



**INTERAGENCY AGREEMENT WITH
THE NATIONAL OCEANOGRAPHIC AND ATMOSPHERIC ADMINISTRATION
NORTHWEST FISHERIES SCIENCE CENTER**

Agreement No. IAA 13-340

- 1) This Memorandum of Agreement (MOA) establishes an agreement between the Washington State Department of Natural Resources (herein after referred to as “DNR”) and the Northwest Fisheries Science Center (NOAA Fisheries), National Oceanic and Atmospheric Administration, U.S. Department of Commerce (herein after referred to as the “NWFSC”), through which DNR will pay NWFSC to develop a conceptual model of the structure and functional ecological properties for the marine waters of Washington state, and collate and evaluate a list of ecological indicators that reflect status and trends in Washington’s marine waters.

- 2) The purpose of this MOA is to establish the conditions under which NWFSC shall provide analytical capacity and technical support for marine spatial planning to DNR, as detailed in the attached Statement of Work (SOW), and to define how funds will be transferred to cover the costs involved with these services.

Attachment A

STATEMENT OF WORK

1.0 Background and Objective

The Northwest Fisheries Science Center Ecosystem Science Program (ESP) will assist with the development of a portfolio of indicators that communicates strategic objectives and enables policy makers, managers, the public to measure, monitor and manage the key actions needed to achieve ecosystem-based management (EBM) goals. Our objective is to develop a relatively small collection of interconnected ecosystem indicators that reflects both short- and long-term status and trends in Washington marine waters. An effective indicator portfolio should:

- be grounded in a conceptual model of the Washington Marine Ecosystem
- provide a snapshot of the overall health of the Washington Marine Ecosystem
- provide an early warning of negative trends so that corrections can be made quickly
- show the impacts of new or ongoing management strategies
- transparently reveal how funding for management actions produces results
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A PROCESS FOR DEVELOPING INDICATORS FOR THE WASHINGTON MARINE ECOSYSTEM DEVELOP CONCEPTUAL MODELS OF MARINE WATERS OF WASHINGTON STATE

First, the ESP will develop a draft conceptual model of the ecosystem. This conceptual model will include both structural/compositional elements and dynamic functional properties of the system. Developing a consensus regarding the components and linkages in the conceptual models is the first step in the process of reaching agreement on specific measures of ecosystem status and trends.

DEVELOP LIST OF POTENTIAL INDICATORS AND MAP THEM TO THE CONCEPTUAL MODEL.

We collate existing lists of indicators for components of the California Current and map them to elements or processes in our conceptual model.

OBJECTIVELY EVALUATE INDICATORS

The ESP will modify the approach outlined in Kershner et al. (2011) to evaluate indicators. In particular, we will focus on the “Primary considerations” criteria outlined in Kershner et al.. These are essential criteria that should be fulfilled by an indicator in order for it to provide scientifically useful information about the status of the ecosystem. The evaluation criteria are as follows:

- **Theoretically-sound:** Scientific, peer-reviewed findings should demonstrate that indicators can act as reliable surrogates for ecosystem attribute(s)
- **Relevant to management concerns:** Indicators should provide information related to specific management goals and strategies.
- **Responds predictably and is sufficiently sensitive to changes in a specific ecosystem attribute(s):** Indicators should respond unambiguously to variation in the ecosystem attribute(s) they are intended to measure, in a theoretically- or empirically-expected direction.

- **Responds predictably and is sufficiently sensitive to changes in a specific management action(s) or pressure(s):** Management actions or other human-induced pressures should cause detectable changes in the indicators, in a theoretically- or empirically-expected direction, and it should be possible to distinguish the effects of other factors on the response.
- **Linkable to scientifically-defined reference points and progress targets:** It should be possible to link indicator values to quantitative or qualitative reference points and target reference points, which imply positive progress toward ecosystem goals.
- **Complements existing indicators:** This criterion is applicable in the selection of a suite of indicators, performed after the evaluation of individual indicators in a post-hoc analysis. Sets of indicators should be selected to avoid redundancy and increase the complementarity of the information provided, and to ensure coverage of Key Attributes.

In this case, Key Attributes will be defined as key components or processes in the Conceptual Model. Each indicator will be assessed reviewing peer-reviewed publications and reports. The benchmark of peer-reviewed literature will be used because it is a criterion that was relatively easy to apply in a consistent fashion, and is consistent with work performed in Puget Sound.

WHAT WILL REMAIN TO BE DONE?

This work will begin, but not complete the process of indicator selection. Additional work should include further evaluation of data availability, relationship to and compatibility with other indicator sets, indicator response time and specificity, and cost of monitoring.

2.0 SERVICES REQUIRED

The NWFSC ESP will provide the following services to assist in addressing the tasks outlined above

- 2.1 Develop conceptual model of Washington Coast Marine Ecosystem
- 2.2 Develop list of potential list of ecosystem indicators for the Washington Coast
- 2.3 Evaluate candidate indicators using the approach described above in section 1.0
- 2.4 Participate in workshops (objective-setting and Indicators) as determined by agreement of both parties

3.0 DELIVERABLES

- 3.1 Electronic version (in pdf form) of initial draft conceptual model – Due: May 10, 2013
- 3.2 Description of candidate indicators and indicator evaluation, in written form (MS Word) – Due: May 10, 2013
- 3.3 Interpretation of results, in written form (MS Word), in addition to revisions to 3.1 and 3.2– Due: June 14, 2013