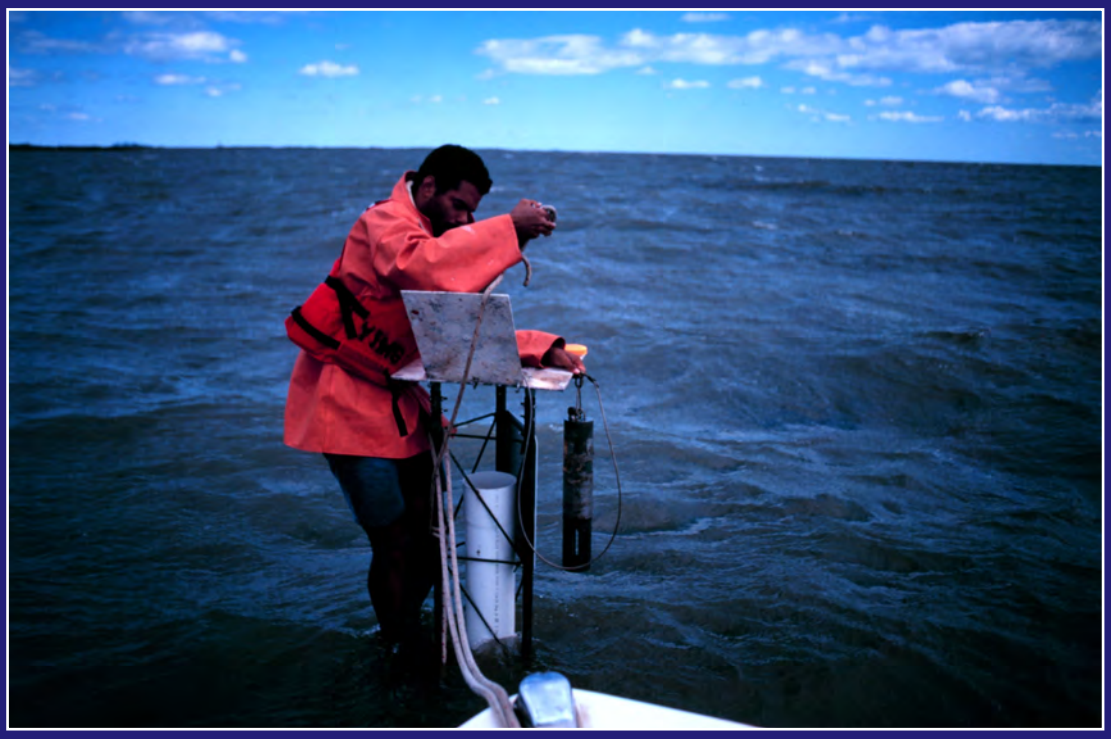

Building and Strengthening Linkages between the National System of Marine Protected Areas and the Integrated Ocean Observing System (IOOS®)

Final Recommendations from the Marine Protected Area (MPA) and Integrated Ocean Observing System (IOOS®) Task Team

MPA/IOOS Task Team
MPA Center
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Contents

I. EXECUTIVE SUMMARY

In November 2008, the Marine Protected Areas Federal Advisory Committee (MPA FAC) sent recommendations to the Department of Interior (DOI) and Department of Commerce (DOC) regarding *Linking Ocean Observing Systems with the National System of Marine Protected Areas*. These recommendations included:

- Establishing a strong linkage between the National System of Marine Protected Areas (MPAs) and the United States (U.S.) Integrated Ocean Observing System (IOOS®).
- Creating an interagency working group to enhance cooperation between the National System of MPAs and IOOS.
- Increasing and stabilizing funding for integrated monitoring by IOOS and the National System of MPAs.

The National System of MPAs is called for in Executive Order 13158, in order to strengthen the protection of the nation's marine resources, by providing science, technology, tools and technical assistance to the country's diverse MPA programs. The National Marine Protected Areas Center (MPA Center) was established to coordinate this effort, and works in partnership with federal, state, tribal, and local governments, tribes, and stakeholders. The Integrated Ocean Observing System is a coordinated network of people and technology that work together to generate and disseminate continuous data on our coastal waters, Great Lakes, and oceans.

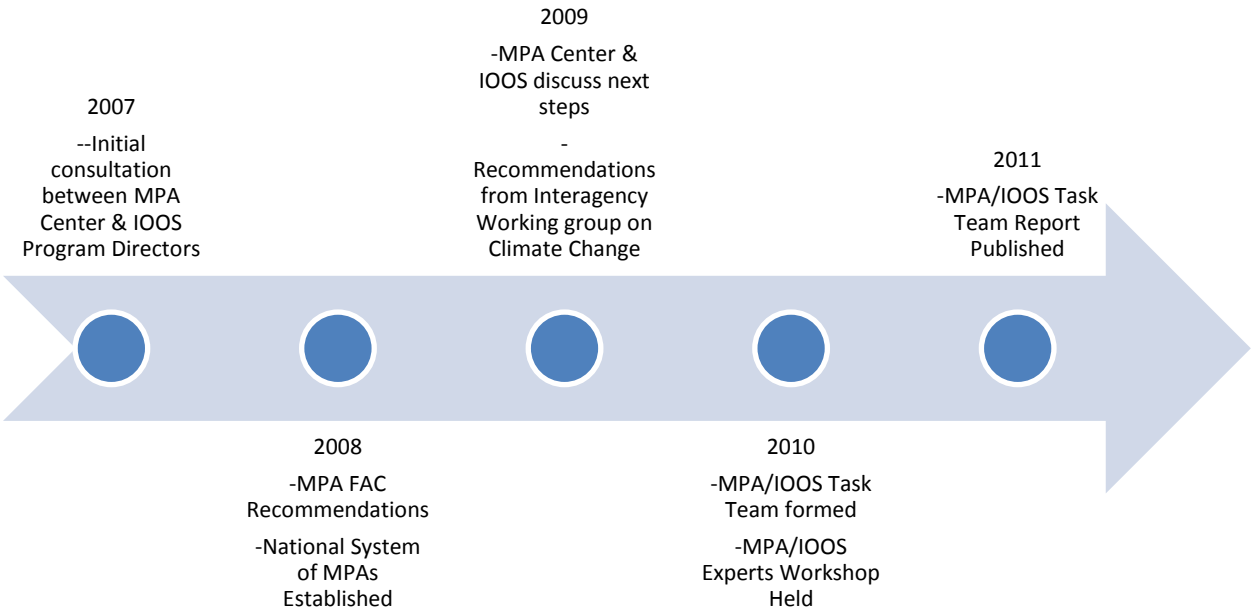
In Spring 2010, the Marine Protected Area / Integrated Ocean Observing System (MPA/IOOS) Task Team (hereafter referred to as the Task Team) was formed to follow up on these recommendations. The Task Team considered how the National System of MPAs (hereafter referred to as the national system) can link to IOOS and how MPAs can be used as platforms for monitoring to enhance our understanding of marine ecosystems.

Based on the recommendations of the MPA FAC, the MPA Center developed a charge to focus the work of the Task Team, including:

1. Identifying the end user products the MPA managers will need to be able to determine if the MPA and MPA networks are operating as designed.;
2. Identifying key environmental parameters and processes that would be most important to MPA managers to enhance understanding of dynamic marine ecosystems and ecosystem health; and
3. Recommending steps to explore with the Climate Reference Network (CRN) program about the addition of marine sites.

The Task Team was asked to consider these issues from both a national and a regional perspective. The Task Team aimed to identify ambitious recommendations that require capacity that may be built out over time, as well as considering short-term opportunities within current and expected budget constraints. For example, the environmental parameters should be selected based on importance and need, but should be prioritized with consideration of costs and other constraints.

Figure 1: Timeline of efforts to strengthen the linkages between the National System of MPAs and the U.S. IOOS



It is important to understand how to use MPAs as platforms for ocean monitoring both inside and outside MPA boundaries. In addition, scientific and technical experts recommended the use of MPAs to monitor impacts of climate change. Experts highlighted the need to explore, create linkages between and expand upon current monitoring. The Task Team found that the three components of their charge are all interrelated so one recommendation may address more than one component of the charge. Below are the Task Team's key recommendations (please refer to the Final Recommendations section of this report for more information):

Recommendations:

Identifying Key End User Products Needed by MPA Managers:

- Use the linkages between the MPA Center, its National System of MPAs, and IOOS to identify efficient and effective ways to monitor MPAs for impacts of climate change.
- Use the MPA Center as the main point of contact between the national system partners and the Regional Associations (RAs) and IOOS, since the MPA Center operates as a cross–program and cross-agency lead collaborator. This role would help strengthen the linkages between the IOOS and/or its RAs and MPA managers. Some collaborations exist between RAs and MPAs in their region, but a common communication framework can help strengthen partnerships.
- Develop a national scale sentinel site monitoring effort across MPA programs. Drawing upon some existing efforts by the National Estuarine Research Reserves (NERRS), the National Marine Sanctuaries (NMS), and other programs, a national scale sentinel site monitoring program should be developed through expansion to other MPA programs,

and by including all types of MPAs as defined in the U.S. MPA Classification System by the MPA Center http://www.mpa.gov[1].

- Refine the list of key parameters important for monitoring for impacts of climate change on MPAs developed at the experts workshop (see pp. 22-23).
- Seek input from the national system partners to help refine the development of a national scale sentinel site monitoring effort, by providing information on needs, existing assets, mechanisms for climate change information, or other issues (see page 20). In addition, MPA managers may provide information to assess the monitoring needs of their MPAs and their relationships with IOOS monitoring programs.
- Focus linkages between the MPA Center and IOOS on monitoring MPAs for impacts of climate change. Understanding climate change variables inside an MPA may help managers identify the impacts of other stressors (e.g., fishing, habitat destruction, pollution, and invasive species).

Identify key environmental parameters and processes most important to MPA managers to enhance understanding of dynamic marine ecosystems and ecosystem health

- Identifying essential parameters to include in a national sentinel site MPA monitoring approach for monitoring for impacts of climate change within MPAs. This should be a short list that are relevant across all MPA site types and that can be monitored at a regional/national scale.
- Identifying key parameters for monitoring climate change, and whether these are being collected by IOOS or other existing efforts.
- Foster enhanced collaboration among RAs and MPAs in each region. A first step would be to assess current partnerships between RAs and MPAs.
- Assessing existing marine monitoring efforts at regional and national scales to identify any additional efforts that may be needed to support the national system of MPAs. Specific questions to be addressed include:
    - What are the priority monitoring needs of the national system of MPAs?
    - Can existing monitoring data address these needs?
    - Is MPA monitoring information being made available to other management and science programs? (IOOS has the tools to share the data, but data owners need to provide their data to IOOS.)
    - Are the physical parameters collected spanning all types of MPAs?
    - Are data collection methods comparable across different MPA programs?

Explore the idea of adding coastal and marine sites to the Climate Reference Network (CRN) program.

- Investigating existing monitoring capabilities and presence/ absence of monitoring assets inside and outside MPAs. Visual products to show where monitoring assets and MPAs are located would be a useful tool for identifying possible partnership

[1] The MPA Classification System uses five key functional characteristics (Conservation Focus, Level of Protection, Permanence of Protection, Constancy of Protection, and Ecological Scale of Protection) to describe any MPA.

opportunities for MPAs, IOOS, and RAs, as well as the identification of any monitoring gaps within or outside of MPAs.
- Capitalize on existing monitoring networks to find cost effective ways to enhance monitoring capabilities.
- Identify a range of measurements important to monitoring MPAs, recognizing a standard suite of measurements may not be feasible because the resources being managed are different at each MPA.

Use the attached product templates (Appendix E) to expand the linkages between the national system of MPAs and IOOS.

(1) *Exploration of Climate Reference (CRN) Sites to Coastal and Marine Protected Areas (MPAs)*
(2) Creating an *Information Discovery Portal*
(3) *Demonstration of Emerging Technologies*
(4) Develop a *Communication Strategy Between National System MPAs and IOOS Regional Associations*
(5) Work Collaboratively with *Outreach: Ocean Observing Systems and Marine Protected Areas*
(6) Complete a *Periodic Assessment of Marine Resources Within a Regional Area*

Finally, the Task Team recommends that a clear mechanism for communication be developed between the national system and the IOOS, including the establishment of a cross-program to continue efforts to foster linkages across MPA and monitoring programs. IOOS assets and capabilities could be leveraged to support national system MPA programs' inventory and monitoring objectives. These partnerships would be a cost effective use of federal resources.

II. BACKGROUND

The Marine Protected Area (MPA) and the Integrated Ocean Observing System (IOOS®) Task Team (hereafter referred to as the Task Team) was formed in Spring, 2010 to follow up recommendations of the Marine Protected Areas Federal Advisory Committee (MPA FAC) to the Departments of Commerce (DOC) and the Interior (DOI). The Task Team was asked to recommend areas of collaboration between the National System of MPAs (hereafter referred to as the national system) and the United States (U.S.) Integrated Ocean Observing System (IOOS), including how MPAs can be used to enhance our understanding of marine ecosystems and the impact of climate changes to MPAs. The detailed charge to the Task Team was developed by the MPA Center and the IOOS Program, with input from the Interagency MPA Climate Change Workgroup.

III. POLICY AND PROGRAM CONTEXT

A. RECOMMENDATIONS FROM THE MPA FEDERAL ADVISORY COMMITTEE

Linking Ocean Observing Systems with the National System of MPAs (2008)

In November 2008, the MPA Federal Advisory Committee (MPA FAC) sent recommendations to the DOI and DOC regarding *Linking Ocean Observing Systems with the National System of Marine Protected Areas* (recommendations available on http://mpa.gov). These recommendations included:

- *Establish a strong linkage between the National System of MPAs and the IOOS by:*
  - *determining the information requirements of MPA managers;*
  - *promoting the development of biological observing technology to meet the needs of MPAs;*
  - *enhancing data integration, standardization and accessibility;*
  - *integrating MPAs as reference sites into the IOOS; and*
  - *developing and disseminating key data, information and decision support products to ensure effective MPA management and enhance stakeholder education.*
- *Create an interagency working group to enhance cooperation between the National System of MPAs and the IOOS.*
- *Increase and stabilize funding for integrated monitoring by the IOOS and the National System of MPAs.*

Climate Change in the Ocean (2010)

In April 2010, the MPA FAC sent additional recommendations regarding Climate Change in the Ocean and its potential impact on MPAs (see http://www.mpa.gov/pdf/helpful-resources/mpafac_tor_doi_5-3-10-1.pdf) to DOI and DOC. The MPA FAC's recommendations highlight the importance of MPAs in addressing climate change. In the face of climate change, MPAs can help to maintain and restore ecological resilience and the capacity to provide ecological goods and services. The recommendations specifically recognize that MPAs, networks of MPAs and the national system have an important role to play regarding the

increased uncertainty around the responses of marine organisms and ecosystems to the effects of climate change in the ocean. Implications and recommendations for the national system of MPAs are to:

1. *Design MPAs, MPA networks, and the national system of MPAs to be as ecologically resilient as practicable to the impacts of climate change*:
    - MPAs can be used individually or as part of an integrated system to achieve one or more of the following objectives: reducing non-climate stresses; protecting the least exposed; protecting the most resistant and adaptable; protecting the most valuable; protecting resilient populations; making MPAs dynamic; maintaining connectivity; and spreading risk; and
2. *Evaluate and adaptively manage MPAs, MPA networks, and the national system of MPAs in response to climate change*:
    - MPA managing agencies need to build capacity in MPA monitoring and evaluation, scientific knowledge, ecosystem characterization, and flexible governance to provide MPA managers with the capacity to use adaptive management to modify MPAs when appropriate. Key elements include: monitoring and evaluation, predictive capabilities, agency coordination and governance, education and public engagement, policy action thresholds, ecosystem characterization, and targeted scientific research.

B. MPA/IOOS TASK TEAM CHARGE

Based on the recommendations of the FAC and insights from the Interagency Working Group on Climate Change, the MPA Center developed a charge (Appendix A) to focus the work of the Task Team to:

1. *Identify the end user products the MPA managers will need to be able to determine if the MPA & MPA networks are operating as designed.*
2. *Identify key environmental parameters and processes that would be most important to MPA managers to enhance understanding of dynamic marine ecosystems and ecosystem health;*
3. *Recommend steps to explore with the Climate Reference Network (CRN) program about the addition of marine sites.*

C. NATIONAL SYSTEM OF MPAS

On May 26, 2000, through Executive Order 13158, President Clinton instructed the Department of Commerce and the Department of the Interior, in consultation with other pertinent federal agencies, to:

"Develop and implement a scientifically based, comprehensive national system of MPAs representing diverse U.S. marine ecosystems, and the Nation's natural and cultural resources"

The national system of MPAs was established in 2008. The national system is science-based, inclusive of all MPA programs (state, federal, territorial, and tribal), and a coordinating

mechanism for all voluntary MPA partners. The national system strengthens the management, protection, and conservation of existing MPAs, newly established or expanded MPAs; and is implemented at the national, regional and site scales through MPA programs.

The goals of the national system are to conserve and manage:

- Natural Heritage – the nation's biological communities, habitats, ecosystems, and processes; and the ecological services, values and uses they provide;
- Cultural Heritage – cultural resources that reflect the nation's maritime history and traditional cultural connections to the sea, as well as the uses and values they provide; and
- Sustainable Production – the nation's renewable living resources and their habitats (including, but not limited to, spawning, mating, and nursery grounds and areas established to minimize bycatch of species) and the social, cultural and economic values and services they provide

The national system is currently composed of 297 MPA sites; with representation of federal MPA programs in 30 states and territories including 12 National Marine Sanctuaries (NMS), 29 National Parks, and 106 National Wildlife Refuges (NWR). Eleven states are partners, including American Samoa, California, Florida, Hawaii, Maryland, Massachusetts, New Jersey, Puerto Rico, U.S. Virgin Islands, Virginia and Washington. In addition, several partnership sites managed by federal and state agencies are members, including the Papahanaumokuakea Marine National Monument and five National Estuarine Research Reserves (NERRS).

D. UNITED STATES (U.S) INTEGRATED OCEAN OBSERVING SYSTEM (IOOS®)

The U.S. IOOS is a coordinated national and international network of observations and telemetry elements, data management and communications elements, and data analyses and modeling elements that systematically and efficiently acquire and disseminate data and information on the past, present, and future state of the oceans and U.S. coastal waters to the head of the ocean tide.

The IOOS represents a national consortium of governmental (17 federal agencies participating) and nongovernmental stakeholders with specific interest in marine environmental phenomena occurring in the open ocean, U.S. coastal waters, and the Great Lakes. The core mission of the IOOS is to provide and ready access to marine environmental data and data products in an interoperable, reliable, timely, and user-specified manner to end users/customers in order to serve seven critical societal needs:

- Improve predictions of climate change and weather, and their effects on coastal communities and the nation
- Improve the safety and efficiency of maritime operations
- More effectively mitigate the effects of natural hazards
- Improve national and homeland security
- Reduce public health risks

- More effectively protect and restore healthy coastal ecosystems
- Enable the sustained use of ocean and coastal resources

The U.S. IOOS is composed of 11 regional associations (RAs) that are coordinated through the U.S. National Federation of Regional Associations (NFRA). The geographic boundaries of the RAs are determined by the major biogeographical flora and fauna boundaries (e.g., Cape Cod, Point Conception) and Large Marine Ecosystem (LME) provinces. In addition to the 11 RAs, the Alliance for Coastal Technologies program also helps to support the development and implementation of IOOS.

E. EXISTING U.S. IOOS CAPABILITIES AND DATABASES

Within IOOS there are three subsystems: Observations, Modeling and Analysis, and Data Management.

- Observations: IOOS Observations subsystem includes 26 IOOS core variables (Table 1), five of which are biological variables (indicated with *). IOOS strives to improve access to and use of existing ocean observation data and information (real-time and delayed). IOOS works toward the interoperability of the variety of ocean observing assets distributed around the nation. Some of these assets include gliders, buoys, and HF radar stations that are important in assessing water mass movement; and associated ocean currents.
- Modeling and Analysis: Each of the 11 RAs has unique capabilities that IOOS can leverage, such as harmful algal bloom, larval transport and coastal inundation monitoring information and models.
- Data Management: IOOS hosts a data catalogue that includes existing IOOS observing assets and real-time data collected by Federal Agencies. This data catalogue will continue to expand over time to include additional IOOS assets expanding into a more detailed level of information made available through the RAs.

IOOS has a number of partnerships with federal agencies and groups including relationships with the National Science Foundation's Ocean Observatories Initiative (OOI) that focuses on the existing and innovative observing sciences. In addition to the above, IOOS maintains important management, scientific and technical relationships and interactions with the International Global Ocean Observing System (GOOS) and Global Earth Observation System of Systems (GEOSS).

Table 1: IOOS® CORE VARIABLES	
Temperature	Bathymetry
Salinity	Ice Distribution
Water Level	Contaminants
Currents	Stream Flow
Surface Waves	Dissolved Nutrients
Surface Winds	Optical Properties
Ocean Color	Total Suspended Matter
Dissolved Oxygen	Colored Dissolved Organic Matter
pH	Fish Species*
pCO2	Fish Abundance*
Heat Flux	Zooplankton Species*
Bottom Character	Phytoplankton Species*
Pathogens	Zooplankton Abundance*

F. EXISTING MONITORING EFFORTS

System-wide monitoring efforts and/or IOOS activities occur at a variety of scales within and outside selected U.S. MPAs. Examples of some of these national monitoring efforts are included for the NERR, NMS, NWR, and National Parks Service (NPS) programs. Often, there are regional-scale monitoring efforts that have been formed by the assistance of the IOOS RAs. . In many cases there are locally relevant monitoring activities such as water quality monitoring programs (e.g., beach monitoring; National Pollutant Discharge Elimination System (NPEDES) monitoring, dredged materials disposal site monitoring, and National Coastal Assessment monitoring that can provide useful information to the regional and national scale ocean monitoring or observing programs.

NATIONAL SCALE MPA MONITORING

National Estuarine Research Reserves System (NERRS)

The NERRS has established a System-Wide Monitoring Program (SWMP) to identify and track short-term variability and long-term change across our nation's estuaries in a routinized and systematic fashion (http://nerrs.noaa.gov/RCDefault.aspx?ID=18). SWMP data are collected using standardized approaches across the program, and data collection is designed to provide a high degree of spatial coverage and temporal resolution. As a robust, long term, and versatile monitoring program SWMP is intended to have the capacity to address a comprehensive suite of coastal management issues to improve understanding and inform decisions affecting estuaries and coastal watersheds. Data from SWMP's operational core elements are collected, managed, and served by the NERRS Centralized Data Management Office (CDMO). The CDMO ensures that SWMP data has a high level of quality assurance, is of high quality, and is easily accessible on a public website. This monitoring infrastructure creates the foundation of a NERRS sentinel site network for understanding anthropogenic and other climate-based impacts on coastal ecosystems and communities.

SWMP monitoring activities are grouped into "toolkits" according to data type and data product as follows:

- Abiotic – standard protocols, parameters, and approaches that describe the physical environment including weather, water quality, hydrological, and sediment related parameters;
- Biotic – standard protocols, parameters, and approaches that describe biological communities, including estuarine vegetated habitats, benthos, plankton, nekton, and birds;
- Mapping – standard protocols, parameters, and approaches that establish spatial reference frames to national geodetic networks for reserve and watershed-scale spatial data products;
- Data Analysis and Synthesis – standard protocols and approaches that provide a means of analyzing and interpreting SWMP data and placing it in the context of specific and relevant coastal management issues;
- Translation and Education– common approaches for communicating SWMP data and products to a wide variety of audiences, including independent researchers, reserve scientists, educators, recreational visitors, and coastal decision makers.

Since a primary function of SWMP is the collection and analysis of long-term data that have relevance to management issues and can improve understanding and inform decisions affecting estuaries and coastal watersheds, SWMP is designed to address the following three questions:

- How do environmental conditions vary through space and time within the network of NERRS sites?
- How does ecosystem function vary through space and time within critical NERRS habitats?
- To what extent are changes in estuarine ecosystems represented by the NERRS attributable to natural variability versus anthropogenic activity?

In addition to national priorities, the SWMP goals and objectives reflect issues of regional and site-specific concern. To address these issues, individual reserves can articulate specific objectives in their five year Management Plans, and can include strategies to address local or regional issues through standardized monitoring activities that go beyond implementation of SWMP itself. These "elective elements" may be implemented as needed, and although they may not receive national support, they have standardized approaches and protocols. By utilizing standardized elective elements for issues of local relevance, the NERRS ensures that data and information relating to environmental conditions and impacts are comparable across multiple ecosystem types and spatial scales.

National Marine Sanctuaries (NMS)

Marine sanctuaries support and facilitate research and monitoring on climate change, contaminants, productivity, habitat change, biodiversity, invasive species, keystone and focal species, and human impacts (e.g., noise). Conservation science activities in sanctuaries strive to improve ecosystem understanding using on-going field studies as well as historical ecology. Much of this work depends on partner input and community involvement. The sanctuary program is currently developing sentinel sites as part of its system-wide monitoring program for all sanctuaries. These areas within Sanctuaries will provide sustained observations for the purpose of monitoring ecosystem integrity. They will also provide early warning of environmental perturbations (natural and anthropogenic). The key elements of the sanctuary sentinel sites concept include infrastructure of the sentinel sites, web accessibility to monitoring data and other environmental information, and contributions of information for the development and publication of periodic "condition" reports. To develop the reports, subject experts are asked to rate conditions and trends relative to 17 questions at each sanctuary, most of which are specific to water, habitat, and living resource quality. These reports help inform management decisions and support management plan development. Both sentinel sites and the approach to monitoring in sanctuaries provide for consistency in design and reporting, and are tailored to local requirements for tracking resource and human use trends.

National Wildlife Refuges (NWR)

The U.S. Fish and Wildlife Service (USFWS) has many responsibilities in ocean and coastal habitats including large populations of migratory seabirds and shorebirds, endangered species, marine mammals, and national wildlife refuges. The NWR System includes 180 ocean and coastal protected areas that span the entire geographic range of the U.S. including the Caribbean, the Arctic, and the remote Pacific Ocean. Because they are managed for the primary purpose of conserving wildlife and habitat, NWRs serve as important natural laboratories for studying the effects of climate change and ocean acidification in the absence of other major human disturbances. The NWR System's Inventory and Monitoring Program is a component of the National Biological Inventory and Monitoring Partnership for the USFWS. The purpose of this effort is to collect and synthesize information which supports management at multiple geographic scales and informs decisions at all organizational levels. The Inventory and Monitoring program is designed to address the Refuge System's mission critical information needs, and to help plan and evaluate the effectiveness of conservation strategies implemented by the USFWS and conservation partners in the face of accelerating climate change and growing threats from other environmental stressors.

National Park Service (NPS)

The National Park Service is entrusted with managing 84 ocean and Great Lakes parks across 26 states and territories. These parks conserve over 12,500 miles of coast and 2.4 million acres of ocean and Great Lakes waters. NPS has adopted strategies to enhance the agency's organizational and scientific capacity to understand and conserve ocean and coastal park resources with state and federal agencies and local organizations. The NPS conducts assessments of submerged maritime historic and cultural resources, and assessments of coastal watersheds and water resource conditions. The NPS also conducts long-term monitoring of

marine ecosystems within its jurisdiction and maintains inventories of natural resources. The NPS Inventory and Monitoring Program provides a set of 12 baseline natural resource inventories on National Parks, which include presence, class, distribution, and status of biological resources such as plants and animals, and abiotic resources such as air, water, soils, and climate in certain coastal and estuarine locations. The NPS Inventory and Monitoring Vital Signs Monitoring Program measures physical and biological indicators of ecosystem condition across networks of parks in bioregions.

REGIONAL SCALE MONITORING

Partnership for Interdisciplinary Studies of Coastal Oceans (PISCO)

The Partnership for Interdisciplinary Studies of Coastal Oceans (PISCO) (http://www.piscoweb.org/) nearshore coastal monitoring program conducted in the California Current LME is an example of a regional level monitoring effort. PISCO is a long-term ecosystem research and monitoring program established with the goals of:

- understanding dynamics of the coastal ocean ecosystem along the U.S. west coast
- sharing that knowledge so ocean managers and policy makers can take science-based decisions regarding coastal and marine stewardship; and
- producing a new generation of scientists trained in interdisciplinary collaborative approaches

The program integrates studies of changes in the ocean environment through ecological monitoring and experiments. Scientists examine the causes and consequences of ecosystem changes over spatial scales that are the most relevant to marine species and management, but largely unstudied elsewhere.

Regional Associations (RAs) of U.S. IOOS

The IOOS RAs maintain spatial data portals of the ocean observing and monitoring efforts within their area. The IOOS Program Office within NOAA is in the process of linking the RAs data to the emerging capabilities of a central IOOS Data Catalogue http://www.ioos.gov/catalog. The Central and Northern California Ocean Observing System (CeNCOOS) and Northeastern Regional Association of Coastal Ocean Observing Systems (NERACOOS) are two of the 11 geographically distinct RAs that comprise the coastal ocean component of IOOS. The NFRA represents, advocates for and helps coordinate the RAs (http://www.usnfra.org/). NFRA completed a report titled *Providing Coastal Information in a Changing Climate* available at http://www.usnfra.org/documents/03.10_RCBooklet_lo-res.pdf.

CeNCOOS **(**http://cencoos.org/) uses various physical, biological and chemical sensing technologies to add to our knowledge of changing ocean conditions and to enhance coastal management, allowing for more informed decision-making. The geographic extent of CeNCOOS includes the region from Point Conception north to the California-Oregon border and from the coastline out to 200 nautical miles (the seaward extent of the U.S. Exclusive Economic Zone). CeNCOOS includes bays and estuaries in this region. In 2008, CeNCOOS completed a document effort titled *Communicating for Conservation: Potential Ocean Indicators and Information Products for Evaluating MPA Success*

(http://www.cencoos.org/sections/about/Observing_MPAs_Report.html). Additionally, CeNCOOS maintains a number of instruments, data tools and web-based products aimed at providing coastal and ocean information for improved short and long-term management and decision-making.

NERACOOS (http://neracoos.org/) spans coastal waters from the Canadian Maritime Provinces of New Brunswick and Nova Scotia to the New York Bight. Weather and ocean data are provided to fishers and commercial shippers determining if conditions are safe for passage and to emergency managers issuing storm warnings. NERACOOS is also working to distribute data for water quality monitoring, harmful algal bloom predictions and warnings, and coastal flooding and erosion forecasting systems. NERACOOS maintains a number of tools including an online mapping tool that displays real-time observations from buoys and monitoring stations in the Northeast region. The Northeast Coastal Ocean Forecast System (NeCOFS) daily provides three day forecasts of conditions above, at, and below the surface of the regions waters.

G. EXISTING EFFORTS EXAMINING MARINE PARAMETERS FOR MONITORING

During the past decade, some seminal documents have been completed to determine the number and type of estuarine, marine, and open ocean "parameters" that could be used to monitor the ocean environment. Below is a brief description of some of these documents.

- Building Consensus: Toward an Integrated and Sustained Ocean Observing System (2002): http://www.ocean.us/documents/docs/Core_lores.pdf . This workshop was held to determine IOOS's list of requisite "Core Variables" (or "Parameters") that could be monitored by its "backbone's" monitoring programs.
- First U.S. IOOS Development Report (2006): http://www.ocean.us/documents/docs/IOOSDevPlan_low-res.pdf . This report includes priority variables and IOOS societal goals and their relevance to one another.
- Public Health Risks: Coastal Observations for Decision Making (2006): http://www.ocean.us/system/files/PH_Final_LOW-res.pdf
- Embracing the Full Spectrum of IOOS Environmental Information for Maritime Domain Awareness (2007): http://www.ocean.us/system/files/MDA_Proceedings_lowres.pdf Includes Variables for "Port" Security and IOOS Core Variables and the relationships to Federal Programs.
- The Integrated Ocean Observing System (IOOS) Modeling and Analysis Workshop Report (2008): http://www.ocean.us/files/MAST_Report_2008.pdf
- National Water Quality Monitoring Network (NWQMN) (2006): http://acwi.gov/monitoring/network/
    - Network Design Features http://acwi.gov/monitoring/network/network_features.html
    - Complete Report http://www.acwi.gov/monitoring/network/design/Entire_Report_v18_060506.doc
- U.S. Environmental Protection Agency's (EPA) National Coastal Condition Report (NCCR)III (2008):

- Fact Sheet: http://www.epa.gov/owow/oceans/nccr3/pdf/nccr3-factsheet.pdf
- Full Report: http://www.epa.gov/owow/oceans/nccr3/pdf/nccr3_entire.pdf

H. EXISTING LINKAGES BETWEEN MPAS AND IOOS

There are several programmatic intersections between IOOS and the national system programs. Both have national scale programs in fairly early stages of development. IOOS has 11 RAs that include MPAs within their boundaries. Some national systems MPAs have IOOS assets within their boundaries. The national system facilitates a process for identifying shared priorities and objectives between member MPAs at different regional levels to affectively achieve broader ecosystem-based management goals. Regional planning provides an opportunity to address connectivity for many different marine organisms at different spatial scales. Three of the seven IOOS societal goals are relevant to the national system including:

- Protect and restore healthy coastal ecosystems;
- Enable sustain use of ocean and coastal resources; and
- Improve climate change predictions and their effects

The Task Team identified some existing linkages between the RAs and MPA sites. Refer to the Section on *Task Team Activities* (page 17) for more information about existing linkages between MPAs and IOOS RAs.

Areas of common interest between the national system and IOOS are to protect and restore healthy coastal ecosystems more effectively; to enable the sustained use of ocean and coastal resources; and to improve predictions of climate change and weather and their effects on coastal communities and the nation.

IV. TASK TEAM PROCESS

A. MPA/IOOS TASK TEAM ORGANIZATION AND WORK PLAN

The Task Team worked for approximately one year to complete its tasks, including conference calls, a two-day science and technical workshop, and a one-day in-person meeting. The Task Team was composed of government agency individuals and two IOOS RAs representatives who can assist in accomplishing the charge (Appendix B, for Task Team Membership).

The science and technical workshop (August 31-September 1, 2010) was held to gather a variety of experts and stakeholders that could broaden the scope of information that would be used by this Task Team to develop its products. Expertise present at the workshop covered the areas of MPA design and planning, ocean observing and monitoring and included MPA FAC representatives from the Scientific and Technical Subcommittee.

The Task Team considered how the national system can link to IOOS and how MPAs can be used as platforms for monitoring to enhance our understanding of the dynamics of marine ecosystems. Each MPA is managed under its own legal and regulatory authorities. The Task Team aimed to identify ambitious recommendations that require capacity that may be built out

over time, as well as considering short-term opportunities within current and expected budget constraints. For example, the environmental parameters should be selected based on importance and need, but should be prioritized with consideration of costs and other constraints.

In addition to this report and its recommendations, the Task Team produced a draft monitoring concept (included in this report under the Task Team Activities section on pp. 21), and identified important RA linkages with MPAs.

V. TASK TEAM ACTIVITIES

A. MPA/IOOS TASK TEAM DISCUSSION

Initially the Task Team discussed insights about the creation of a sentinel sites monitoring effort by taking an issue or a sentinel site-type approach and suggest recommendations toward the development of a monitoring effort across all place types. Some insights included: developing a list of monitoring parameters; developing recommendations on end user products; and developing recommendations on the value of the expansion of CRN that the Task Team believes will be appropriate for MPA monitoring programs.

Task Team members and MPA Center staff developed and discussed an initial compilation of existing efforts (Refer to the "Policy and Program Context" " section for more information), a compilation of RA observation and monitoring products, and an update of the IOOS Catalogue that contains observations and monitoring information and assets (http://www.ioos.gov/catalog/). The IOOS Catalogue may provide an approximation of all assets across regions. All of the RAs have the capability to display real-time data and provide a metadata inventory, access to real-time and various historical data through a web portal, nutrient tracking and a harmful algal bloom tool, and most have real-time surface currents displayed. A list of products highlighted at an IOOS workshop in May 2010, can be found at http://www.usnfra.org/products.html . The RAs have a number of products that may be helpful to MPAs (see Table 2).

During additional discussions the Task Team decided to focus on parameters that would be useful across all types of MPA sites.

Table 2: IOOS Products Identified as Potentially Helpful to MPAs

PRODUCT	PURPOSE	GEOGRAPHICS	LINK	NOTES
Drifter Tool using Real-time Ocean Monitoring System (ROMS) Model	Predict the path of an object you place in the water. Drop-n drifters.	AOOS (Alaska Ocean Observing System); SCCOOS (Southern California Coastal Ocean Observing System)	http://ourocean.jpl.nasa.gov/PWS09/mangen_s.jsp ; http://cencoos.jpl.nasa.gov/CENCOOS/scbmangen.jsp	ROMS model will be available for the entire west coast. The drifter capability will be available wherever there is ROMS.
Drifter Product using High Frequency Radar (HFR)	Particle trajectory	CeNCOOS (Central and Northern California Ocean Observing System)	http://www.cencoos.org/sections/conditions/CENCAL_currents/mb_node_drift.shtml	Hindcasts and Forecasts Available
Trajectory Model	Particle trajectory	PacIOOS (Pacific Islands Integrated Ocean Observing System)	http://oos.soest.hawaii.edu/google_maps/trajk2.html	
Automated Identification System (AIS) Ship Tracker	Identification of ships, their path and desination.	CaRA (Caribbean Regional Association); CeNCOOS	http://www.caricoos.org/drupal/node/98 ; http://www.cencoos.org/sections/ais/aismap.shtml	Requested by Sanctuaries
Climatologies	Comparison of present to historical data. T, salinity	CeNCOOS	http://www.mbari.org/bog/Projects/MOOS/M1.html	Monterey Bay Time Series; GCOOS has one in beta-type mode
Observations and MPAs	Interactive pdf of observing activities	CeNCOOS	http://www.cencoos.org/documents/products/Map_of_Ocean_Observing_in_Central_Coast_MPAs_lo.pdf	Central CA MPAs ; made specifically for MPAs

Table 2 (cont.): IOOS Products Identified as Potentially Helpful to MPAs

PRODUCT	PURPOSE	GEOGRAPHICS	LINK	NOTES
Marine Larval Transport Models	Tracking Larvae using HFR	CeNCOOS/SCCOOS	http://www.cencoos.org/documents/products/Zelenke_OS_09_MTS_IEEE.pdf ; http://southcoast.marinemap.org/marinemap/	Made specifically for MPAs. In Marine Map for Marine Life Protection Act (MLPA), marine spatial planning (MSP).
Glider Transects	Subsurface oceanographic conditions along glider track	CeNCOOS	http://www.cencoos.org/sections/data/glider/index.html	Some gliders continuous; some periodic. SCCOOS to have similar product out soon.
Satellite sea surface temperature (SST) and Chlorophyll (CHL)	Real-time and composite images for comparison; zoom capability	CeNCOOS	http://www.cencoos.org/sections/conditions/SST_Chl.shtml	Capability of overlaying surface currents
Plume Tracking	Tracking plume/path from river discharge	SCCOOS	http://www.sccoos.org/data/tracking/IB/	Good for nearshore MPA, Areas of Special Biological Significance (ASBS)
MSP and Marine Map	Marine Transportation Marine Larval Transport Map and Model Viewer	SCCOOS OOS (Ocean Observing System) NERACOOS (Northeastern Regional Association of Coastal Ocean Observing Systems)	http://www.sccoos.org/data/harbors/lalb/fullscreen.php http://southcoast.marinemap.org/marinemap/ http://www.neracoos.org/products/wms/#	Overlay of multiple layers. San Diego and San Francisco too. In Marine Map. Many political, regulator and marine layers.

In June, 2010, Task Team staff attended the national system Partners Retreat to present on the Task Team process. The National System partners were provided with an opportunity to ask questions and to participate in future inquiries regarding the review of materials that this group produces. A list of questions was prepared to present to the managers (below), but time was not available to share them at the time of this meeting. It was suggested that another follow-up mechanism be created to obtain feedback from the managers.

Questions to the National System of MPA Partners

1. **Why was your MPA developed (e.g., sustainable fisheries, natural heritage, cultural heritage, and so on)?;**
2. **What are the "resources" (e.g., biological, geological, physical (habitat), fisheries, recreation, chemical) that you are trying to protect, sustain, or restore through the MPA(s)?;**
3. **What monitoring and assessment metrics, measurements, variables, or parameters do MPA managers believe are the most important for monitoring the effectiveness of the MPA(s) you manage to ensure that the MPA "resources" are being protected, sustained, or restored over time?; and**
4. **How would the MPA managers use climate change information if it could be delivered to them?**

During a conference call in July, 2010, the Task Team discussed two national monitoring efforts developing the concept of sentinel sites --- NERRS and NMS (see section F. Existing Monitoring Efforts). In addition biological parameters are specifically highlighted by the Task Team as a requirement for monitoring within and outside MPAs. It was noted that biological monitoring in the marine environment is much more costly and labor intensive and thus has not been conducted as consistently or extensively as the physical and geological oceanographic parameters nor has it been incorporated in as much detail into the IOOS at present. The Task Team was asked to focus on developing ideal monitoring program recommendations in order to build additional capacity over time while considering opportunities in the short-term with the consideration of budget constraints. Biological and ecosystem indicators should be selected based on their importance for informing management decisions, and then prioritized based on practical considerations including cost. The Task Team drafted a monitoring concept approach and purpose (see box on p. 19).

Monitoring Concept Approach and Purpose Statement Drafted by the Task Team

The purpose of the monitoring concept from the MPA/IOOS Task Team is to provide ecosystem-based management recommendations to MPA managers to assist with adaptive management and the design of MPAs.

The goal of the monitoring concept is to assist in: the assessment of resource changes in response to natural and anthropogenic factors, the changes in environmental patterns and variation over multiple scales, and development of a common or standardized set of parameters to assist in understanding and monitoring marine ecosystems and their resources.

The MPA/IOOS Task Team considered how MPAs could be used as platforms for monitoring to enhance the understanding of the dynamics of marine ecosystems via the creation of a linkage to the ocean observation world through IOOS. The next step is to identify parameters to monitor environmental changes and ecosystem characteristics across Natural Heritage, Sustainable Production and Cultural Heritage MPAs.

The aims of the recommended sentinel parameters would be to help MPA managers address needs within areas of monitoring ad assessment of their MPAs. Specifically, the parameters should help managers assess environmental changes, perturbations and condition assessments; provide some further understanding of ecosystem characteristics and biodiversity; help to enhance resource sustainability and conservation; and to help support specific populations of species. Ideally, the parameters recommended will expand the range of biological parameters currently monitored by ocean observing assets. The parameters should be monitored across the three types of MPAs in a standardized product to facilitate protection and understanding of marine ecosystems.

B. LINKAGES BETWEEN MPAS AND IOOS' REGIONAL ASSOCIATIONS

In August 2010, IOOS Regional Associations (RAs) were contacted by email to complete a survey (Appendix C) to identify general linkages that already exist between MPAs and RAs. The MPA Center on behalf of the Task Team sent a general survey to the 11 RAs. Nine of the 11 responded to the inquiry. Most of the respondents were aware of some MPAs in their region and are beginning to build relationships with managing agencies. Relationships with federal managing agencies dominate with some RAs building state agency level relationships. The types of relationships vary with multiple MPAs in RAs. Data portal access is common. Some have formal relationships in the form of signatories on Memorandum of Understandings (MOUs) and some relationships are developing products together.

C. MPA/IOOS TASK TEAM PRODUCTS AND PARAMETERS

MPA/IOOS TASK TEAM EXPERT WORKSHOP

In late August /early September, 2010, the National Oceanic and Atmospheric Administration's (NOAA) MPA Center hosted an expert's workshop Monterey, California, for the Task Team (Agenda in Appendix D). Twenty-four individuals attended or participated via teleconference at the workshop. Participants included individuals from the MPA Center, IOOS, the Task Team, the MPA FAC, experts in MPA planning, monitoring and design, MPA managers, RAs, state, federal and tribal expertise.

The purpose of the workshop was to solicit input and feedback from experts about:

- an initial draft set of key environmental parameters and processes that would be most important to MPA managers to enhance understanding of dynamic marine ecosystems and ecosystem health,
- recommendations toward the value of expanding the CRN by including marine sites, and
- recommendations for end user products that MPA managers may need to be able to determine if MPAs and MPA networks are operating as designed.

The Task Team gained insight into ocean monitoring parameters and/or processes that should be considered in monitoring MPAs for impacts of climate change and received several points of considerations and recommendations during the workshop. In addition, several product ideas were discussed and generally fleshed out. These parameters and products are briefly listed below and are further discussed in the discussion section of this report and the templates created for the products from information gathered at the workshop are located in Appendix E.

Important parameters for monitoring climate change impacts discussed by experts were (*indicates key Monitoring Variables for Climate Change Impacts that may not be being collected by IOOS):

- Temperature
- Salinity
- *Ocean Acidification (pH vs. Carbon Dioxide partial pressure (pCO2) – there is a division between the two)
- Waves
- *Focal species/resource (including cultural heritage 'resources', species ranges & composition, phenology [how animal areas are shifting e.g., Humboldt squid; seabirds])
- Chlorophyll a
- Dissolved Oxygen
- Sea Level
- Currents (regions have their own associations with the modeling community)
- Fronts
- *Human pressures/impacts/health indicators

- *Socioeconomic /human interest/economic measures
- *Species composition
- * Habitat migration/change /movement/distribution (abiotic & biotic);
- Shoreline change (coastal processes)
- *Ecosystem processes
- Atmospheric variables (general CRNs) - barometric pressure, precipitation…
- Watershed variables (what would these be and what is IOOS currently monitoring
- Hydrology
- Climate variables (fog, coastal forest)

Possible Products to Be Developed

The workshop participants generated the following list of products that could be developed. Those identified with an asterisk have had draft templates developed (located in Appendix E) that could be used to move product development forward.

- *Data Information Sharing (Discovery) Portal
- *Communication Strategy Between the National System of MPAs and IOOS Regional Associations
    - Defined/formalized relationship between RAs and national system
- *Periodic Regional Assessment
    - Regional scale climatologies
    - Looking at trends in oceanographic conditions
- *Explore the expansion of the CRN to coastal/marine sites
    - Sentinel sites monitoring for climate change
- Targeted IOOS products for MPA management
    - Identify feedback loop with managers
- Report cards for MPA status and trends
    - Seasonal and annual variability and oscillation. Shorter and longer term.
- Developing toolkits for monitoring MPAs similar to those developed by the NERRS.
- *Demonstrating New technologies
- Development of conceptual products that link MPAs
- *Understanding through outreach and training. MPA Center and IOOS/RAs working together.
- MPA University (providing training to MPA managers). Working with National Conservation Training Center
- Sea Level Hazard. Fine-scale Map
- Delivery of Real-time data to recreational shellfish harvest

Workshop participants expressed support for using MPAs as platforms for ocean monitoring with the understanding that it is important to know what is happening inside as well as outside of MPAs. In addition, participants agreed that it is appropriate to use MPAs to monitor impacts of climate change and provided several recommendations toward key environmental

parameters and products. Experts highlighted the need to explore, create linkages between and expand upon current monitoring and parameters already in place. In addition to receiving valuable recommendations and considerations, an additional benefit of this workshop was exploring linkages between the national system and the IOOS to identify ideas for strengthening and expanding linkages with common goals and strategies. The Task Team provides short-term and long-term recommendations for expanding and strengthening these linkages in the discussion and recommendations section.

Prior to the Task Team's effort and more specifically the expert's workshop, the view on the existing linkages between the national system and IOOS was very simplistic. Following these efforts, the Task Team gained a better understanding of the potential value in expanding the linkages between these two systems (Figure 2).

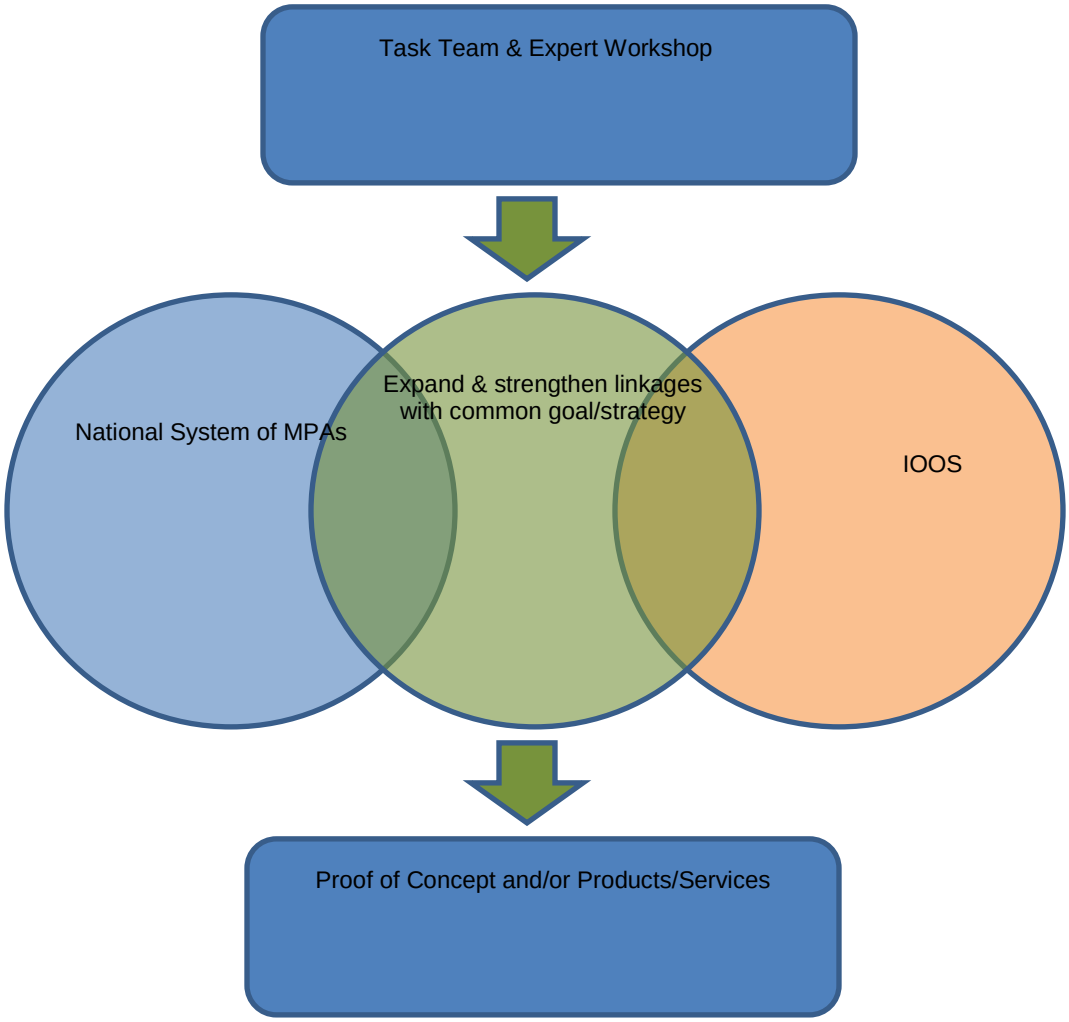


Figure 2: Post-workshop view of the MPA/IOOS Task Team regarding potential to expand and strengthen linkages between the the National System of MPAs (national system) and the Integrated Ocean Observing System (IOOS). The Task Team has provided recommendations of a proof of concept and/or product or service to help create this strengthened linkage in this report.

VI. TASK TEAM FINAL RECOMMENDATIONS

This section contains the final recommendations of the Task Team based on the efforts summarized above.

Recommendations:

Identifying Key End User Products Needed by MPA Managers:

- Use the linkages between the MPA Center, its National System of MPAs, and IOOS to identify efficient and effective ways to monitor MPAs for impacts of climate change.
- Use the MPA Center as the main point of contact between the national system partners and the Regional Associations (RAs) and IOOS, since the MPA Center operates as a cross–program and cross-agency lead collaborator. This role would help strengthen the linkages between the IOOS and/or its RAs and MPA managers. Some collaborations exist between RAs and MPAs in their region, but a common communication framework can help strengthen partnerships.
- Develop a national scale sentinel site monitoring effort across MPA programs. Drawing upon some existing efforts by the National Estuarine Research Reserves (NERRS), the National Marine Sanctuaries (NMS), and other programs, a national scale sentinel site monitoring program should be developed through expansion to other MPA programs, and by including all types of MPAs as defined in the U.S. MPA Classification System by the MPA Center http://www.mpa.gov[2].
- Refine the list of key parameters important for monitoring for impacts of climate change on MPAs developed at the experts' workshop (see pp. 22-23).
- Seek input from the national system partners to help refine the development of a national scale sentinel site monitoring effort, by providing information on needs, existing assets, mechanisms for climate change information, or other issues (see page 20). In addition, MPA managers may provide information to assess the monitoring needs of their MPAs and their relationships with IOOS monitoring programs.
- Focus linkages between the MPA Center and IOOS on monitoring MPAs for impacts of climate change. Understanding climate change variables inside an MPA may help managers identify the impacts of other stressors (e.g., fishing, habitat destruction, pollution, and invasive species).

Identify key environmental parameters and processes most important to MPA managers to enhance understanding of dynamic marine ecosystems and ecosystem health

- Identifying essential parameters to include in a national sentinel site MPA monitoring approach for monitoring for impacts of climate change within MPAs. This should be a short list that are relevant across all MPA site types and that can be monitored at a regional/national scale.
- Identifying key parameters for monitoring climate change, and whether these are being collected by IOOS or other existing efforts.

[2] The MPA Classification System uses five key functional characteristics (Conservation Focus, Level of Protection, Permanence of Protection, Constancy of Protection, and Ecological Scale of Protection) to describe any MPA.

- Foster enhanced collaboration among RAs and MPAs in each region. A first step would be to assess current partnerships between RAs and MPAs.
- Assessing existing marine monitoring efforts at regional and national scales to identify any additional efforts that may be needed to support the national system of MPAs. Specific questions to be addressed include:
    - What are the priority monitoring needs of the national system of MPAs?
    - Can existing monitoring data address these needs?
    - Is MPA monitoring information being made available to other management and science programs? (IOOS has the tools to share the data, but data owners need to provide their data to IOOS.)
    - Are the physical parameters collected spanning all types of MPAs?
    - Are data collection methods comparable across different MPA programs?

Explore the idea of adding coastal and marine sites to the Climate Reference Network (CRN) program.

- Investigating existing monitoring capabilities and presence/ absence of monitoring assets inside and outside MPAs. Visual products to show where monitoring assets and MPAs are located would be a useful tool for identifying possible partnership opportunities for MPAs, IOOS, and RAs, as well as the identification of any monitoring gaps within or outside of MPAs.
- Capitalize on existing monitoring networks to find cost effective ways to enhance monitoring capabilities.
- Identify a range of measurements important to monitoring MPAs, recognizing a standard suite of measurements may not be feasible because the resources being managed are different at each MPA.

Use the attached product templates (Appendix E) to expand the linkages between the national system of MPAs and IOOS.

(1) *Exploration of Climate Reference (CRN) Sites to Coastal and Marine Protected Areas (MPAs)*
(2) Creating an *Information Discovery Portal*
(3) *Demonstration of Emerging Technologies*
(4) Develop a *Communication Strategy Between National System MPAs and IOOS Regional Associations*
(5) Work Collaboratively with *Outreach: Ocean Observing Systems and Marine Protected Areas*
(6) Complete a *Periodic Assessment of Marine Resources Within a Regional Area*

Finally, the Task Team recommends that a clear mechanism for communication be developed between the national system and the IOOS, including the establishment of a cross-program to continue efforts to foster linkages across MPA and monitoring programs. IOOS assets and capabilities could be leveraged to support national system MPA programs' inventory and monitoring objectives. These partnerships would be a cost effective use of federal resources.

VII. APPENDIX A

Charge to the National System of Marine Protected Areas and and Integrated Ocean Observation System Task Team
April 8, 2010

Background: Recommendations from the Marine Protected Areas Federal Advisory Committee

In November 2008, the Marine Protected Areas Federal Advisory Committee (MPA FAC) sent recommendations to the Departments of Interior and Commerce regarding *Linking Ocean Observing Systems with the National System of Marine Protected Areas* (recommendations available on http://mpa.gov). These recommendations include:

- Establish a strong linkage between the National System of MPAs (hereafter referred to as the national system) and the U.S. Integrated Ocean Observing System (IOOS®) by:
  - o determining the information requirements of MPA managers;
  - o promoting the development of biological observing technology to meet the needs of MPAs;
  - o enhancing data integration, standardization and accessibility;
  - o integrating MPAs as reference sites into the IOOS; and
  - o developing and disseminating key data, information and decision support products to ensure effective MPA management and enhance stakeholder education.
- Create an interagency working group to enhance cooperation between the national system and the IOOS.
- Increase and stabilize funding for integrated monitoring by the IOOS and the national system.

The creation of a short-term MPA/IOOS Task Team (hereafter referred to as the Task Team) is the first step in following up on these recommendations. The Task Team will operate with the overarching considerations of how the national system can link to the IOOS and how MPAs can be used as platforms for monitoring to enhance our understanding of the dynamics of marine ecosystems.

The Task Team will work on the following defined tasks that address recommendations from the MPA FAC and needs identified by MPA programs.

The Task Team should consider work conducted via teleconference, email or webinars and an in person, two day workshop as necessary to accomplish the tasks.

Tasks:

1. **Identify the end user products the MPA managers will need to be able to determine if the MPA & MPA networks are operating as designed.**

Recommend priorities for information and data to be gathered, synthesized and distributed by the IOOS and the Regional Associations (RAs) to MPA managers. What can be accomplished within current resource limitations?

Key questions:

- What are the information and data needs of MPA sites and managers?
- How best to synthesize/integrate the data? What is most useful?
- How best to deliver information to managers?
- Once we determine what the MPA sites/mangers need and how they want the information portrayed - What are the models and observations needed to provide this info and verify the info?
- How can the existing US IOOS DMAC effort be used to pilot such an effort?

Proposed Process/Product:
The Task Team could use the marine parameters described in Task 2 and produce a white paper on the development of an information delivery system for MPA managers.

2. **Identify key environmental parameters and processes that would be most important to MPA managers to enhance understanding of dynamic marine ecosystems and ecosystem health.**

Key questions:

- What are the specific physical, biological and/or chemical parameters and processes that managers need to monitor in and around their MPA?
- Identify the spatial, temporal and accuracy requirements.
- These should include parameters needed to support decisions related to planning for and adapting to climate change.

Proposed Process/Product:
Identify a straw man or sentinel approach to develop a prioritized list of key environmental parameters and processes that are important to MPA managers, their sites, and in understanding the dynamics of marine ecosystems. The Task Team should use the MPA FAC's recommendations on ocean observations systems, resilience and monitoring, and the national system of MPA managers to help produce this list. This list should be informed by a variety of stakeholder groups including those with expertise in ocean observing, monitoring, MPA planning and design through a workshop. This prioritized list should be vetted by key stakeholders in MPA managing agencies. This list would be used to inform the priorities of the national and regional observing systems and should include a national coastal layout to include expected cost information.

3. **Recommend steps to explore with the Climate Reference Network (CRN) program about the addition of marine sites.**

Recommend if it would be valuable to engage with the CRNs to explore expanding the CRNs to include marine sites and parameters to help managers better understand and adapt to climate change.

Key questions:

- Where (and at what resolution) should the key parameters (see #2 above) be measured? What is the methodology? Where are the gaps? What is the technology for the future?
- What does a marine climate reference station look like? How would the information be extended from the existing climate reference sites?
- How can long-term funding be gained for the uninterrupted, long-term monitoring of the parameters identified?
- What other recommendations are needed to move toward implementation?

Proposed Process/Product:
The Task Team would use the parameters identified in Task 2, along with the list of existing parameters collected in the terrestrial climate reference network to produce recommendations on exploring the CRNs to coastal and/or marine sites.

VIII. APPENDIX B

MPA/ IOOS Task Team Members

Agency or Organization	Member
NOAA's National Marine Protected Areas Center	Rondi Robison
Office of National Marine Sanctuaries (ONMS)	Catherine Marzin, Elizabeth Moore and Steve Gittings
NOAA's National Climatic Data Center	Karsten Shein
U.S. Fish and Wildlife Service (USFWS)	Bret Wolfe
Environmental Protection Agency (EPA)	Brian Melzian
Integrated Ocean Observing System (IOOS)	Charly Alexander
National Marine Fisheries Service (NMFS)	Robert Brock (MPA Center)
National Estuarine Research Reserves System (NERRS)	Whitley Saumweber and Dwight Trueblood
National Parks Service (NPS)	Thom Curdts
Central and Northern California Ocean Observing System (CeNCOOS)	Heather Kerkering
Northeastern Regional Association of Coastal Ocean Observing Systems (NeRACOOS)	Ru Morrison

IX. APPENDIX C

Survey to Integrated Ocean Observing System (IOOS®) Regional Associations (RA) on Local Marine Protected Area (MPA) Cooperation

This request is to generally document the current interactions between the RAs and MPAs for the National MPA/IOOS Task Team.

Date:
Regional Association:
Contact Name & Email:

General Questions & Descriptions:

1. Are you aware of all the MPAs[3] in your region? **Yes or No**

2. Do you have an existing working relationship with some or all MPAs through MPA managing agencies (e.g. federal, state, territorial, tribal, or local) or other connection in your region? **Yes or No**

3. If yes, do you have the same general type of working relationship with all MPAs in your region? e.g. providing service(s) data or other. Please describe the type of cooperation or working relationship with your local MPAs. e.g. my RA has an MOU with all three federal National Marine Sanctuaries (MPAs) in my region, or my RA provides a data portal to the state Department of Fish and Game MPAs in my region

4. Do the MPA managing agencies (e.g. National Marine Sanctuaries, U.S. Fish and Wildlife Service, State agencies, Non-Governmental Organizations (NGOs), etc.) in your region provide you with services or information? Please describe.

5. If you are only working with a subset of MPAs in your region can you provide their site names or groupings if easier? e.g. Stellwagon National Marine Sanctuary; all recently cited Marine Life Protected Area sites in California; National Estuarine Research Reserves; or all Florida State sites

List of projects/interactions or products/services (indicate if the MPA or the RA is providing the product/service), include attachments or URLs as appropriate:

[3] From Executive Order 13158: "Marine protected area means any area of the marine environment that has been reserved by federal, state, territorial, tribal, or local laws or regulations to provide lasting protection for part or all of the natural and cultural resources therein."

X. APPENDIX D

MPA/IOOS Task Team Experts Workshop Agenda

Workshop Agenda

Marine Protected Area and Integrated Ocean Observation System Task Team
Expert Workshop
Hotel Pacific, Sobrano Room
300 Pacific Street, Monterey, California 93940
August 31 and September 1, 2010

Workshop Purpose, Objectives & Desired Outcomes

Purpose:

- The purpose of the MPA IOOS Workshop is to obtain information and recommendations, from an expert group, that are related to the work now being conducted by the MPA/IOOS Task Team (e.g., development of Ocean Monitoring parameters & recommendations on product development);

Objectives:

1. Explore through the input of the expert group how MPAs could be used as "platforms" for Ocean Monitoring to enhance the understanding of the dynamics of marine ecosystems via the creation of a "linkage" with appropriate Ocean Observing Systems (e.g., IOOS, OOI);
2. To understand better the range of observing and monitoring requirements at MPAs and the extent to which these a) intersect with the existing IOOS infrastructure/capabilities and b) can be prioritized as candidate(s) for future IOOS enhancements;
3. Obtain, information, and knowledge on Ocean Monitoring parameters/processes that are the most important to monitor environmental changes and ecosystem characteristics at a national scale across Natural Heritage, Sustainable Production and Cultural Heritage MPAs;
4. Obtain key expertise, information, and knowledge to identify "end user" product(s) needed by MPA managers to determine if the MPA and National MPA Network are operating as designed; and
5. Share and discuss with the expert group information about needs and priorities of MPAs regarding monitoring, to help identify the recommendations that could be used to expand the Climate Reference Network by adding appropriate marine sites.

Desired Outcomes:

- A top "10" list of Ocean Monitoring parameters and/or processes, focusing on information requirements of MPA managers at a national scale;
- A description of a proof of concept observing activity or two to three potential "end user" products/services that may be useful to the MPA mangers, the National MPA System, and the IOOS; and
- A listing of key considerations and recommendations on the integration of MPAs as potential "reference" sites into the IOOS and on expanding the Climate Reference Network to marine sites.

Tuesday, August 31

8:30-9:00 Coffee/Tea & Snack

9:00-9:20 Welcome and Introductions (**Joe Uravitch, MPA Center Director**)

9:20-9:30 Brief Overview of Workshop (**Rondi Robison, MPA Center**)
- Orientation of Monterey and Resources During the Workshop
- Purpose, Objectives, and Desired Outcomes

9:30-9:45 Background & Federal Advisory Committee Recommendations (**Rondi Robison for Dennis Heinemann, Ocean Conservancy & MPA FAC**)
Objective: Provide the appropriate background context for the workshop including FAC recommendations on Linking Ocean Observing Systems and Climate Change.

9:45-10:45 Components of Consideration
- National System of Marine Protected Areas (**Joe Uravitch, MPA Center**)
- Integrated Ocean Observation System (**Charly Alexander, IOOS**)
- Climate Reference Networks (**Karsten Shein, NCDC** – via WebEx)
- Task Team Progress, Existing Efforts, Scale, and Current Initiatives (**Rondi Robison and Charlie Wahle, MPA Center**)

10:45-11:00 Morning Break

11:00-12:00 Linking MPAs and IOOS
Objective: Provide existing context of current IOOS or RA interactions with MPAs
- Concise summary of existing IOOS capabilities and datasets (spatial and temporal) (**Charly Alexander, IOOS**)
- Case Examples on IOOS assets, MPA boundaries and RA boundaries & activities (**Rondi Robison, MPA Center and Ru Morrison, NERACOOS**)
- National Monitoring Examples (**Steve Gittings, NMS and Whit Saumweber, NERR** – via WebEx)

12:00-1:00 Lunch (on own)

1:00-3:00 Breakout Groups on Parameters Part 1:
Objective: Breakout groups will be charged with sharing insights on the framing questions (feasibility of scale, need and purpose) that should be considered in observing and monitoring of the National System of MPAs and provide system indicators by listing biological, chemical and physical parameters/processes important to monitoring the National System of MPAs. Initially breakout groups should consider an optimal system by choosing parameters/processes without capacity constraints.
- Insights shared on scale, need and purpose (questions provided)
- Interactive group activities to identify biological, chemical and physical parameters/processes

3:00-3:20 Afternoon Break

3:20-4:20 Breakout Groups on Parameters Part 2:
Objective: Breakout groups will be charged with identifying a priority list of parameters based on work in Part 1 and provide thoughts for consideration.
- Interactive group activity

4:20-4:30 Re-Cap of Day and Expectations for Day 2

4:30 Adjourn for day

Wednesday, September 1

8:30-8:45 Coffee/Tea & Snack

8:45-9:00 Recap from Day 1 (**Rondi Robison, MPA Center**)

9:00-10:40 Lessons Shared Roundtable:
Objective: Expert's discussion on lessons learned on observing and monitoring MPAs. Expert's share knowledge, considerations, recommendations toward helping to identify priorities and strategies for deliverables or approaches to having MPAs as platforms for observing and monitoring.

10:40-11:00 Morning Break (Tour of MPA Center, Monterey with **Jackie Sommers** - *optional*)

11:00-12:00 Task Team's Questions for Experts
Objective: Allow task team members to ask questions of clarification to experts.

12:00-1:00 Lunch (on own)

1:00-2:30 Breakout Group on Proof of Concept, Products or Services
Objective: Identify specific actions, products or services to establish or strengthen linkages between the National System of MPAs and IOOS.
Facilitated discussion around resources, opportunities and partnerships that can support strategies identified by breakout groups.
- National System of MPA products
- IOOS products/services
- Proof of concept observing activity across one to several MPAs

2:30-2:45 Afternoon Break

2:45-3:45 Final thoughts, Questions, Considerations and Recommendations from Experts and Task Team Members (**Joe Uravitch & Rondi Robison, MPA Center**)
Objective: To provide an open forum for final thoughts, questions, considerations and recommendations to be shared.

3:45-4:00 Next Steps (**Rondi Robison, MPA Center**)

- Summarizing workshop findings and providing next steps
- Other

4:00 Workshop Adjourned

Background Materials to be Provided

Factsheets:

- Linking IOOS to the National System of MPAs
- National System of MPAs Snap Shot
- MPA Classification Scheme
    - Definitions of Natural Heritage, Sustainable Production and Cultural Heritage MPAs

Other:

- Executive Order 13158 http://mpa.gov/pdf/eo/execordermpa.pdf
- Federal Advisory Committee November 2008 Recommendations http://mpa.gov/pdf/fac/fac_recommend121208.pdf
- Charge to MPA IOOS Task Team
- Task Team's monitoring concept purpose - DRAFT
- Corrected List of Attendees
- List of Task Team Members
- Listing of existing work on monitoring, parameters
    - National Park Service http://science.nature.nps.gov/im/monitor/index.cfm
    - National Park Service protocols http://science.nature.nps.gov/im/monitor/VitalSigns/BrowseProtocol.aspx
    - Climate Reference Networks http://www.ncdc.noaa.gov/crn/elements.html
    -
    - http://www.wmo.ch/pages/prog/gcos/index.php?name=EssentialClimateVariables
- List of parameters/processes from existing work
- Excel file on end user products or services
- Current MPA activities within Regional Associations
- IOOS asset & MPA boundaries regional examples shown in map view
- FAC Climate Change http://mpa.gov/pdf/helpful-resources/mpafac_tor_doi_5-3-10-1.pdf
- MPA National System http://mpa.gov/nationalsystem/

Invited Experts & Task Team Members

Attending Experts:

Dr. Sarah Allen, National Park Service
Dr. Lisa Beever, National Estuarine Program
Dr. Stephen K. Brown, National Marine Fisheries Service
Dr. Gary Davis, GEDavis and Associates & MPA Federal Advisory Committee
Dr. Steve Gittings, National Marine Sanctuaries
Dr. Phil Levin, National Marine Fisheries Service
Dr. Dwayne Porter, University of South Carolina
Dr. Cheri Recchia, California MPA Monitoring Enterprise
Dr. Steve Rumrill, University of Oregon & South Slough National Estuarine Research Reserve

Mr. Joe Schumacker, Quinault Indian Nation & MPA Federal Advisory Committee
Dr. Curt Storlazzi, United States Geological Survey
Dr. Brock Woodson, Stanford University
Mr. Joseph Uravitch, MPA Center

Attending MPA IOOS Task Team Members:
Mr. Charly Alexander, IOOS
Dr. Robert Brock, National Marine Fisheries Service & MPA Center
Mr. Thom Curdts, National Park Service
Ms. Heather Kerkering, CeNCOOS
Dr. Ru Morrison, NERACOOS
Ms. Rondi Robison, MPA Center
Mr. Bret Wolfe, US Fish and Wildlife

XI. APPENDIX E

DRAFT MPA/IOOS Task Team Templates (Based on Input from MPA/IOOS Task Team Experts Workshop (August 31 & September 1, 2010))

<table>
<tr><td colspan="2">(1) Title: Exploration of Climate Reference Network (CRN) Sites to Coastal and Marine Protected Areas (MPAs)</td></tr>
<tr><td colspan="2">Description:
Monitoring of climatic variables to establish baselines and detect change in MPA sites; in accordance with CRN data standards by expanding CRN protocols to coastal and marine environments.</td></tr>
<tr><td>Goal(s):
To link or fill gaps between terrestrial and marine ecosystem climate change variables. To reduce uncertainty in climate change for the nation, by improving understanding of the variations from offshore to onshore and effects on resources of concern within the MPAs.</td><td>Objective(s):
▪ Establish a climate reference network of stations within coastal and marine protected areas.
▪ Identification of climate change information needs for MPAs.
▪ Identify existing sensors, capabilities, instruments, compatibilities, etc. and identify gaps.</td></tr>
<tr><td colspan="2">Tasks:
▪ Ask CRN program management if need and desire exists on the CRN side.
▪ Establish a working agreement with CRN through sharing MPA/IOOS Task Team final report and other appropriate information.
▪ Identify what infrastructure exists within MPAs, including existing relationships with coastal and marine partners (such as: C-MAN; FAA; RAWS and NDBC buoys).
▪ Identify requirements and whether or not existing packages, as they stand, meet CRN criteria or can be adapted to those criteria of the CRN standards.
▪ Establish new or existing sites with standalone or adapted packages.</td></tr>
<tr><td colspan="2">Benefits:
▪ Creates a better understanding of climate variability and change to address environmental impacts on coastal and marine ecosystems.
▪ Improves linkages between marine and terrestrial climate drivers.
▪ Better inform climate change adaptation planning and site management, “climate readiness”.
▪ Creates an opportunity to pair terrestrial and offshore stations.
▪ Provides a standard of comparability of data and instruments.
▪ Provides a dedicated team for maintenance.
▪ Creates redundancy in instrumentation within the coastal and marine environment, ensuring no loss of data.
▪ Provides long-term reference-quality data sets that will reduce the substantial uncertainty surrounding climate change for offshore environments.</td></tr>
<tr><td colspan="2">Timeframes:
▪ Need of this effort is current for MPAs.
▪ Initial new or adapted sites established as a proof of concept within two to three years.
▪ Fifty percent of new or adapted sites established within three to five years.
▪ One-hundred percent of new or adapted sites established within 10 years.</td></tr>
<tr><td colspan="2">Examples of applications:
▪ Is climate change occurring at the same rates and scales across MPAs as it is over terrestrial areas?
▪ What sort of climate change variability is there from one MPA to the next?
▪ How is the climate affecting managed resources?
▪ Assist in evaluating the effectiveness of MPAs. (Are the effects equal across all MPAs? Are the effects mediated within an MPA?)
▪ Quantify the climate change stressors on an MPA by decoupling an array of stresses. (What proportion of stress on a particular resource can be attributed to climate.)
▪ Reduction of uncertainty regarding climate change for the continental U.S.</td></tr>
<tr><td colspan="2">Potential Partners: DOC (NOAA (CRN; IOOS; NMS; MPA Center; NMFS; NDBC (C-Man); NERR)), DOI (NPS; USFWS; USGS), DOT (FAA), USDA, EPA, and State Parks</td></tr>
<tr><td colspan="2">Cost:
▪ Land-based $50,000-60,000/per station</td></tr>
</table>

- $150,000 – $250,000/per station for marine
- Annual maintenance costs: est. $50,000 per station (higher for more remote locations)
- Potentially leverage cost with partnerships and existing infrastructures.

Roles: MPA Center acts as the coordinating/facilitating body to establish necessary relationships. IOOS provides necessary support in coordination, data access and technology development.

(2) Title: Information Discovery Portal

Description: Two-way information exchange of data and data products which is standards-based and includes web service, multi-agency access, GIS viewer,

Goal(s)	Objective(s)
Improve interested parties ability to discover, obtain, and share information	▪ Provide improved access to a broad set of ocean observations data via standard tools and technologies ▪ Encourage use of these same tools/technologies for MPA managers to provide improved exposure of monitoring data collected by MPA managers

Tasks:

- Performance evaluation of prototype information systems
- Create mechanism/training/guidelines to add MPA information to IOOS (certification standards)
- Training on how to use and other tools
- Pilot regions (California and North East

Benefits:

- More information available for decision making
- Improved capacity to conduct technical assessments of MPA effectiveness
- Facilitating partnerships
- Better metadata
- Wider audience for ocean observation data/products (Education/Outreach)
- Transparency and accountability

Timeframes: Fiscal Year 2011 – plan/execute project in the next 12 months (Oct 2010-Sept 2011)

- Work with partners to define a project plan with mutual goals/objectives (Q1)
- Organize logistics and resources with project partners (Q2)
- Execute project including ingest of new data and access to existing data, initial products, and outreach/communications (Q3)
- Finalize products and develop candidate next steps (Q4)

Examples of applications:

- Univ. of MD integration and application network (ian.umces.edu)
- NOAA Climate portal
- IOOS Data portal
- RA data portals

Potential Partners: MPA Center, RAs, National Marine Sanctuary Program, IOOS Program Office, MPA Regional Associations, Regional Landscape Conservation Cooperatives (LCCs)

Cost: TBD – depends upon possible sponsorship funds from partners and size of project proposed

Cost: Can leverage

Roles: IOOS act as lead in development and providing examples of application. MPA Center's role would be to share or create the necessary links to the discovery portal and information with the national system partners.

(3) Title: Demonstration of Emerging Technologies	
Description: Conduct a demonstration project using emerging observation technologies such as gliders, wave gliders or tagged pelagics in one or more MPAs or across a network of MPAs	
Goal(s) Successfully demonstrate uses of emerging ocean observation technologies such that these instruments or techniques become a useful and valued tool for MPA management.	Objective(s) ▪ use emerging ocean observation technologies as a basis for technical collaboration with the National MPA Network ▪ raises awareness among MPA managers of the potential uses and value of such technologies ▪ raise awareness among IOOS Regions regarding MPA uses/applications
Tasks: ▪ Identify candidate information requirements along a "network" of MPAs (California or an extended area along the West Coast) that can be addressed by glider, wave glider or tagged pelagic ▪ Meeting of candidate project partners to explore goals/objectives and available resources per viability of a demonstration project ▪ If agreed, develop a detailed "mission plan" based upon executing a regional project across two or more existing MPAs, possibly along an extended region such as the West Coast (5 National Marine Sanctuaries, other MPAs) ▪ Define a set of products (including a communications package)	
Benefits: ▪ improves technical collaboration between IOOS and National MPA System ▪ demonstrates viability of technologies typically used only for physical oceanography ▪ exposes MPA managers to the capabilities of IOOS, particularly unmanned technologies ▪ likely moves these types of technologies closer to operational use	
Timeframes: Fiscal Year 2011 – plan/execute project in the next 12 months (Oct 2010-Sept 2011) ▪ Work with partners to define a project plan with mutual goals/objectives (Q1) ▪ Organize logistics and resources with project partners (Q2) ▪ Execute project including field activities, initial products, and outreach/communications (Q3) ▪ Finalize products and develop candidate next steps (Q4)	
Examples of applications: ▪ measuring/documenting selected elements of the California Current on MPA management ▪ regional circulation patterns along the Pacific coast ▪ water column habitat characteristics inside and outside of MPAs ▪ coastal upwelling effects on MPA management	
Potential Partners: National Marine Sanctuary Program, California MPAs, IOOS Regions (NANOOS, CeNCOOS, SCCOOS and MACOORA including the Univ. of Washington, MBARI, Scripps, and Rutgers), Liquid Robotics, Stanford University Hopkins Marine Lab	
Cost: TBD – depends upon possible sponsorship funds from partners and size of project proposed	
Roles: IOOS act as lead in development and execution. MPA Center assists with marketing and outreach on value to MPAs.	

(4) Title: Communication Strategy Between the National System of MPAs and the IOOS Regional Associations	
Description: The MPA Center will develop a communication strategy between the national system of MPAs and the U.S. IOOS Regional Associations (RA)	
Goal(s) ▪ Improve coordination and communication among MPAs ▪ Strengthen links between MPAs and RAs	Objective(s) ▪ Create regional organizational structure for MPAs without increasing workload for MPAs and without creating a new layer of bureaucracy
Tasks: ▪ Create lists of MPAs within each IOOS RA ▪ Create contact lists for MPAs within each IOOS RA ▪ Develop and implement communications strategy to inform MPAs and RAs	
Benefits: ▪ Facilitates communication, coordination and potential partnerships among MPAs ▪ Facilitates communication, coordination and potential partnerships between MPAs and IOOS RAs	

Timeframe: 6 months
Potential Partners: MPA organizations (state, local and tribal governments, NOAA, USFWS, NPS, NERRS), IOOS RAs
Cost:

(5) Title: Outreach: Ocean Observing Systems and Marine Protected Areas	
Description: Improve communication and collaboration between IOOS/RAs and MPAs through outreach. **Note that the italicized text indicates aspects that would need to be considered if engaging the public is an additional aim of the effort.*	
Goal(s) ▪ Improve communication and familiarity of IOOS/RAs and National/Regional MPAs. ▪ Link MPAs to geographically appropriate RAs – and vice-versa. ▪ Ease the process of sharing ideas, needs and information. ▪ Regional coordination of outreach strategy and materials. ▪ *Engage the public in understanding the need for ocean information in protecting our resources.*	Objective(s) ▪ Create a communication strategy for RAs to talk to, survey, and share information with MPA managers. ▪ Create a communication strategy for MPA managers to talk to, survey and share information with RAs and ocean observing communities. ▪ Create a communication strategy that works at both the national IOOS and MPA Center level and down to the local level. ▪ Establish agreed upon mechanisms of communication. ▪ *Engage the public through the creation of outreach platforms, such as kiosks, at MPA sites. Collaborative effort of Task Team.*
Tasks: ▪ Distribute letter from the MPA Task Team to all involved. ▪ Identify successful communication tools (web, flyer, blog, listservs) for this effort. ▪ Survey MPAs to understand how the MPA managers at federal, regional and local levels communicate with one another. ▪ Identify contacts in all participating MPAs and each RA. ▪ Use NFRA and MPA Center to contact and familiarize respective establishments to familiarize everyone with the plans and processes. ▪ Identify Points of Contact (POCs) in each region to maintain and assure the flow of communication. ▪ Require a POC from each of the agencies represented on the MPA Task Team (and FACA?) to participate in the outreach process. ▪ Highlight success stories through IOOS/NFRA and the MPA Center. ▪ Create training sessions and or webinars for MPA managers to introduce new tools and expose managers to what the technology can do for them; Introduce data sharing portal. ▪ Work to build a Tool Kit and/or Report Card with the MPAs. ▪ Establish key parameters for local MPAs. ▪ Link local/regional MPAs to parameters being examined by the national IOOS and local RAs of relevance. ▪ *Select 2-4 MPA sites to develop a public kiosk (Information Centers, Sanctuaries, Park Service??) with the aid of the MPA Task Team and RA Programmers and RA E&O specialists. The kiosk will highlight the link between ocean information and resource protection.*	
Benefits: ▪ Less use of middle-man and beaurocratic process to get the right answers and products into the right hands! ▪ Increased familiarity of MPA management issues and ocean observing systems at both regional and national levels. ▪ Quicker replies and product development from IOOS/RA in response to MPA management user needs. ▪ Established POCs for MPA managers when in need of ocean information. ▪ Potential ease of siting and monitoring MPA sites. ▪ *The public can make sense of the value of long term monitoring, process of MPA siting and monitoring, and the need to protect resources.*	
Timeframes: 1-2	
Potential Partners: NOAA MPA Center, NFRA and all RAs, NOAA IOOS, All Agencies represented on the Task Team, various states and counties with MPA jurisdiction, NOAA Sanctuaries, COSEE, and NOAA Office of Education.	
Cost: $2K/region (~$20K) for development of outreach materials and methods. *~$10K per kiosk.*	
Roles: MPA Center communication and outreach component works collaboratively with IOOS (possibly via NFRA) communication and outreach component.	
Roles: MPA Center is the lead in developing a communication strategy cross agency. IOOS supports and actively participates in the communication strategy development and execution of the strategy.	

<table>
<tr><td colspan="2">(6) Title: Periodic Assessment of Marine Resources Within a Regional Area</td></tr>
<tr><td colspan="2">Description: Information is regularly collected by IOOS observations and scientists in the field. A semi-annual report will be summarize marine resource conditions over the past six months with perhaps some insight into forecasting likely future conditions</td></tr>
<tr><td>Goal(s)
Inform managers, decision makers, scientists, and the public on marine resource conditions over the last 6 months
Inform marine related industries on past marine resource conditions and potentially predicted future conditions</td><td>Objective(s)
Provide data to decision makers in order to assist with taking any responsible and informed proactive actions
Provide data to scientists (e.g., fisheries, modelers) to facilitate develop of forecasting tools (e.g., allowable catch, fishery closures, beach water quality)
Provide information to the public to assist in making potential commercial and/or recreational decisions</td></tr>
<tr><td colspan="2">Tasks:
Integrate IOOS and field observations into a coherent data set
Develop a format for analyzing and disseminating data and information
Demonstrate model accuracy through comparing forecast results with field collected data
Create forecasting tools that can be used throughout the region;
Develop user's manual for interpreting forecasting tool output data and information;
Communications strategy developed and implemented;
Analyze and interpret data and disseminate assessment</td></tr>
<tr><td colspan="2">Benefits: Outputs – regional beach water quality and fisheries forecasting tool; communications strategy to get information out to target audience; tourism facilities may use for marketing purposes
Outcomes/results – Gain insight into why recent conditions existed and be able to forecast what short-term conditions may be expected to exist in the future</td></tr>
<tr><td colspan="2">Timeframes: Once every six months</td></tr>
<tr><td colspan="2">Examples of applications: Fisheries forecasts would assist in planning future commercial actions; Modelers would be able to better develop and/or validate their models from receiving recent data</td></tr>
<tr><td colspan="2">Potential Partners: local and state public health/fisheries agencies and academic institutions, aquaculture facilities, information outlets such as newspapers and local television, Volunteers</td></tr>
<tr><td colspan="2">Cost: $xxx is needed every six months to collect, integrate, and summarize the regional data as well as develop and distribute the semi-annual summary report</td></tr>
<tr><td colspan="2">Roles: MPA Center acts as the lead coordinating the assessment product. IOOS leads the acquisition of the data necessary to produce an assessment. Both IOOS and MPA Center collaborate on appropriate mechanism(s) for information dissemination.</td></tr>
</table>

XII. Appendix F

Acronyms Defined

A
AIS – Automated Identification System
AOOS – Alaska Ocean Observation System
ASBS – Areas of Special Biological Significance

C
CA – California
CaRA – Caribbean Regional Association
CeNCOOS – Central and Northern California Ocean Observing System
CDMO – Centralized Data Management Office
CHL – Chlorophyll
CMan-Coastal-Marine Automated Network
COSEE – Centers for Ocean Science Education Excellence
CRN – Climate Reference Network

D
DOC – Department of Commerce
DOI – Department of Interior

E
EPA – Environmental Protection Agency

F
FAA – Federal Aviation Administration
FAC – Federal Advisory Committee

G
GCOOS – Gulf of Mexico Coastal Ocean Observation System
GEOSS – Global Earth Observation System
GIS – Geographic Information System
GOOS – Global Ocean Observing System

H
HFR – High Frequency Radar

I
IOOS – Integrated Ocean Observing System

L
LCC – Land Conservation Cooperatives
LME- Large Marine Ecoregion

M
MLPA – Marine Life Protection Act

MOU – Memorandum of Understanding
MPA – Marine Protected Area
MPA FAC – Marine Protected Area Federal Advisory Committee
MPA/IOOS Task Team – Marine Protected Area/Integrated Ocean Observing System Task Team
MSP – Marine Spatial Planning

N
NCCR – National Coastal Condition Report
NCDC – National Climatic Data Center
NDBC – National Data Buoy Center
NeCOFS – Northeast Coastal Ocean Forecast System
NERACOOS – Northeastern Regional Association of Coastal Ocean Observing Systems
NERRs – National Estuarine Research Reserves
NFRA – National Federation of Regional Associations
NGO – Non-governmental Organization
NMS – National Marine Sanctuaries
NOAA – National Oceanic and Atmospheric Administration
NPEDES – National Pollutant Discharge Elimination System
NPS – National Park Service
NWQMN – National Water Quality Monitoring Network
NWR – National Wildlife Refuge

O
OOI – Ocean Observatories Initiative
OOS – Ocean Observing System

P
PacIOOS – Pacific Islands Integrated Ocean Observing System
PISCO – Partnership for Interdisciplinary Studies of Coastal Oceans
POC – Point of Contact

R
RA – Regional Association
RAWS – Remote Automated Weather Stations
ROMS – Real-time Ocean Monitoring System

S
SCCOOS – Southern California Coastal Ocean Observing System
SST – Sea Surface Temperature
SWMP – System-Wide Monitoring Program

U
U.S. – United States
U. S. FWS – United States Fish and Wildlife Service