions and investment opportunities, meets the science and adaptation needs of federal agencies, and provides transparent access to data and information at a variety of scales that other actors in the private sector, civil society, and

local/regional governments need to assess their own risk-management strategies. While the sustained assessment process is already underway, including this workshop, this report will provide an official recommendation from the National Climate Assessment Development and Advisory Committee (NCADAC) toward the development of an ongoing, sustainable national assessment of global change impacts and adaptation and mitigation strategies for the nation.

### **Oceans and Coasts Indicators System**

A second foundational effort already in progress is the NCA Indicators System, which will create a system of indicators that will help inform policy-makers and citizens about key aspects of climate changes, impacts, vulnerabilities, and preparedness. The goals of the Indicators System are to:

- Provide meaningful, authoritative climate-relevant measures about the status, rates, and trends of key physical, ecological, and societal variables and values,
- Inform decisions on management, research, and education at regional to national scales,
- Identify climate-related conditions and impacts to help develop effective mitigation and adaptation measures, and
- Provide analytical tools by which user communities can derive their own indicators for particular purposes.

Though there are existing indicator products within many agencies, there is not a cross-agency effort that could bring together indicators relevant to this effort. Thus, the NCA Indicators System is not meant to re-do these existing efforts but instead to build upon and integrate information from these efforts into the same system to enhance synthesis, collaboration, identify research gaps, and systematically evaluate the effectiveness of the indicator system. The recommended indicators must be scientifically defensible, of national significance, relevant to decision-makers and management, and, while not intended to indicate causality, the indicators must have a defined relationship to climate.

Roger Griffis (NOAA Marine Fisheries Service) described the Oceans and Coasts Indicators technical team effort. The Oceans and Coasts Indicators team is considering indicators that are relevant to the impacts of climate change on the physical, biological, and socioeconomic systems within oceans and coasts. The team has developed a conceptual framework that illustrates the interconnectedness of the indicators in these three systems. The workshop participants were given an overview of the status of the Oceans and Coasts Indicators Team and were asked to provide their thoughts and feedback on the initial indicators under consideration.

The NCA Indicators system will launch a pilot set in Spring 2014 on the Global Change Information System (see below), and the full set of indicators will be finalized in 2015, at which point implementation will be initiated.

### **Global Change Information System**

Workshop participants were introduced to the Global Change Information System (GCIS), an interagency climate information portal under development, by Megan McVey (USGCRP). The GCIS will be a unified web-based source of authoritative, accessible, and timely information about climate and global change for use by scientists, decision makers, and the public. The

GCIS is planned to launch in Spring 2014, timed with the release of the final third NCA report. The initial launch will be focused on the material in the report and will include regional, sectoral, and highlights pages. In the future, the GCIS will allow for interagency information integration, data mining, and traceability of data. This will be accomplished through providing access to reports, research papers, journals, datasets, instrument and model information, a searchable image library, news, blogs and social media, an adaptation clearinghouse, and interactive visualizations to display scientific monitoring information, indicators, and other data products for non-expert users.

After hearing talks about these components of the sustained assessment process, workshop participants joined in for discussion and Q&A. Participants noted the importance of not forgetting what has been done before and that it would be beneficial if GCIS would allow for searchability across the 2000 and 2009 NCA reports, as well as the third NCA report.

## **Small Group Discussions**

### **1. Science and Information Needs**

The first small-group discussion focused on the existing and emerging science and information needs in support of coastal and ocean assessments. Brian Helmuth (Northeastern University) provided a framing presentation highlighting several key ocean and coastal climate science questions and knowledge gaps. Participants were shown the list below, which is a summary of key science/information needs identified in the Oceans and Coastal chapters of the draft third NCA report, and were asked to identify their top 2-3 needs from this list:

- Extratropical storm frequency and intensity projections; understanding risks associated with sequences of extreme events.
- Regional impacts of warming and acidification.
- Synergistic impacts of climatic and non-climatic stressors on social, economic, infrastructural, ecological systems.
- Effects of ocean acidification on organisms.
- “Winners” vs. “losers” (species and communities that benefit from climate-related changes vs. those that are negatively impacted).
- Ecological tipping points – drivers, trajectories, determining which impacts are reversible.
- Adaptive capacity of human and natural systems.
- Integration and translation of scientific understanding of benefits provided by ecosystems into engineering design and hazard management.
- Impacts of climate change on coastal and ocean leisure/tourism activities.
- Methods and costs (including on social systems) associated with transformational adaptation (e.g. managed retreat).
- Projections of future social vulnerability based on demographic changes/variables.
- Ways to inventory the constantly-evolving landscape of coastal and ocean adaptation efforts.

Participants in all four groups agreed that several of the issues on the above list were related or supported one another and should be grouped together. However, common themes emerged from the groups. The top information needs identified by the groups were:

- Adaptive capacity of human and natural systems,
- Synergistic impacts of climatic and non-climatic stressors on social, economic, infrastructural, and ecological systems,
- Ecological tipping points – drivers, trajectories, determining which impacts are reversible, and
- Integration and translation of scientific understanding of benefits provided by ecosystems into engineering design and hazard management.

Much discussion ensued concerning these needs. The top need identified by all groups concerned adaptive capacity, and how the fundamental questions of how to research and study this topic are still up for debate. A participant raised the question of “adaptation of what to what?” Especially in terms of natural ecosystems, are we able to help a species adapt? And are we talking about evolutionary adaptation (which would in many cases be outpaced by climate change) or other forms of adaptation? What methods can be used to assess adaptive capacity of coastal and ocean systems? This is a topic that needs much more development.

Participants were then asked to list science/information needs that were not articulated in the above list. The full list is found in [Appendix B](#), but topics that came up repeatedly in the small groups included:

- Understanding sea level rise at local-to-regional scales, including the synergistic effects of tides, heat, ice melt, climate regions, etc.,
- Maintaining and expanding baseline scientific observations and monitoring, including waves, wind, subsurface observations, circulation patterns, storm surge, species lifecycles, land use/land cover,
- Developing regional coastal/ocean climatologies,
- Advancing regional/downscaled/coupled climate-ecosystem models and guidelines and quality control measures for how to develop such models, and
- Developing a database of local and traditional ecological knowledge associated with coastal and ocean climate variability and change.

The final topic in this first small group discussion session focused on how to advance understanding of the science and information needs identified above ([Appendix C](#)). Participants agreed that we need to better leverage existing datasets by improving integration and utility of these datasets, as well as ensuring continued support. These datasets should also be accessible through centralized databases, such as the GCIS. Standard operating procedures should be developed, both for datasets as well as model/scenario development, to allow for intercomparison between datasets or models in different regions. Lastly, some of these needs could be addressed through nurturing public/private partnerships and citizen science programs.

## 2. Addressing the Needs of Decision-Makers and Managers

The second small-group discussion transitioned to the topic of management and decision-making needs that could be met by national climate assessments of coasts and oceans. The framing presentation by Doug Parsons (National Park Service) brought up the issue that not everyone is aware of the NCA and using it to its fullest extent; many managers do not use the NCA at all. He pointed out that the NCA report should be viewed as the “gold standard” and the credible foundation upon which many people can base their own work and decisions. The groups then discussed how the NCA could benefit decision makers at national to local scales.

In the small-group discussion, participants first identified coastal and ocean decision-making processes that could most benefit from information provided through the NCA. In general, participants agreed that the NCA could be used as a way to highlight topics of national significance and to identify key vulnerabilities. For example, information in the Impacts of Climate Change on Tribal, Indigenous, and Native Lands and Resources and Coastal Zone Development and Ecosystems chapters of the NCA enable tribal governments to highlight the fact that the impacts of climate change on coastal tribal communities is well-documented and of national significance. The NCA can also inform the development of management plans that incorporate climate change, and can identify sensitive decision points, changing boundaries, and indicators of change that can be useful in coastal and ocean management. Specific decision processes that could benefit from the NCA include:

- Fisheries management
- Coastal and ocean ecosystem restoration methods and investments
- Marine spatial planning and use-conflict
- Marine protected area design and management
- Coastal land-use planning
- Nutrient management
- Protected species management
- Invasive species management
- Military readiness/national security
- Energy exploration and development, including siting of renewables
- Upstream water management (supply and quality)
- Insurance (e.g. flood insurance) and financial sectors
- Real estate speculation
- Infrastructure planning (e.g. energy, transportation, national security, water)
- Disaster risk reduction
- Development of federal funding opportunities
- Compliance with existing federal regulations (e.g. Magnuson Stevens Act)
- Development and/or revision of coastal and ocean management plans
- Management challenges where boundaries are shifting (e.g. due to shifts in species ranges)
- Location and types of new coastal and ocean observational capabilities/infrastructure
- Identifying and deploying indicators

There was much discussion and recognition of the fact that the NCA, a national-level report, cannot be “everything for everybody.” However, the NCA should be known as a “gold-standard” mechanism for synthesizing and assessing the most current, best-available science. Participants agreed that most users are not going to read the full NCA report. Therefore, the information should be translated appropriately for different target audiences: derivative products such as one-pagers can be developed for different audiences and needs. This is something that can and should be done not only by the NCA staff but also by NGOs, decision-makers and managers who are working to translate the science to those interested in using it. Although it is a national report, participants urged the NCA to include regional summaries and maps that can help them to localize the data. They also brought up the importance of acknowledging uncertainty in scientific data but highlighting that decision making can still occur even with uncertainty present. Many decision-makers were interested in the Indicators System and wanted the NCA to identify the appropriate indicators and how/when to apply them. Lastly, workshop participants agreed that non-science agencies need to be aware of the NCA and its products and understand that the information has been vetted and is the gold standard.

Each group was asked to develop specific ideas for advancing integration of NCA information into the coastal and ocean decisions discussed above. Participants agreed upon the below as big-ticket ideas (full list is included in [Appendix D](#)):

- Produce 2-3 minute YouTube videos and other derivative products tailored for various user-groups,
- Develop a mechanism for enabling easy extraction of manageable portions of information from the NCA. Participants encouraged this as a potential feature in GCIS,
- Enhance private sector involvement to increase stakeholder pressure on decision makers,
- Build off the recent Government Accountability Office report to highlight federal programs/policies that climate change puts at risk, and
- Use communication and outreach capabilities of existing networks (e.g. Sea Grant Extension, ocean observing systems, Coastal Zone Management programs, etc.).

The full group discussion after these first two small group discussions led to a conversation on the current utility of the NCA. Participants discussed the fact that it is difficult to stay on top of all the information in one’s own field of work; therefore, there are often not the resources or energy to integrate the information from the NCA into one’s own work. This is why it is so important to have the information from the NCA be easily accessible and relevant. The conversation again led to the idea that the NCA cannot be all things to all people, and while we should try to make it as accessible as possible to all user-groups, we cannot lose sight of its purpose as a national-level report of the latest climate science.

### 3. Building Sustained Coastal and Ocean Assessment Capacity

The second day of the workshop focused on capacity building of the sustained assessment process. Emily Cloyd, Public Participation and Engagement Coordinator for the NCA, discussed NCA engagement opportunities, which include the NCA website, an e-newsletter sent once a month, workshops on process and methodology, workshops on regional and sectoral topics, Federal Register Notices, town hall meetings, and the NCAnet. The NCAnet is a network of organizations that extend the NCA process and products to a broader audience through their stakeholders and members. The NCAnet is meant to build long-term capacity to conduct and use assessments by cultivating partnerships with organizations that will participate in the sustained assessment process. This group now consists of 80+ organizations that include professional societies, academia, non-profit organizations, local, state, and tribal governments, and the private sector. Benefits for NCAnet partners include organized access to the NCA process, a point of contact within NCA staff for questions, comments, or concerns about participation, connection to other organizations interested in the NCA and climate change, and a forum for sharing ideas, wisdom, and best practices within and across disciplines. Within the NCAnet are affinity groups, which allow partners to structure their NCA-related activities around common issues and areas of interest. There is a Coasts, Oceans, and Marine Resources affinity group, which includes a variety of members from NGOs, to academia, to the federal government. Interested groups can join the NCAnet at [ncanet.usgcrp.gov](http://ncanet.usgcrp.gov).

The final small group discussions built upon the engagement opportunities described above by identifying potential mechanisms for advancing partnerships and networks in support of national climate assessments. Ann Marie Chischilly, Executive Director of the Institute for Tribal Environmental Professionals (ITEP), gave a framing presentation describing the methods ITEP uses to build partnerships across networks of tribal environmental professionals, including adaptation planning workshops, webinars, and newsletters.

A recurring theme in the ensuing discussions was the idea of reaching out to existing networks so that we are not ‘re-inventing the wheel.’ Established networks that should be utilized in sustaining national climate assessments of coasts and oceans include (but are not limited to):

- NCAnet Coasts, Oceans, and Marine Resources affinity group
- Sea Grant Extension programs
- National Estuarine Research Reserve System
- National Phenology Network
- Landscape Conservation Cooperatives
- Coastal Zone Management programs
- Regional ocean observing systems
- Regional Integrated Science and Assessments program
- Climate Science Centers
- Coastal States Organization
- Coastal America
- Council of Environmental Deans and Directors
- Centers for Ocean Sciences Education Excellence
- National Marine Educators Association
- Smithsonian Ocean Hall

Participants stressed the need to make a stronger effort to reach out to NGOs and industry partners, such as those involved in the Global Partnership for Oceans. These groups can be useful for providing critical information to national climate assessments, as well as a powerful mechanism for supplying information to private stakeholders. Tribal governments also need to be better included in this sustained process, and the Environmental Protection Agency is a very good example of successful partnering efforts with tribes.

The NCA should take advantage of existing forums to supply information, such as professional society meetings, environmental film festivals, and gatherings such as the Blue Vision Summit or Capitol Hill Oceans Week, and connect with adaptation conversations happening on national to local scales. A participant suggested the development of a new forum in which information is collected from technical providers and offered through a portal to those in need (e.g. local communities). Natural Resources Canada also has a climate assessment report, *From Impacts to Adaptation: Canada in a Changing Climate 2007*, which discusses some of the same topics the U.S. is interested in addressing, including food security, the international context, and fisheries, and can be used as an example framework for future NCA special reports.

Participants were then asked to suggest coastal or ocean topics that would make compelling or timely NCA special reports for the sustained assessment process. There was a wide diversity of ideas, all of which are listed in [Appendix E](#), but some common themes included:

- Climate change impacts on fisheries,
- Nearshore impacts of climate change, and
- Local and traditional ecological knowledge associated with climate impacts on coasts and oceans.

Writing these special reports is an area where connecting to existing networks is very useful, as many of the data likely already exist.

In addition, another mechanism articulated for identifying special reports was to address particularly timely and relevant coastal and ocean decision needs, e.g.:

- Integrating climate into coastal ecosystem restoration efforts,
- Addressing climate considerations in marine spatial planning, and
- Incorporating climate into fisheries management.

The sustained NCA process relies not only on its dedicated staff but also on the participation and dedication of many volunteers. A challenge, particularly in this era of limited funding, is how to keep communities engaged and incentivized in participating in the NCA. Workshop participants discussed the challenges and incentives that would keep them engaged in the NCA process. Common themes in this discussion included the importance of being recognized for contributions (e.g. through letters of recognition/appreciation that could be shared with their leadership), as well as the ability to extract useful information from the NCA. Clear demonstrations of how the NCA is useful to a variety of user-groups would encourage different communities to be involved in the process. Participants stressed that the process of helping write something for the NCA (e.g. a chapter, a special report) should be standardized and streamlined, such that volunteers know what to expect and are given clear deadlines and a reasonable amount of time to produce the

work. It was pointed out that developing the sustained assessment process should help with that streamlining. The full list of ideas is in [Appendix F](#).

Even with incentives, volunteer fatigue can still occur. Participants agreed that it is very important to not over-promise benefits and rewards to those who contribute to the NCA. If this were to occur, contributors would be more likely to become disengaged with the NCA process. Thus, realistic incentives and expectations need to be set, and the sustained NCA process needs to be as transparent and streamlined as possible.

## **Workshop Wrap-Up and Key Findings**

The workshop concluded with a full group discussion on lasting impressions from the conversations held over the 1.5 days. Final thoughts from participants included looking towards the future and recognizing that different groups need to be involved in these conversations. Many people who are in high levels of organizations were trained decades ago and do not have the integrative perspective on issues like tipping points, interdisciplinarity, and complex dynamics that younger generations have. Networks should be developed that intentionally include both generations to cover a wide range of expertise.

There were no industry representatives at the workshop, and participants stressed the need to engage private sector entities. Strategies were discussed on how best to engage the industry community, including connecting with the industry NCADAC members and looking at models of successful industry engagement such as Natural Resources Canada's climate adaptation platform and the California Coastal Certification Network. Another group to engage are coastal engineers, as they are often the group on the ground making recommendations to clients and designing facilities in impacted coastal zones.

This workshop was the first of its kind, focused on sustained assessment needs associated with a particular region/sector (coasts and oceans). The workshop can serve as a framework that can be applied to future workshops/meetings associated with sustained assessments for other sectors and regions. The ideas brought forth in the workshop discussions will inform and sustain assessments of oceans and coasts. In addition, the workshop participants can serve as the beginning of a network involved in sustained national climate assessments of coasts and oceans, and can reach out to their networks of networks to enhance visibility and application of the NCA across user-groups and communities.

## Key Findings

- Top key science/information needs include understanding the adaptive capacities, synergetic impacts of multi-stressors, and tipping points of human and natural coastal and ocean systems.
- NCA products should address the ongoing need for local-to-regional-scale information through advancing coastal and ocean climatologies and projections, coupled climate-ecosystem models (at the large marine ecosystem scale), and sea-level rise scenarios.
- Many existing long-term observations and monitoring systems in coastal and ocean regions (e.g. National Estuarine Research Reserve System, Long Term Ecological Research network, regional ocean observing systems) provide valuable information that could be leveraged for the sustained NCA.
- The NCA could enhance its utility for coastal and ocean decision-makers by developing special reports on timely and relevant decision needs (e.g. integrating climate into coastal ecosystem restoration, marine spatial planning, and fisheries management).
- User-friendly derivative products of the NCA, such as one-pagers or regional summaries developed for specific audiences (e.g. coastal zone managers, fisheries managers, coastal tribal communities) are particularly useful.
- Established networks (including but not limited to the NCAnet Coasts, Oceans, and Marine Resources affinity group, Sea Grant Extension programs, Coastal Zone Management programs, Regional Integrated Sciences and Assessments programs) should be utilized for translation, dissemination, and outreach to ocean and coastal stakeholders; these networks can also help to identify and address key decision needs as they arise.

## Appendix A: Workshop Agenda

**Monday, April 22, 2013**

- 8:00 - 8:30**      **Participant check-in; coffee/pastries**
- 8:30 - 8:45**      **Welcome; Overview of agenda**  
Elizabeth Fly, National Climate Assessment, NOAA Climate Program Office
- 8:45 - 9:00**      **Overview of National Climate Assessment process and future goals**  
Kathy Jacobs, Director of the National Climate Assessment
- 9:00 - 9:15**      **Overview of Coastal Zone Development and Ecosystems chapter**  
Laura Petes, NOAA Climate Program Office, Lead Author on Coastal Zone  
Development and Ecosystems chapter
- 9:15 - 9:30**      **Overview of Oceans and Marine Resources chapter**  
Scott Doney, Woods Hole Oceanographic Institute, Convening Lead Author on  
Oceans and Marine Resources chapter
- 9:30 - 10:00**    **Question & answer/discussion session on current National Climate  
Assessment draft and process**
- 10:00 - 10:20**    **Break**
- 10:20 - 10:40**    **Sustained assessment overview**  
Fred Lipschultz, National Climate Assessment
- 10:40 - 10:55**    **National Climate Assessment coastal and ocean climate indicators**  
Roger Griffis, NOAA National Marine Fisheries Service
- 10:55 - 11:10**    **Networks of information sharing/GCIS**  
Megan McVey, U.S. Global Change Research Program
- 11:10 - 11:45**    **Question & answer/discussion session on overall sustained assessment  
process**
- 11:45 - 12:45**    **Lunch (provided)**
- 12:45 - 1:00**      **Framing presentation: Emerging science needs and opportunities in  
support of coastal and ocean climate assessments**  
Brian Helmuth, Northeastern University

- 1:00 - 1:15**      **Framing presentation: The role of climate assessments in informing coastal and ocean natural resource management**  
Doug Parsons, National Park Service Climate Change Response Program
- 1:15 - 2:30**      **Breakout group discussions: Existing and emerging science/information capabilities in support of coastal and ocean assessments**
- 2:30 - 3:45**      **Breakout group discussions: The evolving role of assessments in informing coastal and marine resource management and consumers of information in a changing climate**
- 3:45 - 4:05**      **Break**
- 4:05 - 4:30**      **Breakout group report-outs**
- 4:30 - 5:15**      **Full group discussion on aligning assessments in support of coastal and ocean decision making**

**Tuesday, April 23, 2013**

- 8:00 - 8:30**      **Coffee/pastries**
- 8:30 - 8:45**      **Recap from Day 1**  
Elizabeth Fly, National Climate Assessment, NOAA Climate Program Office
- 8:45 - 9:00**      **National Climate Assessment engagement opportunities; NCAnet**  
Emily Cloyd, National Climate Assessment
- 9:00 - 9:15**      **Framing presentation: Building partnerships across networks of environmental professionals**  
Ann Marie Chischilly, Institute for Tribal Environmental Professionals
- 9:15 - 10:30**      **Breakout group discussions: Mechanisms for enhancing capabilities to sustain coastal and ocean climate assessments (e.g. facilitating partnerships, collaboration, knowledge sharing)**
- 10:30 - 10:50**      **Break**
- 10:50 - 11:15**      **Breakout group report-outs**
- 11:15 - 12:00**      **Full group discussion on identifying paths forward for sustained assessments of oceans and coasts**
- 12:00 - 12:30**      **General wrap-up; articulation of take-home messages and key findings**

## Appendix B: Science/information needs identified by workshop participants that had not been specifically identified in the draft third NCA report

- Integrating socioeconomic models with physical and biological models
- Dealing with uncertainties and unanticipated events
- Understanding local and regional impacts on sea level rise
- Understanding estuarine shoreline response to sea level rise
- Addressing relationships between floodplain management and coastal resilience
- Interactions between climate regimes (e.g. Pacific Decadal Oscillation) and sea level rise
- Developing regional coastal and ocean climatologies
- Developing climatologies of temperature and precipitation for coastal/ocean ecosystems
- Developing new and innovative methods for long-term data collection in biological systems – understanding what is important to measure and what does it mean from a climate perspective?
- Developing regional/downscaled/coupled climate-ecosystem models for coasts and oceans – need guidelines and quality control on how to develop such models
- Developing a more robust baseline – mine the huge amount of work that has already been done to establish what we have and identify gaps; create observational and research priorities to fill in those gaps
- Improving cost-benefit analysis of climate impacts/changes – more expansive economic assessment for coastal communities, including ecosystem services
- Improving regular and sustained land use/land cover monitoring, using both satellite and *in situ* measurements
- Addressing impacts of climate change on key marine species (e.g. commercial fish species)
- Improving collection and integration of local traditional and ecological knowledge associated with coastal and ocean climate impacts – incorporate into GCIS
- Ensuring sustained collection and synthesis of foundational coastal and ocean scientific information (e.g. wave/wind, subsurface observations, storm surge, species lifecycle, etc)
- Improving understanding and projection of storm surge
- Leveraging social science knowledge to improve engagement and communication of relevant science with coastal and ocean information users
- Articulating and prioritizing key coastal and ocean vulnerabilities to help direct adaptation efforts
- Improving integration of engineering and ecological sciences to inform coastal infrastructure (e.g. green-gray approaches)

## Appendix C: Ways to advance coastal and ocean NCA science/information needs

- Sustain and enhance coastal and ocean monitoring efforts (e.g. NERRS)
- Determine ‘standard operating procedures’ and comparable information across regions
- Leverage local knowledge
- Continue support for Long Term Ecological Research and other long-term datasets
- Ensure alignment and coordination between the NCA and other national-level efforts (e.g. National Ocean Policy)
- Hold meetings (e.g. data “jams”) to bring people together with relevant datasets to foster analyses and syntheses
- Incentivize the collection and integration of data through a consortium of partners
- Use protected sites as sentinel sites – both as generators of new information and as networks of previously collected information
- Improve cooperation with and utilization of sites and data generated through existing coastal and ocean observational networks (e.g. IOOS, ARGO, NANOOS)
- Develop more private/public partnerships to improve data sharing, translation, and tool development
- Develop cheap sensors to increase coastal monitoring
- Expand and leverage information gathered through citizen science programs (e.g. National Phenology Network)

## **Appendix D: Ideas for advancing integration of the NCA information into coastal and ocean decisions**

- Produce 2-3 minute YouTube videos
- Make it a requirement of state agencies to address the NCA
- Produce derivative products for different audiences: one-pagers, multiple products, comics, translated brochures. NGOs and other science translators can help create these products.
- Enhance private sector involvement to increase stakeholder pressure on decision makers
- Build off the recent GAO report to highlight federal programs/policies that climate change puts at risk
- Focus on hazard risk reduction and response: repetitive loss data, incorporation of climate into Stafford Act required hazard mitigation plan
- Market information to encourage use
- Train the experts to be better communicators
- Use communication and outreach of existing networks (e.g. Sea Grants, ocean observing systems, coastal zone management programs, etc)
- Enhance coastal data coordination to develop standardized integrated network using IOOS regions, NERRS, NMSP, NEP, LTERRS, MPAs, tribal watershed programs, etc
- Standardize socioeconomic data so it can be included
- Develop consistent messages that get updated when needed
- Focus more on solutions rather than problems
- Develop mechanism for how to extract and communicate manageable “chunks” of information; perhaps through the GCIS
- Articulate costs of action vs. inaction for various adaptation options for infrastructure, etc
- Provide different levels of “technical” vs. “non-technical” information for different users/needs
- Create public-private partnerships to ingest and manage the ‘web of knowledge’ created by NCA products

## Appendix E: Coastal or ocean topics that would make for compelling or timely NCA special reports

- Climate change impacts on fisheries on top of existing management challenges
- Decision relevancy – how to select topics and write reports that are relevant for decision-making
- Valuation methods, especially the costs of inaction
- Tidal estuarine shoreline behavior in response to sea level rise
- Guidance on developing evaluation methodologies for effective measures of adaptation
- Eutrophication/hypoxia as a threat multiplier – the synergies between climate change and hypoxia
- Local and traditional ecological knowledge
- Protected resources – e.g. vulnerability assessment of migratory species – which regions they inhabit are the most vulnerable?
- Highly migratory species
- Linking coastal system to global changes through habitat degradation, eutrophication, ocean acidification, changes in the hydrologic cycle
- Incorporating climate change into Marine Spatial Planning
- Impacts of increasing extreme events on biological resources, ecosystems, and communities
- Ocean acidification in coastal systems
- Hazard mitigation planning
- Social and economic vulnerability of coastal communities
- Climate change impacts on the Great Lakes
- Trade-offs when dealing with climate change
  - Wind farms and bats/birds
  - Storm surge planning and impacts on natural resources/ecosystems
  - Coastal adaptation: hard infrastructure vs. soft infrastructure
- Tribal issues, including “dire straits”
- Regional downscaled climate models for ocean scenario planning
- Changes in hydrological cycle of coastal systems
- Challenges and opportunities of ecosystem restoration in a changing climate
- Climate change and fishing impacts on marine mammals
- Arctic vulnerability to decreasing sea ice, including effects from increased hunting, fishing, and shipping routes

## Appendix F: Incentives and mechanisms for keeping participants engaged in the NCA

- Recognition of contributions (e.g. through letters of recognition/appreciation that could be shared with participants' leadership)
- Clear demonstration of the uptake of NCA information by user groups, such as coastal and ocean decision-makers, tribes, federal agencies, etc.
- Feedback to those who submit material, especially technical input reports – explain why some material is included in the NCA, while other material is not
- Standardize the process so volunteers know what to expect and have clear goals, deadlines, and timelines in mind
- Clarify the importance of participating in the assessment to potential participants
- Expand the NCAnet Coasts, Oceans, and Marine Resources affinity group
- Travel support and small meetings to bring people together; piggyback on existing meetings when possible
- Publications
- Free t-shirts and hats ☺

## Appendix G: Workshop Planning Committee

### Lead Organizer:

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