West Coast Governors' Agreement on Ocean Health

Integrated Ecosystem Assessment (IEA) Action Coordination Team

Final Workplan

Action 3.2 of the West Coast Governors' Agreement Action Plan

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Introduction

The West Coast Governors' Agreement on Ocean Health

In September 2006, the Governors of Washington, Oregon, and California signed the West Coast Governors' Agreement on Ocean Health. Working together under this agreement and consulting with federal agency leads and stakeholders, the three states developed a bold set of actions to improve the health of our ocean and coastal resources. In July 2008, the three states released a final action plan outlining activities on a range of issues that will be pursued with close regional collaboration.

The West Coast Governors' Agreement on Ocean Health (WCGA) identified Ecosystem-Based Management (EBM) as an overarching principle under which the following issues and priority areas can be addressed:

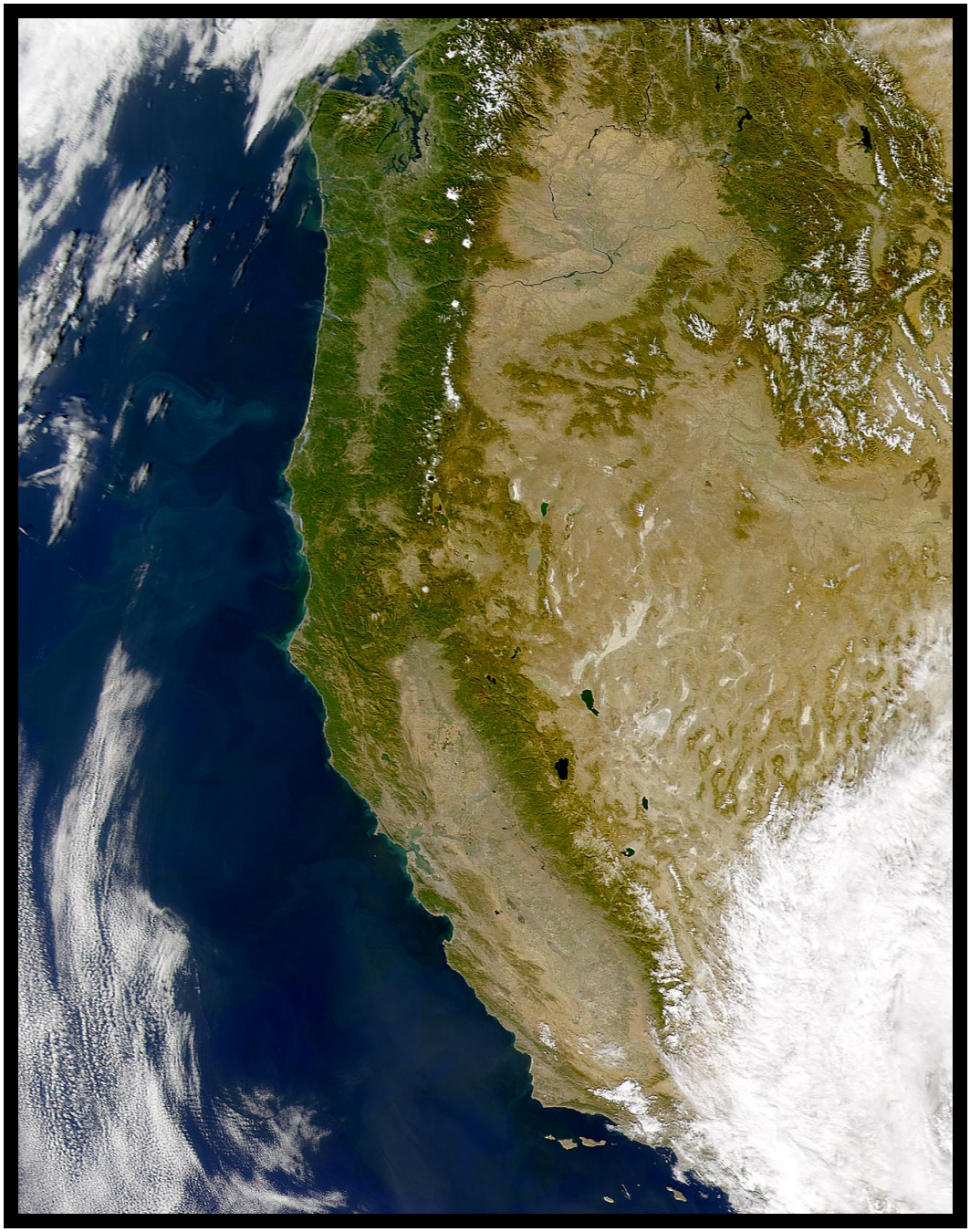
1. *Ensure clean coastal waters and beaches;*
2. *Protect and restore ocean and coastal habitats;*
3. *Promote the effective implementation of ecosystem-based management;*
4. *Reduce adverse impacts of offshore energy development;*
5. *Increase ocean awareness and literacy among citizens;*
6. *Expand ocean and coastal scientific information, research, and monitoring; and*
7. *Foster sustainable economic development in coastal communities.*

Ecosystem-Based Management

The Pacific coast of the contiguous United States encompasses a very broad range of coastal ecosystems, each consisting of complex landforms and seascapes, diverse natural habitats and biological communities, and intricate ecosystem functions and services that provide a productive foundation and attraction for sustained economic development, appreciation of our cultural heritage, and aesthetic enjoyment (Figure 1). The large spatial-scale and complexity of the land-margin ecosystem that encompasses the coastlines of Washington, Oregon, and California will require balancing multiple uses of the coastal zone and ocean. These multiple uses include development of sustainable communities within municipal, urban, and rural areas, designation and management of recreation and conservation areas, maintenance of critical infrastructure such as highways, roads, and bridges, as well as facilitation of commercial and recreational fishing, mariculture operations, maritime commerce, offshore energy development, and many other competing uses. It is critical to determine the optimal suite of management actions for these competing ocean and coastal land uses that will best maintain the delivery of ecosystem services while minimizing socioeconomic impacts. As the three states work together to address these important issues, better science and scientific-support tools are needed that will inform the various types of management decisions,

such as siting for alternative ocean energy development, managing west coast fisheries, and protecting coastal habitats, while addressing the cumulative effects of human stressors and climate change on the coastal ecosystem.

Figure 1. Pacific coastal land-margin ecosystem encompassing the coastlines of Washington, Oregon, and California (NASA / MODIS image).



The U.S. National Ocean Policy (2010), the U.S. Commission on Ocean Policy (2004), and the Pew Ocean Commission (2003) recently identified that traditional single-species or single-sector approaches to management of ocean and coastal resources have failed to achieve long-term resource sustainability, effectively balance multiple uses and goals, or to resolve conflicting management decisions. These national-level reviews recommend that the United States adopt an Ecosystem Approach to Management (EAM) for ocean and coastal resources. The EAM concept strives to provide a comprehensive framework for coastal resource decision-making, and to consider a wide range of ecological, environmental, and human factors that bear on diverse societal objectives regarding resource use and protection (NOAA, 2005).

As a complement to EAM, Ecosystem-Based Management (EBM) is a multidisciplinary process that can integrate information and management decisions across multiple ecological, social, and economic goals, ensure recognition of humans as key components of the ecosystem, and give full consideration to ecological boundaries while acknowledging and working effectively across political borders. EBM requires wide-ranging cooperation among the federal, tribal, state, and local governments and regional stakeholders to progress beyond single-issue or single-species management. Several management and planning tools have emerged over the past few years to assist the transition toward EBM, including the California Current Cumulative Impacts Model (2009; and see Halpern *et al*., 2008), and the National Framework for Coastal and Marine Spatial Planning (NOAA, 2010). Effective implementation of Ecosystem-Based Management is a priority under the West Coast Governors' Agreement on Ocean Health. The EBM approach will allow the states of Washington, Oregon, and California to take a regional, holistic, and coast-wide view, and to adopt an adaptive approach to address emerging regional issues and uses such as renewable ocean energy. In addition, the EBM approach will also provide a regional perspective to address cumulative human impacts and the multiple manifestations of climate change that are anticipated throughout the nearshore areas of the California Current Large Marine Ecosystem.

Integrated Ecosystem Assessments

Incorporation of multiple objectives, scientific information, stakeholder perspectives, and evaluation of management alternatives are all critical steps to support successful EBM and effective coastal and marine spatial planning. Integrated Ecosystem Assessments (IEAs) have been developed as a formal science-based process to enable formulation of an ecosystem approach to management. An IEA follows a five-step process (Figure 2) to synthesize and analyze quantitative technical data and social-science information that is relevant within the context of specified ecosystem management goals (Levin *et al.*, 2009). Each IEA focuses on a specific geographic area; the assessment involves and

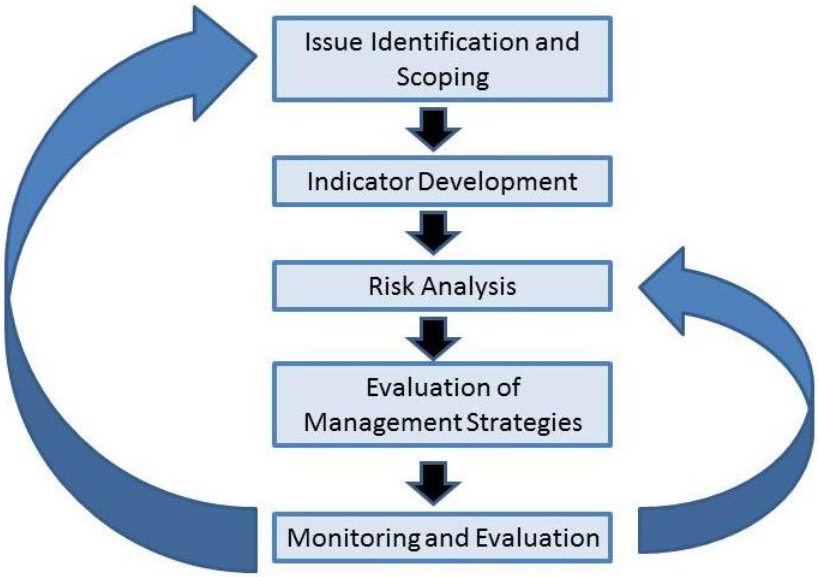
informs citizens, industry representatives, scientists, resource managers, and policy makers through a stepwise process to contribute toward attaining the goals of EAM (NOAA, 2008). In addition, each IEA also provides a means to explore the combined effects of management actions, identify efficient and effective management strategies, and reveal trade-offs between ecosystem services associated with desired ecosystem goals for the shared resources along the West Coast.

A key goal of each IEA is to make tangible progress toward clear, well-defined ecosystem objectives that are built on a science strategy that fuses natural-science components and social-science considerations into a coherent characterization, assessment, and evaluation of future management scenarios. As a proactive planning tool, each IEA process:

1. *Brings together multiple datasets and information to characterize and assess a suite of essential natural and socioeconomic processes;*
2. *Highlights the most important social and ecological drivers of desired ecosystem states or management goals;*
3. *Provides an analytical decision support tool for resource managers and policy makers; and*
4. *Helps identify ecosystem indicators that can be used to determine if policy actions are effective.*

It is important to note that each IEA provides for the clear identification of priority coastal issues and objectives, recognition of ecosystem indicators, a synthesis and quantitative analysis of relevant ecological and socio-economic datasets, modeling to evaluate alternative management options, and monitoring to assess changes in ecosystem status and the effectiveness of management actions. The IEA process does not supplant the need for traditional analysis and review of significant coastal projects and development activities (*i.e.*, Environmental Impact Reports, Environmental Impact Statements, Biological Opinions, etc.). In contrast, the IEA process should be considered as a complementary and beneficial supplement that contributes directly to the goals of EAM by provision of an assessment and analysis of the diverse and potentially conflicting multiple uses of ocean and coastal resources.

Figure 2. Five-step process for Integrated Ecosystem Assessments.



Integrated Ecosystem Assessments follow a five-step process:

1. Issue Identification and Scoping. Each IEA begins with a scoping process that engages stakeholders within a defined geographic area to identify the priority coastal management issues, recognize threats and constraints, and establish key ecosystem objectives balancing threats and constraints with legal mandates and shared community goals. The scoping process involves identification of important ecosystem drivers and pressures, and also includes conceptual thinking and abstraction of the ecosystem into essential sub-systems that are responsive to the priority management issues.

2. Indicator Development. A series of ecological and socio-economic indicators are established to identify and describe the status and trends of coastal resources. Suites of indicators should be selected to provide quantitative and understandable measures for a wide diversity of ecosystem attributes, and to provide informative metrics of progress toward ecosystem-based management. Existing data sets are then acquired and assembled for the indicators, and the technical information is integrated and congregated for synthesis and analysis.

3. Risk Analysis. Ecosystem modeling and forecasting are conducted to evaluate risk to the indicators posed by human activities and natural processes, and to estimate the probability that an indicator will reach or remain in an undesirable

state. The risk analysis incorporates uncertainties in ecological and socio-economic data, and makes use of a variety of assessment techniques that can include expert opinion, multivariate statistics, retrospective reconstructions, time-series analysis, quantitative numerical forecasts, visualization, and other projection techniques to identify and treat impact probabilities and incremental improvements in the understanding of ecosystem dynamics.

4. Evaluation of Management Strategies. A modeling framework is used to evaluate the potential trade-offs and outcomes associated with alternative management scenarios. The modeling strategy is selected to best simulate behavior of the coastal ecosystem in response to shifts in natural and anthropogenic drivers, and to provide a clear evaluation of the ecological and socio-economic consequences of different management actions. The outcomes of the models must be made available and reviewed by stakeholders and decision makers at the relevant scales, and eventually incorporated into policy and plans for management of coastal ecosystems.

5. Monitoring and Evaluation. An iterative assessment and evaluation of the ecosystem indicators is conducted within the context of adaptive monitoring to assess the effectiveness of management actions. The monitoring and evaluation process requires establishment of clear criteria for success as well as identification of thresholds for failure. Working with coastal communities and managers, periodic monitoring and re-evaluation is required for key components of the coastal ecosystem to validate the selection of indicators, metrics, and benchmarks, and to close the adaptive management loop.

Through the IEA process, assessments of the status, indicators, and trends of ecosystem condition relative to existing management targets can be realized. Tangible outcomes and user-group products generated by the IEA process include decision-support tools, peer-reviewed reports, and other data products that are communicated directly to stakeholders, resource managers, and policy makers. Decision-support products may be delivered in the form of static management strategy evaluations or as dynamic web-based documents that are updated as new data and information becomes available. The IEA products will also include societal and economic overlays that are linked to the ecological risk assessments, and these products will characterize the potential impacts of alternative management decisions to individuals and coastal communities.

Integrated Ecosystem Assessments on the Pacific Coast

All Integrated Ecosystem Assessments conducted along the Pacific coast must explicitly consider the spatial extent of the land-margin ecosystem and the time-frame over which coastal dynamics and management issues occur. It is essential that the spatial and temporal scales for the IEAs are selected in a manner that is appropriate to address the most important drivers and threats to the ecosystem. Consequently, a first step in any

IEA effort must be to identify the appropriate spatial and temporal scales for the coastal management problem under consideration.

Along the Pacific coast of the United States, Integrated Ecosystem Assessments have been developed previously on a large (California Current) and smaller regional (Puget Sound / Salish Sea / Vancouver Island) spatial scale. In the case of the California Current Large Marine Ecosystem (LME), conceptual understandings of the physical ocean drivers, ecosystem sub-components, multiple datasets, and relevant technical information were combined within the Regional Ocean Model System (ROMS) and Atlantis modeling framework to develop and validate a spatially-explicit simulation tool for the California Current LME (Horne *et al.*, 2010). In addition, the scoping process, data assembly, analysis, and synthesis steps have been initiated to address management questions raised by recent fisheries closures and seabird breeding failures largely within the offshore federal waters located outside the territorial seas of Washington, Oregon, and California. The large-scale California Current IEA encompassed marine ecosystem components over a spatial scale of over 25^{o} latitude and a time frame over the past 50 years (Sydeman and Thompson, 2010). NOAA's California Current IEA Team completed an initial IEA of the California Current by using selected ecosystem components (e.g., ecosystem health, groundfish, green sturgeon, salmon) and pressures that were of priority interest to west coast fishery resource managers (Levin and Schwing [ed.], 2011). The team selected a set of scientifically credible indicators for each component and reported on the status and trends of each indicator. The combination of effective use of indicators, and development of new risk assessment methods, as well as the use of ROMS and Atlantis models as decision-making tools, has generated a powerful process of guiding the transition toward ecosystem-based management of the California Current LME. In particular, the IEA provides an analytical platform to address hypotheses related to the effects of human perturbations (*i.e.*, fishery harvest activities), to characterize the tradeoff relationships associated with alternate management actions, to estimate the potential socio-economic impacts to coastal communities, and to test the utility of ecosystem indicators for the purpose of long-term monitoring and adaptive management. Findings generated by the California Current IEA are currently under consideration by the Pacific States Marine Fisheries Commission to address fishery management issues throughout Washington, Oregon, and California.

The IEA process has also been used to assemble, synthesize, and analyze information on a much more limited geographic scale for Puget Sound, components of the greater Salish Sea, and the west coast of Vancouver Island. In the case of Puget Sound, the regional IEA focused primarily on multiple drivers and pressures associated with land-based development and urbanization that impact water quality, habitat degradation, food webs, and recovery of salmonids. The time-frame for the integrated analysis of changes and management actions in Puget Sound encompasses forecasting for a longer period of about 200 years (Puget Sound Partnership, 2010). In 2007, the State of Washington formed the Puget Sound Partnership as a new state agency that is tasked with coordination of state, local, tribal, federal, private and NGO efforts to restore the Puget Sound Ecosystem by 2020. The Partnership endorsed the IEA approach, and the implementation strategy for

the regional IEA (led by NOAA Fisheries) combined scoping workshops and quantitative analyses to quantify ecosystem stressors by sub-region, identify indicators of ecosystem status and human well-being, and to specify scenarios and model relationships between human actions and ecosystem outcomes in the regional marine, nearshore and terrestrial environments. The IEA framework was intended to help organize federal, tribal, state and local agencies, and other stakeholders around a common set of indicators, and to develop priority strategies to achieve system-level goals. Over a 3-year period with the help of NOAA Fisheries and regional co-managers and partners, the first iteration of a Puget Sound ecosystem model was completed and used to investigate a number of management scenarios. Policy makers worked with scientists within the context of the regional Puget Sound IEA and combining it with a modified Open Standards methodology (Salafsky *et al*., 2008) to better articulate the broad system-level goals (*i.e*., swimmable, fishable, drinkable waters) into specific objectives and benchmarks against which progress can be measured. In addition, new methods for creating scientifically informed management targets and reference points for ecosystem attributes were developed. The first regional IEA for Puget Sound can be accessed online (www.psp.wa.gov/downloads/pssu2011/PSSU_04011_1A.pdf) and provides the central organizing tool for the Partnership's Puget Sound Science Update.

The nested, hierarchical, and regional IEA approach has also been applied to the marine environment of northern British Columbia, the west coast of Vancouver Island, and the small sub-systems of Clayoquot Sound and Barkley Sound (Okey *et al.*, 2009). Prompted by increased use of ocean resources and declines in ocean health, an ecosystem overview was conducted as part of the overall planning process for the Pacific North Coast Integrated Management Area (PNCIMA / northern British Columbia, Queen Charlotte Islands, northern Vancouver Island). The PNCIMA is an 88,000 km2 area of the nearshore and offshore marine environment that is considered by Canada as a Large Ocean Management Area (LOMA). An ecological overview of the PNCIMA (Lucas et al., 2007) included a general ecosystem description (Perry et al., 2007), a summary of functional habitat use by key species (Lucas and Jamieson, 2007), and eleven detailed appendices that describe the physical and biological characteristics of the area. The indicators, datasets, and synthesis products are currently being discussed within the framework of a regional Integrated Ecosystem Assessment for British Columbia marine ecosystems. Work is also underway to assess the ecosystem-level effects of marine zoning policies in the Gwaii Haanas (Queen Charlotte Islands) by examining how marine biological communities change in response to the proposed Gwaii Haanas National Marine Conservation Area Reserve and current Rockfish Conservation Areas. The goal of the regional integrated ecological assessment is to develop a strategic monitoring program that can identify and evaluate the direct and indirect effects of alternative zoning policies.

Regional IEAs for the outer coasts of CA, OR, WA

The specific vision identified by the WCGA for priority area 3 (effective implementation of ecosystem-based management) is to achieve:

> *a healthy, thriving, and resilient marine and coastal ecosystem along the entire west coast that supports a range of human activities (WCGAOH Action Plan, 2008).*

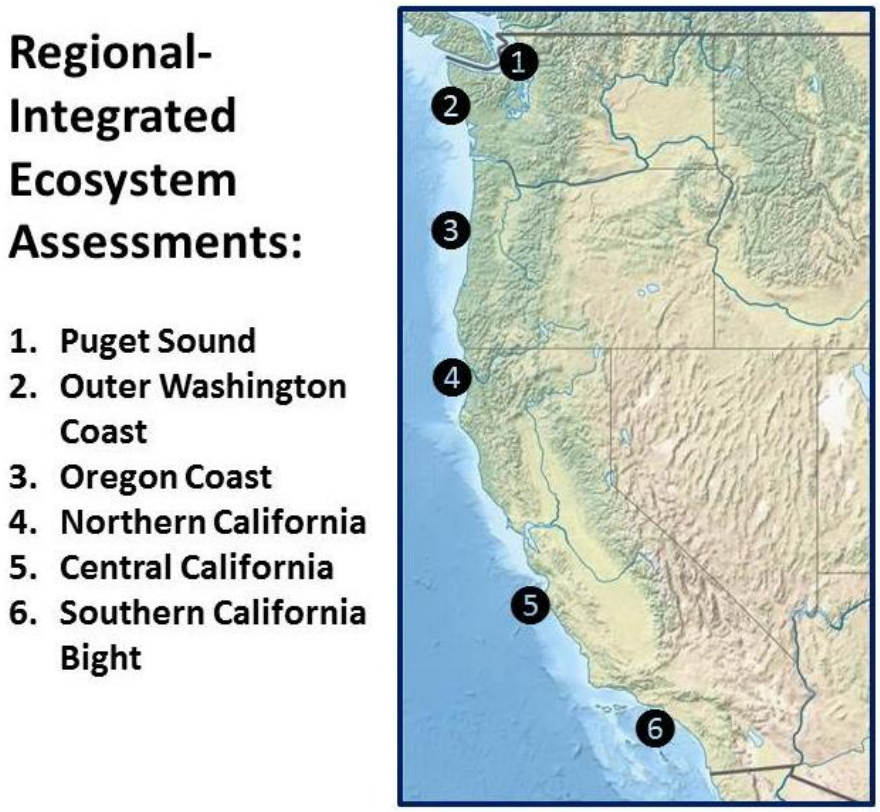
Realization of this vision will be aided by a rigorous assessment of scientifically robust indicators of ecological and socioeconomic conditions and key system-level drivers along the heterogeneous coast. The enormous spatial scale and diverse marine/coastal environment encompassed by the three states poses a challenge to implementation of the IEA process in a uniform manner. Moreover, application of the IEA to locally relevant management problems becomes substantially more complex as the scope and focus of the evaluation and assessment transitions from the nearshore marine areas into the state territorial seas and coastal zone. For example, development of the broad-scale IEA for the offshore and nearshore marine areas of the California Current LME (Sydeman and Thompson, 2010) addressed fundamental climate-ecosystem relationships and their interaction with commercial and recreational fisheries issues as the primary management concern. In contrast, the IEAs that will be developed for the state territorial seas and coastal zone are faced with an elevated level of socio-ecological complexity and myriad management issues. Consequently, a series of regional IEAs are needed to address distinct geographic areas and focus more directly on pressing coastal problems and regional management issues. The NOAA California Current IEA team's approach to this daunting task was to systematically decompose the California Current into a series of ecosystem drivers, pressures, and components that are of keen interest to resource managers, policy makers, researchers, and the public. Working with regional managers, the team then selected a limited set of EBM drivers, pressures, and components to use in the initial phase of the California Current IEA (Levin and Schwing [ed.], 2011).

The California Current LME is a large, international, dynamic, and spatially heterogeneous marine ecosystem that spans nearly 3,000 km from the northern tip of Vancouver Island (British Columbia) to Punta Eugenia (Baja California, Mexico). Within the United States, the eastern boundary current land-margin ecosystem encompasses at least six distinct eco-regions that include: (1) Salish Sea/Puget Sound; (2) the outer coast of Washington (Cape Flattery to the Columbia River mouth); (3) the outer coast of Oregon (Cape Foulweather to Cape Blanco); (4) northern California (Point Saint George to Mendocino/Point Arena); (5) central Califonia (Point Reyes to Point Conception); and (6) the southern California Bight (Point Conception, Channel Islands to Mexico). Although they share several common ecosystem-scale attributes, these distinct sub-regions are coupled with characteristic communities, dissimilar management issues, and specific research and information needs (Risien *et al.*, 2009). As a case in point, important management concerns and disagreements are currently prompted by conflicts between wave energy exploration and commercial crabbing along the outer coast of

Oregon, while planning efforts are occupied by pressing management issues associated with coastal development and designation of marine protected areas in southern California.

Given the heterogeneous characteristics of the tri-state, land-margin ecosystem and the regional specificity of coastal management issues, it makes sense to also adopt a regional approach to the development of the Integrated Ecosystem Assessments (Figure 3). A nested spatial hierarchy of Regional-IEAs (R-IEAs) will synthesize information within ecologically meaningful geographic areas and address regionally specific problems in coastal management. In addition, a series of rigorous and well-coordinated R-IEAs will also serve to identify appropriate indicators and provide consistent measures of the status of ecosystem health. Successful R-IEAs will improve regional-scale management and decision-making for coastal and marine ecosystems by evaluating proposed management strategies and the risks associated with alternative management decisions, while integrating the most appropriate biophysical and socio-economic information. R-IEAs will also address regional (and sometimes local-scale) management issues by identifying essential coordination steps (*e.g.*, data and information sharing; governance consistency, etc.), resources (*e.g.*, personnel, fiscal), and research gaps (*e.g.*, latitudinal shifts in species distributions and biotic productivity) that should be addressed to make more informed management decisions. Finally, R-IEAs will help build interagency connections, improve communication, and increase exchange of information. Development of Regional - Integrated Ecosystem Assessments will be an important scientific foundation for continuing the West Coast transition toward ecosystem-based management of marine resources. It is also important to recognize that the R-IEAs will contribute essential technical information and forecasting scenarios to comprehensive coastal and marine spatial planning at regional or sub-regional levels.

Figure 3. Regional-Integrated Ecosystem Assessments along the coastlines of Washington, Oregon, and California.



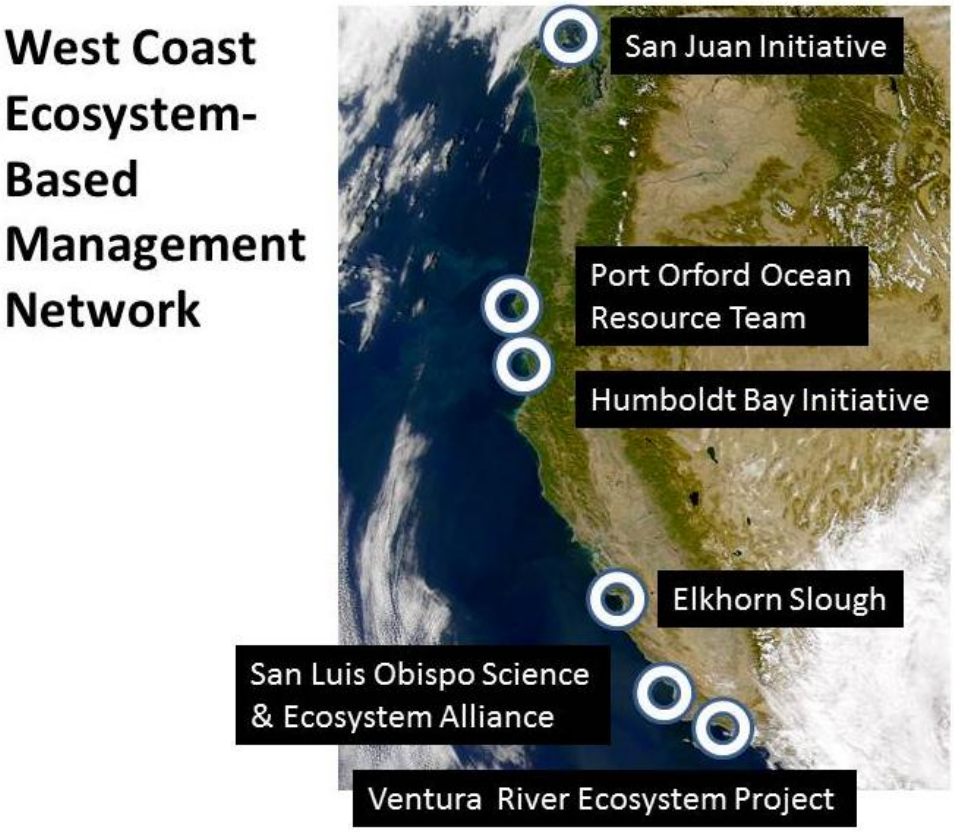
Information generated by the R-IEAs for different sub-ecosystems along the west coast (Figure 3) will be harmonized within the nested hierarchy so that they contribute to the development of a West Coast-IEA (WC-IEA) that will address the broader-scale California Current Large Marine Ecosystem. It is important to note that each R-IEA will be configured to address priority management issues (*i.e.* wave energy, marine reserves, nearshore aquaculture, coastal development, invasive species, seafloor mapping, etc.) that are relevant at the regional scale, and that different management issues may be addressed by the R-IEAs. The specific R-IEAs will serve as pilot projects to test the individual elements of the IEA framework that addresses the range of coastal management issues and environments in the California Current ecosystem. Additional R-IEAs may become necessary in the future to focus on different geographic areas and emerging management problems. NOAA Fisheries recently completed the first iteration (Levin and Schwing, 2011) of the WC-IEA that focuses primarily on fisheries issues, and they anticipate completion of the second iteration in 2012. Those efforts will be closely coordinated with the R-IEAs proposed here and may influence the relative priorities of the individual R-IEAs.

Some sub-sections of the Pacific coast are clearly at greater risk to degradation and impaired ecological function than others, and the range of pressing management problems and socio-political issues vary considerably from place to place. Nevertheless, the R-IEAs that are initially selected as regional pilot projects will serve as building blocks to allow for concurrent development of a broader-scale WC-IEA. The WC-IEA will eventually address a more complete set of challenges including: (1) formulation of conceptual and numerical models linking watersheds with estuarine/marine environments; (2) documentation of the ecological connections between different biogeographic regions; (3) quantification of the exchange of materials and organisms between inshore and nearshore waters; (4) identification of physical and biotic connections between the benthos and the water column; (5) modeling the connections between the shallow inshore areas and the deeper regions of the outer continental shelf; (6) ecological forecasting of the effects of climate change and the fluctuations in the global economy on west coast communities; (7) improving knowledge of socioeconomic dynamics that facilitates engagement in IEAs; and (8) implementation of EBM by regional and local governments, including Tribes, particularly in areas with pressing management needs to address emerging uses of the ocean and nearshore coastal area. In addition, the process to merge the R-IEAs and construct the WC-IEA also will require new advancements in analytical techniques to combine spatially explicit socioeconomic information from different coastal communities and to develop broad-scale ecosystem simulation models that can be used to evaluate the outcomes from different management actions at larger scales.

Regional IEAs and the West Coast EBM Network

The scoping activities and indicator development work encompassed by the Regional-Integrated Ecosystem Assessments are highly complementary to local activities currently undertaken along the coasts of Washington, Oregon, and California by the West Coast Ecosystem-Based Management (EBM) Network. The West Coast EBM Network was established in 2008 as a partnership of community initiatives that are focused on successful implementation of EBM at the local level (Figure 4). The Network seeks to facilitate ecosystem-based management approaches along the West Coast of the United States, and to share its techniques and lessons learned with the broader community interested in effective management of the ocean, coasts, and watersheds. By working at the local level, the Network and its member projects constitute a “bottom-up” approach to initiate ecosystem-based management. The Network is also working at a broader scale to pursue administrative partnerships that can link multiple levels of governance and achieve policy discussions that expand the use of successful EBM approaches. Successful EBM approaches are those that result in real-world benefits to coastal ecosystems, and are enhanced by coordination between local efforts and policy development at the state, regional, and national levels.

Figure 4. The West Coast Ecosystem-Based Management Network. (note: The San Juan Initiative (Washington) was discontinued in 2009 and some of the community-based activities were incorporated into the Puget Sound Partnership / Regional-IEA).



The West Coast R-IEAs and the local-level nodes of the West Coast EBM Network constitute a nested spatial hierarchy where community-based EBM activities are encompassed within the larger spatial domain of the broader R-IEAs. It is important to acknowledge that the proposed R-IEA efforts should not supersede existing community planning work nor supplant the priorities that have already been identified by the local West Coast EBM Network initiatives. In addition, it is also acknowledged that the Regional-IEAs must explicitly identify and provide additional support, capacity, and planning tools in order to link the local partners with the broader-scale R-IEA efforts. The complementary hierarchical relationship between the R-IEAs and the EBM Network sites further acknowledges that distinctive management issues may arise at different spatial scales, and that the nexus of management to evaluation scale should be explored to fully realize the beneficial outcomes of an ecosystem-based approach to coastal management. The local-level EBM Network activities will be incorporated into the

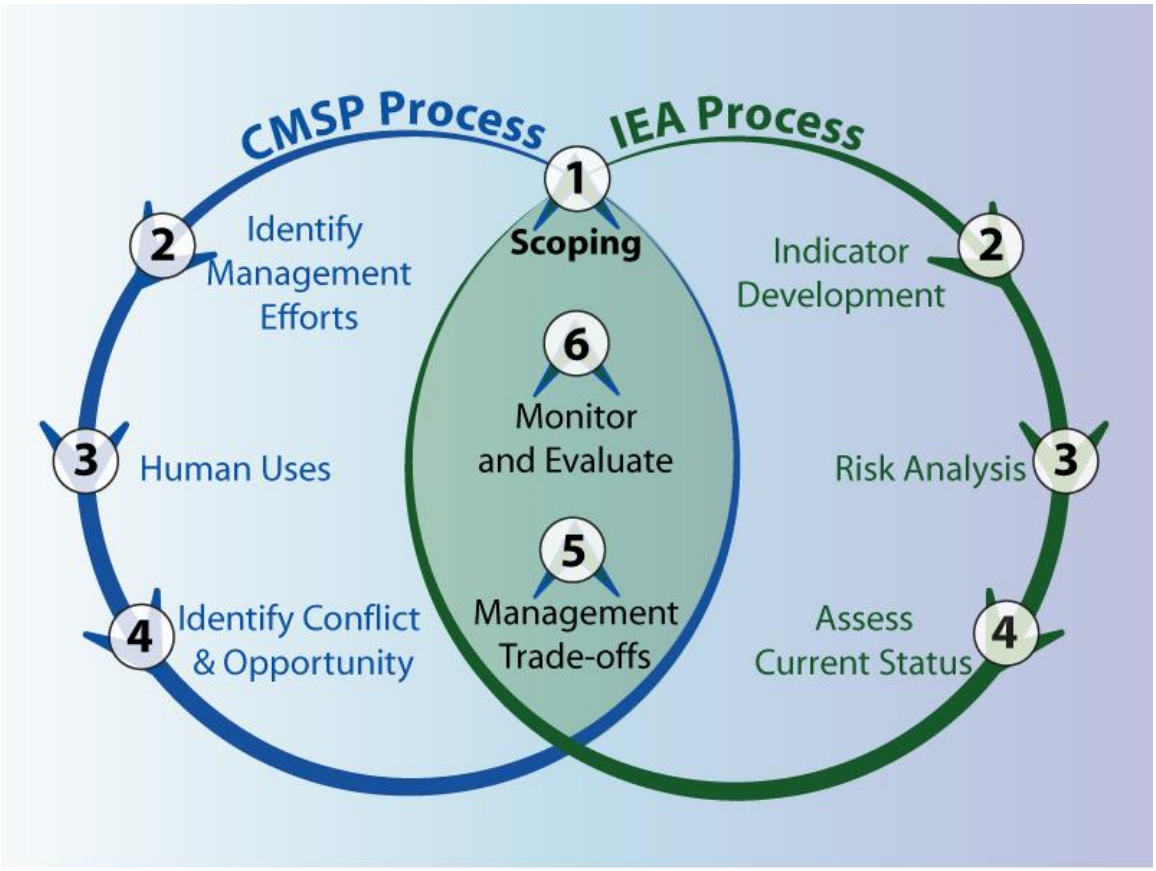
Regional-IEAs, and the R-IEAs will be scaled-up to contribute to the larger California Current IEA.

Application of Regional-IEAs to Coastal and Marine Spatial Planning

Coastal and Marine Spatial Planning (CMSP) has recently emerged as a national framework to ensure a comprehensive, adaptive, integrated, ecosystem-based, and transparent process for analyzing and planning current and anticipated resource use throughout the US coastal zone and nearshore marine environment (NOAA, 2010). Like Integrated Ecosystem Assessments (IEAs), the goals of CMSP are founded in sound science, and the CMSP process seeks to identify areas that are most suitable for different types of activities in order to reduce conflicts among uses and reduce environmental impacts. The CMSP process also seeks to facilitate compatible uses and preserve critical ecosystem services to meet economic, environmental, security, and social objectives. The CMSP process is openly participatory and active steps are taken to engage stakeholders in the identification of local priorities, initiate ocean planning activities, and facilitate the sharing of information on multiple human uses of the coastal zone. The national framework for Coastal and Marine Spatial Planning (NOAA, 2010) includes designation of several regional CMSP coordinators, formation of expert theme teams, and creation of an interagency program implementation council.

Along the west coast of Washington, Oregon, and California, regional CMSP would benefit from the work products generated by the Regional-Integrated Ecosystem Assessments. In particular: (1) CMSP for the California Current marine region will provide the over-arching and comprehensive public planning process, while (2) the R-IEAs will provide the synthesis of technical information and analytical tools that are required by the CMSP processes to advance ecosystem-based management. In a reciprocal manner, the R-IEA process will function to evaluate alternative management strategies posed during the CMSP process. It is likely that the initial scoping steps for CMSP and the R-IEAs will be conducted simultaneously (Figure 5) as members of the project teams interact with local stakeholders to prioritize coastal management issues, assemble existing information, identify requirements for data collection and sharing, conduct technical analyses, and synthesize the findings. It is also likely that the tangible products generated by the R-IEAs may include a regionally-applicable CMS planning document that addresses multiple coastal management issues and local problems. Due to the highly complementary nature of the CMSP and R-IEA processes, it will be mutually advantageous to share the monitoring and evaluation steps in order to maximize efficiency, leverage support, and to reduce costly redundancies in resources and personnel time (Figure 5).

Figure 5. Complementary and concurrent processes for Coastal and Marine Spatial Planning (CMSP) and Integrated Ecosystem Assessments (IEA).



Workplan to Address WCGA Priority Area 3 / Action 3.2

The 2006 West Coast Governors Agreement on Ocean Health (WCGA) calls for the development of an action plan that will address each of the seven priority areas, including evaluation of how well each action area incorporates ecosystem-based management approaches. In 2008, the WCGA released a 26-point action plan to tackle come of the region's most challenging issues. Subsequently an Action Coordination Team (ACT) was formed to develop a workplan to address Action 3.2 of the 2008 Action Plan:

> **Action 3.2** *Assess physical, biological, chemical, and socio-economic factors in ecosystem health across the West Coast to establish standards and indicators for ocean health.*

A core group of four individuals were identified in October 2008 as members of the initial ACT charged with responsibilities to develop a workplan to describe the federal, tribal, and tri-state collaboration required to implement Action 3.2 (hereafter referred to

as the Integrated Ecosystem Assessment – Action Coordination Team (IEA-ACT)). Additional members joined the IEA-ACT in Spring and Fall 2009 to constitute the following team:

- Tom Hom (Point of Contact), Strategic Program and Budgeting Advisor, Northwest Fisheries Science Center, NOAA Fisheries
- Phil Levin, Program Manager, Ecosystem Science Program, Northwest Fisheries Science Center, NOAA Fisheries
- Tim Quinn, Habitat Program Chief Scientist, Washington Department of Fish and Wildlife
- Mary Ruckelshaus, Managing Director, Natural Capital Project, Stanford University
- Steven Rumrill, Shellfish Program Leader, Marine Resources Program, Oregon Department of Fish and Wildlife
- John Stein, Acting Science Director, Northwest Fisheries Science Center, NOAA Fisheries
- Tom Suchanek, Lead Scientist, USGS Western Ecological Research Center
- Jacques White, Executive Director, Long Live the Kings (Ecoregional Planner, The Nature Conservancy)

The IEA-ACT convened several conference calls in late 2008 and early 2009 to discuss the conceptual components, scope, and spatial extent of IEAs. In addition, the ACT also shared information about emerging EBM and IEA activities in California, Oregon, and Washington. These ongoing activities included the initial efforts by the Pacific Fishery Management Council to scope development of an ecosystem-based fishery management plan, the interest expressed by the Office of National Marine Sanctuaries to use IEA as a decision-support tool on the west coast, and connecting with the West Coast Ecosystem-Based Management Network to assess EBM efforts at the local scale. The initial draft of the IEA workplan was completed in 2009, followed by a minor revision in 2010. Public comment was solicited and received in 2010, and additional comments and editorial suggestions were provided by the WCGA Executive Committee in July 2011. This current revision of the IEA workplan (September 2011) incorporates public comments, editorial changes requested by the WCGA Executive Committee, and recent additions to the National-level framework for Coastal and Marine Spatial Planning (NOAA 2010).

Workplan:

This workplan describes steps to conduct six Regional – Integrated Ecosystem Assessments along the coastlines and nearshore marine environments of Washington, Oregon, and California. The R-IEAs will be structured to evaluate a range of management objectives that are representative of the issues facing coastal communities, contribute to the process for integrating complex datasets, provide the foundation for expanding to broader geographical areas, and to make comparisons among different regions of the coast. The R-IEAs will also be structured in a consistent manner such that

the indicators, risk analyses, and other work products can serve as modules that contribute directly to the greater spatial scale of the entire west coast California Current marine and coastal ecosystem (WC-IEA).

Application of the IEA Concept to the Pacific Coast of North America

The broad-scale WC-IEA encompasses the entire coastline and territorial seas of Washington, Oregon, and California while each of the six R-IEAs encompasses a smaller and distinct geographical area (see Figure 3). The WC-IEA and smaller R-IEAs will establish a harmonized set of standards and indicators for ocean health including metrics for ecological integrity, ecosystem services, and socioeconomic conditions. Both the WC-IEA and the R-IEAs will explore numerous metrics of environmental health and human well-being currently in development by the Ocean Health Index program, as well as several other national-level and sub-regional assessment programs (i.e., National Coastal Assessment, National Coastal Condition Report, National Eutrophication Assessment, National Marine Sanctuaries-Ecological Condition Reports, Puget Sound Partnership, San Francisco-Bay Institute Report Card, West Coast EBM Network, *etc.*).

The WC-IEA will identify indicators and address management issues, risk analysis, and ecological forecasting of the effects of different management strategies for the larger California Current Large Marine Ecosystem (LME). Six Regional-IEAs are currently under consideration, each with distinctive management issues and characteristic ecosystem attributes, some of which may be directly transferable among the different regions. Information generated by the R-IEAs will be drawn together, assimilated, and used to address data gaps in the WC-IEA for the larger-scale California Current LME. The WC-IEA assembly process also will require development of new and innovative tools for scaling up and coordinating inputs and outputs from the R-IEAs.

Regional – Integrated Ecosystem Assessments

Six distinct geographic areas are identified for development of Regional-IEAs: (1) Puget Sound; (2) Washington Outer Coast; (3) Coastal Oregon; (4) Northern California; (5) Central California; and (6) Southern California (see Figure 3). These regions were selected because they each represent a distinct biogeographic sub-section of the greater California Current LME, and because they are broadly representative of the diversity of coastal environments, marine ecosystems, and human communities along the coastline. In addition, each region is influenced by a different suite of environmental drivers and anthropogenic stressors. Consequently, the R-IEAs will address different management issues, including urban development and conservation of at-risk salmonid stocks, conflicts over marine use for wave energy and commercial fishing, designation of marine protected areas, accelerated losses of tidal wetlands in response to harbor improvements, and efforts to develop responsible and sustainable fishing in coastal communities. The distinctive characteristics of these marine ecosystems and their associated coastal communities and stakeholder groups pose different types of challenges and opportunities for the development of R-IEAs, and we anticipate that they will provide a fruitful and

productive test-bed for new ideas and innovative approaches for the integration and analysis of seemingly disparate datasets. At the same time, the different regions share commonalities in the suite of fundamental processes and parameters[1] that are routinely used to characterize variability in the marine environment, indicator species and communities[2], and indicators of human well-being.[3] All of the regions are also active participants in the Regional Associations of the Integrated Ocean Observing System (IOOS)[4] and benefit from ongoing programs to generate, interpret, and disseminate IOOS data products. Finally, the R-IEA focus areas are also united in their effort to work together with the federal, tribal, and state agencies, academic institutions, community groups and stakeholders, and by the commitment of substantial institutional support in the form of long-standing partnerships and programs (see below). Consequently, the six regions exhibit a high likelihood of success with initiation of the R-IEAs, they can each make valuable contributions to a WC-IEA, and collectively they constitute a realistic pilot project that will provide adequate data information and lessons learned to evaluate the validity of the R-IEA and WC-IEA concepts.

Proposed R-IEA Focus Areas:

1. Puget Sound: The Puget Sound Ecosystem supports a relatively high standard of living, a robust and diverse economy, and high quality of life. These attributes have resulted in rapid and sustained human population growth. More recently, appreciation of the diverse ecological environment and important socioeconomic attributes have also contributed to growing awareness of limits to the ability of the ecosystem to provide valued ecosystem services, including imperiled salmonid stocks for food and cultural benefits, clean recreational and commercial shellfish beds, endangered species listings, and clean and plentiful water. The primary drivers of the declines in ecosystem functions and human well-being in Puget Sound are land-based pollution, habitat conversion and loss, and legacies of over-harvest. The Puget Sound Partnership (Partnership) efforts build upon and benefit from several previous studies and ongoing work to characterize ecosystem conditions (*i.e.*, for salmonids and their ecosystems, NOAA, Shared Salmon Strategy and others; terrestrial and fresh water biodiversity, The Nature Conservancy (TNC) and others; historic and current condition of the nearshore ecosystems, Army Corps of Engineers, and the Washington Department of Fish and Wildlife). The Partnership endorsed the idea of using a modified IEA approach in their Biennial Science Workplan and Action Agenda, which described a prioritized list of actions for the 2009-2011 state budget cycle, and a longer-term outline for recovery of ecosystem properties that will be achieved by

[1] ocean temperature and salinity, concentrations of dissolved oxygen, chlorophyll and harmful algal blooms, nutrient loading and eutrophication, fecal indicator bacteria, upwelling intensity, timing of spring transition, El Nino/La Nina events, Pacific Decadal Oscillation

[2] eelgrass beds, clams, salt marshes, kelp beds, crabs, non-indigenous species, seabirds, rockfish, bottom fish, salmon, sardines, marine mammals

[3] demographic profiles, unemployment rates, property values and income, transfer payments, income generated by extractive activities and ecotourism, willingness to pay for ecosystem services

[4] Northwest Association of Networked Ocean Observing Systems (NANOOS) and Central and Northern California Ocean Observing System (CeNCOOS)

2020. In conjunction with NOAA's IEA efforts in Puget Sound, the Partnership implemented a strategy that combined scoping workshops and quantitative analyses to quantify ecosystem stressors by sub-region, identify indicators of ecosystem status and human well-being, and to specify scenarios and model relationships between human actions and ecosystem outcomes in the regional marine, nearshore and terrestrial environments. The IEA framework helped organize state agencies and others around a common set of indicators, and to develop priority strategies to achieve system-level goals. The Puget Sound IEA was developed over a 3-year period, and includes three sub-system modules: (1) a marine food web model; (2) quantitative analyses that link changes in nearshore habitats to changes in ecosystem services; and (3) a linked land-use/hydrology/climate watershed model. This led to completion in the first iteration of a Puget Sound R-IEA that is summarized in the Partnership's "Puget Sound Science Update" (www.psp.wa.gov/downloads/pssu2011/PSSU_04011_1A.pdf). The Puget Sound R-IEA represents the state-of-the-science in support of work by the Partnership to protect and restore the Puget Sound ecosystem. The R-IEA provides a synthesis of scientific information about the lands, waters, and human social systems within the Puget Sound basin, and the document includes assessments of specific priority topics identified by policy leaders. Policy makers are currently working with scientists and stakeholders to better define broad Partnership goals for the region (*i.e.*, swimmable, fishable, drinkable waters) into specific objectives and benchmarks against which progress can be measured. In addition, the Partnership is developing implementation actions for protecting and restoring ecosystem elements, again under the guidance of multi-stakeholder science-policy groups. Further, the Partnership engages Puget Sound Treaty Tribes, who possess protected fishing rights and share co-management responsibilities for salmon with the state of Washington and the federal government. Commercial fisheries (both tribal and non-tribal) occur in state and federal waters and are critical components of the regional economy.

2. Washington Outer Coast: The outer coast of Washington extends from Cape Flattery (at the entrance to the Strait of Juan de Fuca) southward along the western edge of the Olympic Peninsula to Ocean Shores, Grays Harbor, Willapa Bay, and Long Beach. This section of coastal Washington encompasses nearly 180 km of spectacular, undeveloped shorelines as well as several urban areas and large estuarine systems that have experienced substantial industrial development, habitat degradation, and habitat loss. The nearshore marine environment along the outer coast provides critical links to the ecologically important trans-boundary regions of coastal British Columbia and Alaska, including the Juan de Fuca 'Big Eddy' International Marine Ecosystem (Jessen and Stark 2005) and the California Current Large Marine Ecosystem. The coastal zone includes extensive rock headlands, offshore islands and reefs, kelp beds, pocket beaches, small estuaries, and river mouths in the northern region, and extensive sandy beaches and large estuarine systems in the southern region.

Several treaty tribes have maintained cultural centers and economic activities throughout the northern region, and the outer coast is overlaid by numerous municipal, state, and federal jurisdictions. The Hoh, Makah, and Quileute tribes, and the Quinault Indian Nation (collectively known as the Coastal Treaty Tribes), continue to make their home on the Washington outer coast where they retain the continuity of historic and recent cultures that are intimately connected with the ocean and its resources. These Coastal Treaty Tribes possess protected fishing rights and share co-management responsibilities for fishing activities with the state of Washington and the federal government. The nearshore region also hosts extensive local, regional, and international commercial enterprises including some of the busiest shipping lanes in the world. Commercial fisheries (both tribal and non-tribal) occur in state and federal waters and are critical components of the regional economy.

The Olympic Coast National Marine Sanctuary (OCNMS) was designated in 1994 as a coastal and nearshore region of local, national, and international significance. OCNMS spans 2,408 square nautical miles (8,259 square kilometers) of marine waters off the rugged northwestern coast of the Olympic Peninsula, and the sanctuary boundaries extend seaward 40 to 72 kilometers (25 to 45 miles), and to depths of over 1,400 meters (4,500 feet) to include much of the continental shelf and the heads of three major submarine canyons. The OCNMS borders one of the few undeveloped coastlines remaining in North America and serves to enhance the protection provided by Olympic National Park (56 miles (90-kilometers) of wilderness shoreline) and the Washington Maritime National Wildlife Refuge Complex (which includes more than 600 offshore islands and emergent rocks). Olympic National Park is designated a World Heritage Site and a UNESCO Biosphere Reserve. Located in a nutrient-rich upwelling zone, the OCNMS supports high primary productivity and is home to a great diversity of organisms and habitats. Twenty-nine species of marine mammals have been sighted within the sanctuary boundaries, and the seabird colonies off the Olympic Coast are among the largest in the continental United States. Commercially important fish species include groundfish, shellfish, and five species of salmon. The OCNMS is influenced by geology, ocean currents, and other global processes, and the nearshore environment supports critical habitats and unique communities of marine organisms, including deep-sea corals and one of the most diverse seaweed communities in the world.

The outer coast of Washington provides important forage and refuge habitat for many stocks of commercially and recreationally valuable fisheries (including Dungeness crab, rockfish and salmon). The nearshore region clearly provides an important migratory corridor for the movements of fishes. For example, young-of-the-year Columbia River Chinook and Coho salmon migrate north along the coastline to utilize shorelines of the central Strait of Juan de Fuca for feeding (Shaffer et al., 2008), while Columbia River sturgeon are frequently observed in

the estuaries of the Hoh and Quillayute rivers (Jill Silver, pers. comm.). Moreover, herring, numerous smelt, eulachon, and sand lance (collectively called forage fish) provide the trophic basis for a several very important marine birds and ESA-listed species of salmon. These forage fish are dependent upon nearshore areas, including intertidal beaches of specific substrate size, for spawning. Substrate size is dictated by the hydrodynamics of the littoral system, and is disrupted by changes in sediment source or beach hydrodynamics. Habitat conservation, spawning by forage fish, and migration of juvenile and adult fishes along the coastline may be considered as essential ecosystem services and an important indicator for both cross regional and Regional Integrated Ecosystem Assessments. Migration of juvenile salmonids is also a key ecosystem process that occurs at the scale of regional (outer Washington coast) and larger (*i.e.*, California Current) spatial scales. It is likely that salmonids and other fish depend on small the isolated estuaries and independent tributaries of coastal Washington as they migrate long distances along the coast.

3. Coastal Oregon: The Oregon coastal zone includes an ecologically complex fusion of watersheds, estuaries, and the nearshore region of the Pacific Ocean that is intermingled with the urban environment of numerous small coastal communities. Extensive stretches of sandy beaches are punctuated by rugged mountainous capes and rocky headlands, and the shoreline and nearshore marine environment is characterized by a series of littoral circulation cells. The Oregon coastline includes 19 state parks that provide long-term protection and access to the shoreline habitats. In addition, the Oregon Islands National Wildlife Refuge provides protected status to 1,853 offshore rocks and islands (including Orford Reef, Rogue Reef, and Mack Reef) that span 320 miles of the Oregon coastline. Major undersea banks (*i.e.*, Heceta, Stonewall, Nehalem) and submarine canyons occur along the continental shelf, and the marine environment is inhabited by myriad marine organisms including diverse communities of algae, invertebrates, fishes, seabirds, and marine mammals.

The Oregon R-IEA will develop and test an integrated ecosystem-based approach to improved understanding, problem solving, and management of resource issues within linked watershed, estuary, and ocean ecosystems. The primary focus of the Oregon R-IEA is to establish a conceptual framework and comprehensive synthesis of the scientific information and management planning work conducted within the diverse components of Oregon's outer-coast land-margin ecosystems. Successful implementation of the pilot project will demonstrate the material and energy transfer links between the terrestrial, marine, and urban elements of the coastal landscape, and document the ecosystem functions and services that are provided to coastal residents. The pilot project will focus on concurrent and complementary development of the conceptual framework for R-IEAs and EBM approaches along the Oregon coast, and will likely address ongoing management issues and emerging conflicts over use of the nearshore marine zone for commercial and recreational fishing, designation of marine protected areas, wave

energy and mariculture. In addition, the Oregon R-IEA will also address the responses of coastal and nearshore habitats to climate change, coastal erosion, spread of non-indigenous species, and efforts to develop responsible fishery harvests and sustainable coastal communities. Ecosystem-based management approaches currently under development in Yaquina Bay, Coos Bay, or Port Orford could be used to provide ecosystem attributes for the R-IEA. These three Coupled Human and Natural Systems (CHANS; Liu *et al.*, 2007) are remarkably similar in the composition, diversity, and ecological services provided by the inherent ecosystem components, yet they are distinctly different in the social interactions among scientists and managers, and in the perspectives and vision of their stakeholders. For example, EBM activities at Yaquina and Coos Bays involve interactions among academia, federal agencies and watershed councils, whereas Port Orford is primarily driven by a community-based approach through the West Coast EBM Network. The Oregon R-IEA pilot project will provide an opportunity to develop a common conceptual framework for integrated coastal EBM in Oregon that will have immediate utility in the three coastal CHANS, help refine, strengthen, and adapt the EBM approach on the scale of coastal watersheds, estuaries, and the nearshore ocean, and provide a strategic R-IEA building-block toward future development of the WC-IEA.

Governance of the Oregon coastal zone is variable depending on location and the ecosystem type. Typically, management issues in state ocean waters are addressed by relevant state agencies under their legal authorities and the overarching policy requirements of Statewide Planning Goal 19, Ocean Resources. Planning for ocean uses may also involve advice from the Oregon Ocean Policy Advisory Council. Management inside estuaries is guided by Statewide Planning Goal 16, Estuarine Resources that sets out policy requirements for estuary management plans adopted by local governments as part of their comprehensive land use plans. Land uses in coastal watersheds are managed by local governments, in coordination with state agencies, through comprehensive land use plans required under state law. Land uses on federal lands in coastal watersheds are exempt from specific requirements of Oregon's land use planning program but must be consistent with state and local policies that have been approved by NOAA as part of the state's coastal management program. In Oregon, the R-IEA approach will seek to identify and define a few persistent management problems that can be best addressed by taking a broader, multi-jurisdictional perspective of the coastal zone ecosystem. In addition, the Oregon R-IEA approach will also develop and apply the best available scientific, traditional and local knowledge to address the intricacies and complexities of natural processes and social systems in a manner that is collaborative, fair, and beneficial to all components of the ecological and human communities.

4. Northern California: The Northern California R-IEA will encompass the distinct biogeographic area between Point St. George and Cape Mendocino, and will build upon the earlier EBM activities that focued on the Humboldt Bay

coastal ecosystem. Humboldt Bay is one of the largest bays on the Pacific coast and is the largest estuary in California north of San Francisco Bay. In addition to being the "front yard" of the north coast's population centers and a desirable travel destination, Humboldt Bay contains a diversity of habitats for fish and wildlife and significant state, national and international resources. The geographic scope of the Humboldt Bay Ecosystem extends from Trinidad Head in the north to Cape Mendocino in the south, the lower portions of the adjacent watersheds, and to the edge of the continental shelf (700 fathoms or 4200 feet). Over 30% of the eelgrass habitat found in California occurs in Humboldt Bay, and some of the most important Coho populations spawn and rear in its watershed. The California Current system in Humboldt and north to Cape Blanco, Oregon, is diffuse with highly variable oceanic conditions. The northern boundary at Trinidad Head is considered ecologically important because of physical processes associated with the Eureka littoral cell and human management activities such as maintenance of Humboldt Bay navigation channels and the Humboldt Bay Offshore Ocean Disposal Site. Although Humboldt Bay represents a significant resource for the north coast region, it provides a manageable EBM project area because it has a well-defined geographic scope, a reasonably small number of active and committed stakeholders (there are about 75,000 people living the Humboldt bay area and many of them have been involved in, and are knowledgeable about, ecosystem-based approaches to management), and access to academic resources through the presence of Humboldt State University and California Sea Grant.

Implementation of EBM in the Humboldt region falls under the Humboldt Bay Ecosystem Program (HBEP), formed by a group of resource managers and scientists and coordinated by California Sea Grant, and involves local and state agencies, stakeholder groups and others. The HBEP Strategic Plan is based on the work of numerous previous efforts that developed various watershed and bay management plans between 1999 and 2006. The HBEP will feed into and complement future planning processes in the region, such as the development and refinement of the Humboldt County General Plan and the California Marine Life Protection Act process. Since the Humboldt Bay Ecosystem Program is in the process of assessing the current status of ecosystem components and services and determining future goals for ecosystem health and the continued delivery of ecosystem services (*e.g.*, fishing, forestry, agriculture, and public use and access), this region is well situated to participate in the IEA process.

5. Central California: The Central California coastal region from Point Reyes to Point Conception is geomorphically diverse, and encompasses a mix of large and smaller coastal communities (*e.g.*, San Francisco, Santa Cruz, Monterey, Pacific Grove, Carmel, Lucia, Cambria, Morro Bay, Pismo Beach) that are situated along the shoreline of a productive nearshore marine environment. This section of the California coast is highly responsive to interannual variability in the California Current, and supports exceptionally rich and abundant communities of seaweeds and kelp, marine invertebrates, fishes, seabirds, and marine mammals. Two

active nodes of the West Coast EBM Network occur in the region at Elkhorn Slough and Morro Bay, and a large section of the coastline and nearshore waters are encompassed by the Monterey Bay and Gulf of the Farallones National Marine Sanctuaries (NMS). Dense urbanization along major sections of the Monterey Bay NMS poses several problematic resource management issues including coastal armoring, beach closures, water quality degradation, emergency response to hazard material events, ecosystem conservation and marine reserves, invasive species, commercial and recreational fishing, ecotourism, and residential development. Accelerated loss of tidal wetland habitat is occurring within the Elkhorn Slough National Estuarine Research Reserve (NERR) due to multiple stressors including harbor development, altered tidal hydrology, and sea level rise. The San Luis Obispo Science and Ecosystem Alliance (SLOSEA) has been established within the Morro Bay coastal ecosystem to address multiple issues including identification of land-based pollutants in the marine environment, accelerated loss of sensitive coastal habitats, invasive species, human access and impacts, and sustainable commercial and recreational fisheries. The Bay Area Ecosystems Climate Change Consortium was formed to bring together numerous stakeholders to focus on climate change impacts on ecosystems in the San Francisco Bay region. Numerous federal, state, and regional agencies, academic institutions, NGOs, and private foundations are actively involved in advancement of ecosystem-based approaches to management and sustainable fisheries management within the region, and are likely to contribute important conceptual and organizational talents toward establishment of the Central California R-IEA. The Central California pilot project will provide an opportunity to develop a common conceptual framework for integrated coastal ecosystem-based management in Central California that will help unify the similar, yet distinct approaches that have been taken by the Monterey Bay NMS, Elkhorn Slough NERR, and SLOSEA, and provide a solid R-IEA foundation for future development of the WC-IEA.

6. Southern California: The geographic scope of the Southern California sub-region extends from Point Conception to Baja California (Mexico), and includes the continental shelf waters of the Southern California Bight and the Channel Islands. Complex currents and dynamic circulation patterns characterize the nearshore Pacific Ocean waters within the Southern California Bight, and the nearshore marine environment includes an extensive series of offshore islands, rocky reefs, kelp beds, sandy beaches and rocky headlands. The shoreline of southern California also includes several major cities (*i.e.*, Santa Barbara, Ventura, Santa Monica, Los Angeles, Long Beach, Costa Mesa, Oceanside, San Diego) with extensive municipal and residential development, industrialized areas, urbanized harbors and river-mouths, and heavily altered estuaries. Millions of people reside along the coastline from Santa Barbara to San Diego, and the anthropogenic impacts to this dynamic and important coastal marine ecosystem are enormous. In contrast, the Channel Islands constitute a chain of eight islands located offshore in the Southern California Bight. Isolation of the islands over thousands of years

has allowed for development of unique communities of marine and terrestrial organisms, and the Channel Islands National Park and Channel Islands National Marine Sanctuary preserve and protecting a wealth of natural and cultural resources. Nearshore ocean circulation patterns within the Southern California Bight are more complex than elsewhere off the west coast of the United States. Southward flow of the California Current dominates offshore water movement throughout the region, and is strongest during summer. However, the current branches shoreward and then poleward within the Bight, and forms the Southern California Countercurrent. In addition, the California Undercurrent also exhibits northward flow over the continental slope in this region, particularly in summer.

It is clear that the tremendous population of humans that reside in southern California contributes to a significant quantity and variety of pollutants that enter the coastal and nearshore waters, and that an integrated assessment of the sources, fates, and management of coastal contaminants could be beneficial to the region. The Southern California Bight receives water-borne pollutants from a variety of sources. Most pollution is derived from land, either from non-point source water runoff after rainfall events, from the outfall pipes of waste treatment plants, or from the discharge of electrical power plants. Such runoff can introduce a mix of industrial and organic pollutants, hydrocarbons, pesticides, and pharmaceuticals, as well as airborne pollutants that collect on the extensive freeways and roads of southern California. Beaches near river mouths are often closed to the public after rainfall events due to high bacterial counts or the presence of high levels of other pollutants. In addition, large amounts of land-based garbage and trash also make their way into rivers or bays via roadways, and they are transported to the marine environment where they accumulate along sandy beaches and in the intertidal zone. Discharges from the San Gabriel River frequently become substantial after heavy winter rains, and a variety of contaminants are transported to the coastal areas at Long Beach and Seal Beach. Plastic bottles and trash bags, Styrofoam cups and packing material, cigarette butts, cans, and other materials are fragmented and become entrapped within the normal sediment load deposited on the ocean floor. In addition, dissolved contaminants such as lead, copper, zinc, oil, and grease can become incorporated into the tissues of marine organisms that live on or within the sediment. The Ports of Los Angeles and Long Beach constitute one of the world's most active centers for marine commerce. Although stringent guidelines are in place to protect the harbor environment, hydrocarbon pollution from ships, port terminal operations, and the Los Angeles River is an ongoing problem. The marine environment in Southern California also receives substantial natural hydrocarbon seeps (liquid oil, tar, and gaseous emissions) that originate from the sea floor in the Santa Barbara Channel and Santa Monica Bay. Gasses derived from the marine seeps rise to the surface as bubble plumes in the Santa Barbara Channel and enter the atmosphere, contributing to air pollution in Santa Barbara County. There is a pressing need for collaborative regional environmental monitoring, development of integrative assessment techniques and decision-support tools to characterize environmental conditions, and modeling

and analysis work to answer relevant coastal and marine environmental management questions.

In stark contrast to the extensive anthropogenic alteration and multiple sources of pollution that impact the coastal zone and shoreline of southern California, the marine environment of the Channel Islands is relatively unaltered. The Channel Islands gained international recognition as a Biosphere Reserve in 1976, and Channel Islands National Park (CINP) was designated in 1980 to encompasses 249,500 acres (100,990 ha) of the terrestrial and marine environment of five islands (San Miguel, Santa Rosa, Santa Cruz, Anacapa, and Santa Barbara Islands). In addition, the Channel Islands National Marine Sanctuary (CINMS) was also established in 1980 to ensure special protected status to approximately 1,470 square miles (380,730 ha) of the intertidal zone, subtidal habitats, and nearshore water surrounding the islands (extending from mean high tide to six nautical miles offshore). The primary goal of the CINMS is to provide long-term protection for the natural and cultural resources contained within its boundaries. The southern California region also contains several additional Marine Protected Areas to conserve and enhance recovery of targeted fish, invertebrates, and ecologically valuable marine habitats.

Conceptual Framework for the Regional-IEA Focus Areas

The IEA-ACT modified the framework of Levin *et al*. (2009) to identify the following steps that will be/is being taken in collaboration with resource managers, policy makers, academic advisors, and other stakeholders to develop R-IEAs for the six regional focus areas located in California, Oregon, and Washington:

1. Conduct a scoping process to identify the relevant spatial and temporal scale for the ecosystem and identify the distinct and pressing management issues within each geographic sub-region. The scoping process will also establish specific ecosystem goals and objectives, identify the key stressors that perturb sub-regional ecosystem functions, and develop an initial conceptual model for the sub-region that addresses human activities in the form of drivers and pressures. This scoping process is critical to the social process of establishing a science-policy dialogue that clarifies basic assumptions behind the identification of pressing management issues;

2. Define, test, and establish thresholds for responsive indicators in collaboration with stakeholders and policy makers, that reflect the important ecosystem attributes or states, and ensure that the indicators are incorporated into a driver-stressor-response model (or similar conceptual framework);

3. Conduct an ecological risk analysis to evaluate the susceptibility and sensitivity of the key coastal indicators to anthropogenic stressors and natural processes, and to appraise levels of uncertainty and ecosystem resiliency;

4. Evaluate alternative management strategies to assess the current status of the coastal ecosystem relative to historic conditions and identified indicators for ecosystem-based management, and develop an ecosystem simulation model to evaluate the potential for different management actions to influence the status of the key natural and socioeconomic indicators;

5. Monitor and assess the ecosystem indicators to identify changes in indicator status and trends, and to track the effectiveness of management decisions; and

6. Evaluate management decisions to determine whether ecosystem goals were achieved, identify critical knowledge gaps, and make adaptive changes to the indicators, thresholds, and strategies, as needed, to evaluate new insights about complexity of the coastal ecosystem.

Unification and Assembly of the West Coast IEA

Six additional steps will be completed following initial development of the R-IEAs to increase utility of the regional conceptual models and identify broader-scale applications to the larger California Current coastal ecosystem in California, Oregon, and Washington. These steps to generate the West Coast Integrated Ecosystem Assessment have been tentatively identified to include:

1. Identify the geographic limits of the R-IEAs to establish the appropriate boundaries for reasonable extrapolation, the restrictions on extended application, and identify significant gaps and the need to establish any additional R-IEAs. These geographic areas will be determined based on biophysical and social boundaries and relevant scales over which management and policy structures occur for decision making audiences to help frame and use the R-IEA results;

2. Crosswalk the coastal management issues among the different regions encompassed by the R-IEAs to develop a detailed matrix of pressing problems, potential solutions, and the locations along the coast where they are relevant, and identify the goals and objectives to help scope the broader-scale WC-IEA;

3. Merge the conceptual models and risk analyses to allow for numerical integration across shared indicators, share insights on methodologies, collaborative synthesis of results, and to incorporate new model components that address linkages across the R-IEAs; and

4. Coordinate with the development of an initial West Coast Integrated Ecosystem Assessment that will include development of standard baseline indicators, a data system and services framework, a management strategy evaluation (MSE) model framework, initial MSE products for selected managers, and documentation of the full process of creating the California Current IEA. The MSE model framework will have the capacity to evaluate the ecological impacts of alternative management actions on key natural and socioeconomic indicators;

5. Monitor and assess the broader-scale ecosystem indicators and socioeconomic metrics coast-wide to identify changes in indicator status and trends, and to track the effectiveness of any tri-state management decisions so that a management strategy evaluation (MSE) of the IEA can be conducted; and

6. Evaluate management decisions that affect coast-wide resources to determine whether ecosystem goals were achieved and to make adaptive changes to the indicators, thresholds, and risk analysis models, as needed, to evaluate new insights about complexity of the coastal ecosystem.

Workplan Objectives and Specific Tasks

The following objectives and tasks provide an overarching set of checkpoints conducting the Regional-IEAs and coordination with a broader-scale West Coast-IEA. These objectives will be achieved through collaboration with state, federal and local agencies, as well as tribal governments, non-governmental organizations, industry, academic institutions, and others.

Objective 1. Periodically update and improve the WCGA IEA Workplan

Task 1A. Periodically review, update, and improve the WCGA IEA workplan to incorporate public comments, stakeholder input, and decisions made by the WCGA Executive Committee (*Timeframe*: Feb 2012, annually thereafter)

Task 1B. Expand the IEA ACT to include additional members with strong links to the West Coast EBM network, and with expertise for planning the West Coast IEA workshop in collaboration with concurrent efforts by NOAA (NWFSC and SWFSC) and the NOAA / Office of Ocean and Coastal Resource Management. Further integrate the TNC Ecoregional Assessment for the Pacific Coast, the West Coast EBM network, the Pacific Fishery Management Council's Ecosystem-based Fishery Management Plan Development Team (being established), state-level coastal atlases, multi-agency IEA planning, and other federal tools such as Biogeographic Assessments and the Multiple Use Marine Cadastre into the WCGA IEA workplan, refine the process leading up to the IEA workshop, and define post-workshop products. The IEA ACT would serve as a California

Current IEA Task Team to facilitate communication and coordination among R-IEA projects. (*Timeframe*: Ongoing)

Task 1C. The WCGA IEA Workplan will evolve as new collaborations among groups, such as the West Coast EBM Network, the NOAA IEA Team, the West Coast Regional Data Framework (Data Portal), the Pacific Coastal and Marine Spatial Planning Group, the West Coast Regional Planning Body, and others. New sections of the workplan will be developed and incorporated into the existing plan on an as-needed basis. (*Timeframe*: As needed 2012-2015)

Objective 2. Convene a West Coast IEA Workshop

Task 2A. Establish an R-IEA Steering Committee (distinct from the IEA-ACT) that will work to refine management objectives, select operational objectives, and develop performance measures for an IEA prior to planning and hosting a West Coast IEA workshop—activities include development of agenda, outcomes and products, and venue. (*Timeframe*: Summer 2012).

Task 2B. Convene a West Coast IEA Workshop, in coordination with the NOAA WC-IEA effort, to introduce participants to the concept of IEAs, discuss recommendations provided by the steering committee for a West Coast IEA, and initiate establishment of four interoperable Regional IEAs. (*Timeframe*: Fall/Winter 2012).

Workshop Purpose: In concert with state and federal agencies, local and tribal governments, nongovernmental organizations, and academia, the states will hold a West Coast IEA workshop in the Summer or Fall of 2012 to discuss the current thinking about integrated ecosystem assessments as an analytical tool to improve management, and to initiate the process to develop R-IEAs and the West Coast IEA. The primary purpose of the West Coast IEA workshop will be to gain consensus about the conceptual approach that will be followed, identify the scope of relevant management issues, and present the driver-stressor-response and risk analysis models. Participants will identify commonalities among likely useful indicators, quantitative methods, and establish a process for periodic exchanges of technical information as each R-IEA progresses. The workshop will also establish the framework required to ensure interoperability of the R-IEAs for future assembly into the broader-scale WC-IEA.

The specific objectives of the workshop are to: (1) present workshop participants with the conceptual framework and working examples for the WC-IEA and the most recent developments with integrated ecosystem-based management; (2) discuss the feasibility and practicalities required for tri-state coordination and full interoperability of multiple R-IEAs, including input from relevant WCGA ACTs (*i.e.*, alternative ocean energy, habitat mapping, climate, sustainable communities, others); (3) identify the specific regions and institutions that will serve as pilot-

project R-IEAs, their ecosystem attributes, and their respective management issues; (4) evaluate, refine, and adapt a simple driver-stressor-response model for utility within Pacific coastal ecosystems; (5) evaluate barriers to integrating IEA framework into natural resource planning, particularly in those area of pressing management problems; and (6) designate R-IEA Team Leaders and project collaborators, identify their resource needs, and establish an action plan to move forward with implementation of the R-IEAs.

Note: NOAA (Office of Ocean and Coastal Resource Management) has proposed to host two workshops, the first primarily for an audience of coastal managers where the participants would be introduced to the concept of IEAs and identify pressing management issues. The second workshop will target a more technical audience and focus on indicators, data availability, and development of the IEAs. If these national-level workshops take place, it will be important for the WCGA IEA ACT to leverage with NOAA efforts to coordinate planning for the West Coast IEA workshop, and to ensure that the conceptual approach, selection of indicators, and risk analyses are fully compatible and interoperable for Washington, Oregon, and California. It is possible to seek support from NOAA/OCRM to hold the West Coast IEA workshop as a special-area focus meeting during their planning for the national-level events.

Task 2C. Solicit and engage new members that can provide technical support and ecological risk analysis and forecast modeling expertise for the West Coast R-IEA Steering Committee. The R-IEA Steering Committee is distinct from the IEA-ACT and will include regional stakeholders, resource managers, technical experts, and policy decision-makers that will work to refine management objectives, select operational objectives, and develop performance measures for an IEA. (*Timeframe*: Fall/Winter 2012)

Task 2D. Discuss early lessons learned about engaging the scientific community and general public in IEA development with IEA practitioners in other regions of the United States. (*Timeframe*: Fall/Winter 2012)

Objective 3. Finalize Selection of the Regional IEA Focus Areas

Task 3A. Identify Regional Team Leaders (*i.e.*, a single contact person responsible for leadership and coordination for each R-IEA) and work with them to develop summary statements that describe the Regional-IEA process within the context of local and regional management issues, ecosystem attributes, and initial R-IEA project goals, and coordinate with NOAA efforts to develop the initial WC-IEA. Each R-IEA focus area will have a defined geographic extent and an identified suite of applicable coastal management issues. (*Timeframe*: Winter 2012)

Task 3B. Develop criteria to assess likelihood of programmatic success for each of the six proposed R-IEA focus areas. (*Timeframe*: Winter/Spring 2012)

Task 3C. Conduct interviews, site-based visits, and a preliminary evaluation to assess likelihood of R-IEA success for each focus area. (*Timeframe*: Winter/Spring 2012)

Task 3D. Generate and deliver comments and recommendations to strengthen and improve the approach proposed for each of the initial R-IEA focus areas. (*Timeframe*: Spring 2012)

Objective 4. Establish and Implement Regional-IEAs

Task 4A. Complete a scoping process to verify pressing management issues identified by the preliminary R-IEA focus areas, establish specific ecosystem objectives, articulate the spatial and temporal scale for the ecosystem, and identify the key stressors that perturb ecosystem functions. (*Timeframe*: Winter 2012)

Task 4B. Host local planning meetings at the R-IEA pilot sites to identify a common suite of natural and social science stressors and indicators that are sensitive to changes in ecological conditions, applicable within the pilot R-IEA project ecosystems and could connect to the broader, coast-wide IEA. The planning meetings will also evaluate the availability of information required (*e.g.*, status and trends datasets, periodic surveys of local habitats and communities, high resolution remote sensing data, seafloor maps, ocean observing system data, socioeconomic information, ecological forecasting models, etc.) to advance ecosystem management approaches at the scale of R-IEAs. (*Timeframe*: Nov-Dec 2012)

Task 4C. Conduct an ecological risk analysis to evaluate the sensitivity of the key indicators to anthropogenic stressors and natural processes, and to appraise coastal ecosystem resiliency. (*Timeframe*: Winter 2012 / Spring 2013)

Task 4D. Integrate multiple indicators to assess the current status of the ecosystem relative to historic conditions and identified targets (*Timeframe*: 2012, as determined during West Coast IEA Workshop)

Task 4E. Coordinate with NOAA on the use of ecosystem simulation model to evaluate the potential for different management actions to influence the status of the key natural and socioeconomic indicators. (*Timeframe*: 2012-13, as determined during West Coast IEA Workshop)

Task 4F. Initiate process to integrate and assemble information from R-IEA pilot projects into broader-scale, west coast-wide IEA. (*Timeframe*: 2012-13, as determined during West Coast IEA Workshop)

Objective 5. Assemble Regional-IEAs into the Broader-Scale West Coast IEA

Task 5A. Identify the geographic limits of the R-IEAs to establish the appropriate boundaries for reasonable extrapolation, the restrictions on extended model and forecast applications, and identify significant gaps. This task addresses the 'scaling up' issue to a WC-IEA and thus the linking of sub-ecosystems to a larger scale ecosystem. Identification of the geographic limits of the R-IEAs will take place concurrently with the early scoping of the WC IEA to ensure the availability of critical data sets and compatibility of R-IEA products. (*Timeframe*: TBD during West Coast IEA Workshop)

Task 5B. Crosswalk the coastal management issues among the different regions encompassed by the R-IEAs to develop a detailed matrix of pressing problems, potential solutions, the locations along the coast where they are relevant, and identify the goals and objectives for the broader-scale WC-IEA. (*Timeframe*: TBD during West Coast IEA Workshop)

Task 5C. Merge the conceptual models and risk analyses to allow for numerical integration, collaborative synthesis, and to incorporate new model components that address linkages across the R-IEAs. (*Timeframe*: TBD during West Coast IEA Workshop)

Task 5D. Coordinate with NOAA's initial WC-IEA activity to inform that process and at same time learn from the WC-IEA to inform and insure harmonization of the R-IEAs to scale up to the California Current Ecosystem assessment. (*Timeframe*: TBD during West Coast IEA Workshop)

Objective 6. Conduct a Coordinated Coast-wide Evaluation of Coastal Management Decisions

Task 6A. Synthesize information from broader-scale ecosystem indicators and socioeconomic metrics to identify changes in indicator status and trends, and to inform on the effectiveness of any tri-state management decisions. (*Timeframe*: TBD during West Coast IEA Workshop)

Task 6B. Evaluate management decisions that affect coast-wide resources to determine whether ecosystem goals were achieved and to make adaptive changes to the indicators, thresholds, and risk analysis models as-needed to evaluate new insights about complexity of the coastal ecosystem. (*Timeframe*: TBD during West Coast IEA Workshop)

Financial Resources (Phase I; 2012)

Phase I / Initiation of the WC-IEA Process (estimated funding required to initiate the process for planning, establishment, and coordination of R-IEAs. Substantial staff time will be required from federal, state, county, NGO, and private sources to develop, contribute, analyze, and synthesis the data sets that will be incorporated into the R-IEAs):

- WC-IEA Workshop $30K

- Puget Sound R-IEA
  Pilot project coordinator $60K
  Regional project expenses $30K
  Operational costs (office) $10K

- Washington Outer Coast R-IEA
  Pilot project coordinator $60K
  Regional project expenses $30K
  Operational costs (office) $10K

- Coastal Oregon R-IEA
  Pilot project coordinator $60K
  Regional project expenses $30K
  Operational costs (office) $10K

- Northern California R-IEA
  Pilot project coordinator $60K
  Regional project expenses $30K
  Operational costs (office) $10K

- Central California R-IEA
  Pilot project coordinator $60K
  Regional project expenses $30K
  Operational costs (office) $10K

- Southern California R-IEA
  Pilot project coordinator $60K
  Regional project expenses $30K
  Operational costs (office) $10K

  Phase I / Initiation total: $630K

Note: The cost estimates above do not take into account the potential leveraging of the WCGA IEA ACT with current and future IEA activities conducted by NOAA and others. For example, IEA efforts for Puget Sound and Monterey Bay are currently underway, with much of the scoping process to identify key management objectives and threats and development of a provisional list of environmental indicators completed, as well as development of ecosystem models to test indicators, perform risk assessments, evaluate proposed management strategies and refine monitoring programs. For example, leveraging with the Puget Sound Partnership and NOAA would reduce IEA efforts by the WCGA, so that fewer resources would be necessary to implement the R-IEA in Puget Sound. Additionally, the WCGA IEA ACT will explore leveraging possibilities of other NOAA IEA efforts taking place along the west coast that may reduce resources needed for other R-IEAs in 2012-2015. It is important to recognize that workforce allocations and contributions by NOAA toward development of the Regional-IEAs are dependent upon budget decisions, agency priorities, emerging responsibilities, and other workforce demands that are outside the scope of this WCGA IEA workplan.

Workplan Summary

#	Deliverables	Timelines	Resources & Funding Needed	Lead organiza-tion(s) & support	Research/ Scientific Support
1	***Periodically update the WCGA IEA Workplan***				
1A	Revise and improve the IEA ACT Workplan.	Feb 2012	None	IEA ACT; WCGA EC	None
1B	Expand IEA ACT membership	Winter 2012, ongoing	None	WCGA EC; IEA ACT	None
1C	Integrate with groups and organizations, such as the West Coast EBM Network, NOAA and others that are engaged in significant IEA/EBM activities (gathering information). Update workplan, as needed.	2012 – 2015	TBD	IEA ACT; NOAA; West Coast EBM Network	TBD
2	***Convene a West Coast IEA Workshop***				
2A	Establish R-IEA Steering Committee to refine management objectives, select operational objectives, and develop performance measures for an IEA prior to planning and hosting a West Coast IEA workshop	Summer 2012	None	IEA ACT; NOAA, West Coast EBM Network	None
2B	Convene a West Coast IEA Workshop, in coordination with the NOAA IEA efforts, to introduce participants to the concept of IEAs, discuss recommendations provided by the steering committee for a West	Fall/Winter 2012	$30K	IEA ACT; NOAA; IEA Workshop Steering Committee	TBD

	Coast IEA, and initiate establishment of four interoperable R-IEAs				
2C	Solicit and engage new members that can provide technical support and ecological risk analysis and forecast modeling expertise for the West Coast IEA Steering Committee	Fall/Winter 2012	TBD	IEA ACT; IEA Workshop Steering Committee	TBD
2D	Discuss early lessons learned about engaging the scientific community and general public in IEA development with IEA practitioners in other U.S. regions	Fall/Winter 2012	TBD	IEA ACT; IEA Workshop Steering Committee	TBD
3	***Finalize Selection of Regional IEA Focus Areas***				
3A	Identify Team Leaders for R-IEA focus areas that will work with IEA ACT to develop work statements and goals for each of the regions	Winter 2012	None	IEA ACT; NOAA; West Coast EBM Network	None
3B	Develop criteria to assess likelihood of programmatic success for each R-IEA	Winter/Spring 2012	TBD	IEA ACT; NOAA; WCGA Ex Com	TBD
3C	Conduct interviews and site visits for initial evaluation to assess programmatic success for each R-IEA focus areas	Winter/Spring 2012	TBD	IEA ACT; NOAA; West Coast EBM Network	None
3D	Generate and deliver comments and recommendations to strengthen and improve the approach proposed for R-IEA focus areas	Spring 2012	None	IEA ACT	None
4	***Establish and Implement Regional-IEAs***				
4A	Complete scoping of pertinent management issues and establish ecosystem objectives related to spatial and temporal scales for R-IEAs	Winter 2012	Note: Estimated funding needed for each R-IEA focus area (Tasks 4A-E) is $100K	IEA ACT; NOAA, state resource agencies plus others (TBD)	TBD
4B	Host local planning meetings at R-IEA pilot project sites to develop R-IEAs, including identification of indicators, stressors, information gaps to advance IEA approaches at proper scale	Winter 2012	See 4A	IEA ACT plus others (TBD)	TBD
4C	Conduct an ecological risk analysis to evaluate the sensitivity of the key indicators to	Winter 2012 / Spring 2013	See 4A	IEA ACT plus others (TBD)	TBD

	anthropogenic stressors and natural processes, and to appraise coastal ecosystem resiliency				
4D	Integrate multiple indicators to assess the current status of the ecosystem relative to historic conditions and identified targets	2012, as determined at WC IEA Workshop	See 4A	IEA ACT plus others (TBD)	TBD
4E	Coordinate with NOAA on the use of ecosystem simulation model to evaluate the potential for different management actions to influence the status of the key natural and socioeconomic indicators	2012-13, as determined at WC IEA Workshop	See 4A	IEA ACT plus others (TBD)	TBD
4F	Initiate process to integrate and assemble information from R-IEA pilot projects into broader-scale, west coast-wide IEA	2012-13, as determined at WC IEA Workshop	See 4A	IEA ACT plus others (TBD)	TBD
5	***Initiate Assembly of Regional-IEAs into the Broader-Scale West Coast IEA***				
5A	Identify the geographic limits of the R-IEAs to address the 'scaling up' issue to the broader WC-IEA	TBD during West Coast IEA Workshop	TBD	IEA ACT plus others (TBD)	TBD
5B	From the R-IEAs, develop cross-walk matrix of issues, potential solutions, and relevant coastal locations and identify the goals and objectives for the broader-scale WC-IEA	TBD during West Coast IEA Workshop	TBD	IEA ACT plus others (TBD)	TBD
5C	Synthesize IEA information to merge conceptual models and risk analyses and incorporate new model components that address linkages across the R-IEAs	TBD during West Coast IEA Workshop	TBD	IEA ACT plus others (TBD)	TBD
5D	Coordinate with NOAA's WC-IEA activities to inform and ensure harmonization of the R-IEAs to scale up to the California Current Ecosystem assessment	TBD during West Coast IEA Workshop	TBD	IEA ACT plus others (TBD)	TBD
6	***Conduct a Coast-wide Evaluation of Coastal Management Decisions***				
6A	Synthesize information from broader-scale ecosystem indicators and socioeconomic metrics to identify changes in indicator status and trends, and to inform on the effectiveness of any tri-state management decisions	TBD during West Coast IEA Workshop	TBD	IEA ACT plus others (TBD)	TBD
6B	Evaluate management decisions that affect coast-wide resources to assess ecosystem status and to recommend changes to indicators, thresholds, and risk analysis models, as needed relative to EBM goals	TBD during West Coast IEA Workshop	TBD	IEA ACT plus others (TBD)	TBD

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