Science Advisory Panel for Washington Coast Marine Spatial Planning
Requests for Scientific Review

Project Name or Data Type	**Science Review Request**	**Organization conducting work**	**Organization making request**	**Anticipated Method**	**Timeline**
Economic Analysis Project Proposal	Review methods provided by consultant	Cascade Economics	Ecology/ DNR	1) Respond to an e-mail from Cascade Economics to provide written feedback on proposed method 3) Follow-up phone call as project progresses	Early Oct. 2014 End Oct. 2014
Identifying Ecologically Important Areas off WA's coast	Help develop criteria to designate areas as "Important Areas" off WA's coast	WDFW	WDFW	1) Meeting with WDFW scientists and staff 2) Review proposed criteria and provide written comments to WDFW	Oct./ Nov. 2014
Benthic Habitat Data from Ecoregional Assessment	Identify strengths and limitations of benthic habitat data for use in MSP	TNC-Ecoregional Assessment	Ecology/ DNR	Summary report of strengths and limitations for MSP	Fall/Winter 2014

Social Indicators	Provide scientific review of methods and candidate indicators	WA Sea Grant	Ecology/ DNR	1) In person meeting to discuss approach 2) Provide written review of preliminary assessment of categories prior to community meetings 3) Provide written comments on final report that incorporate feedback from community	Fall 2014 Dec. 2014 May 2015
Ecological Indicators	Provide scientific review of methods and candidate indicators	NOAA-NWFSC	Ecology/ DNR	1) Provide written comments on methods 2) Provide written comments on final report with indicators, status and trends	Fall 2014 June 2015
Economic Indicators	Provide scientific review of candidate indicators	WA Sea Grant	Ecology/ DNR	Provide written comments on proposed list of indicators	Fall 2014

How was the benthic habitat layer generated for TNC's Pacific Northwest Ecoregional Assessments?

excerpted from Pacific Northwest Marine Ecoregional Assessment

Vander Schaaf, D., K. Popper, D. Kelly and J. Smith. 2013. The Nature Conservancy, Portland, Oregon.

The benthic habitat classification and mapping was developed exclusively by the Conservancy for use in this assessment. The technique uses a moving window analysis to identify polygons of similar geomorphology and substrate characteristics within a depth class. Occurrences within a very small area (<1ha) were omitted as were any potential benthic habitat classes (based on all possible combinations) that occupied less that 10 ha within an ecological section. The analysis resulted in 64 benthic habitat classes that formed a continuous habitat map for the ecoregion.

Recently, high resolution surveys of nearshore benthic habitats using multi beam and side scan sonar have been taking place in state waters in selected areas. Initially these detailed surveys were primarily focused on research but their broader utility and importance for ecosystem-based management has been recognized for a number of other uses. For example, in Oregon, high resolution surveys have been conducted at Heceta Banks and at most of the newly designated and proposed marine reserves. In Washington waters, similar surveys have been conducted within the Olympic Coast National Marine Sanctuary. These surveys, when completed across the continental shelf along the Pacific Northwest coast will significantly improve the benthic habitat characterization for the ecoregion and will strengthen future assessments here.

The four bathymetric classes used in our assessment were inner shelf (nearshore-shallow: 0-40 m), mid shelf (continental shelf: 40-200m), mesobenthal (upper continental slope: 200-700 m) and bathybenthal (lower to toe of continental slope: 700-3500 m) (adapted from Greene et al. 2004). Bathymetry data were downloaded from the National Ocean Services (NOS) Hydrographic Data Base website. Hydrographic data provide background data for engineers, scientific, and other commercial and industrial activities and primarily consist of water depths, but also include features (e.g. rocks, wrecks), shoreline identification, and bottom type information (National Ocean Services [NOS] 2009). The NOS data were provided in a 30 x 30 m grid.

The five substrate or lithology classifications used in the assessment were "soft", mud, sand, gravel, and rock. Substrate data were obtained from the Active Tectonics and Seafloor mapping lab at Oregon State University (Romsos et al. 2007), with additional data from the Center for Habitat Studies, Moss Landing Marine Laboratories (Greene et al. 2004).

The four geomorphology types developed by OSU and used in the assessment were flats, canyon, ridge and middle slope. Additional substrate data were developed under contract with the OSU mapping lab using historical NOS smooth sheet charts to update the benthic substrate data in Oregon and Washington state waters.

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excerpted from Pacific Northwest Coast Ecoregion Assessment - Appendix 4E

Vander Schaaf, D., G. Wilhere, Z. Ferdaña, K. Popper, M. Schindel, P. Skidmore, D. Rolph, P. Iachetti, G. Kittel, R. Crawford, D. Pickering, and J. Christy. 2006. Prepared by The Nature Conservancy, the Nature Conservancy of Canada, and the Washington Department of Fish and Wildlife. The Nature Conservancy, Portland, Oregon.

The benthic model presented here has been used for marine ecoregional planning throughout the continental U.S., including the Southern and Northern California ecoregions, the Floridian and Carolinian on the east coast, as well as in the Northwest Atlantic Coastal and Marine region.

In order to generate a continuous surface depicting the seafloor we used a number of regional bathymetric data sets and examined interpolation techniques. These modeling efforts were based on bathymetry data from the National Oceanic and Atmospheric Administration (NOAA), Washington Department of Fish & Wildlife (WDFW), and the Ministry of Sustainable Resource Management (MSRM) in British Columbia, Canada. After generating a continuous

surface depicting the seafloor, we examined several models that classify the benthic environment into distinct geomorphic types.

We applied a landscape position model described in Fel and Zobel (1995), and later described in detail by Weiss (2001) for mapping seafloor geomorphology. Since landscape classifications are not based on morphology alone but also on the position of the land surface in relation to its surroundings, Fel (1994) developed a quantitative index of landscape position. Also called Topographic Position Index, or TPI, the basic algorithm compares the elevation of a given cell in a Digital Elevation Model (DEM) to the mean elevation of a specified neighborhood around that cell. Positive TPI values represent locations that are higher than the average of their surroundings, while negative TPI values represent locations that are lower than their surroundings. TPI values near zero are flat areas. Recently marine practitioners have adopted this method for deriving landforms, calling this the Bathymetric Position Index, or BPI (Rinehart et al. 2004). Although the BPI model derives landforms on the seafloor, we have added depth classes and substrate types that further delineate distinct marine formations.

We combined the geomorphology and depth data with lithology on the seafloor. The Oregon and Washington continental shelf geologic data set compiled and mapped by Oregon State University (Goldfinger et al. 2001) and others (Greene et al. 1999), as updated for the Groundfish EFH-EIS process, incorporates available information on seafloor substrate types for the region. In addition, geologic data was available for British Columbia (MSRM 2001). We used a simplified classification of marine substrate types (hard, soft, unclassified) in order to match data across the region.

The resultant grid after combining geomorphology and depth with substrate types tracked all potential combinations of inputs resulting in 48 (4 landforms x 4 depth classes x 3 substrate types) unique benthic habitat types for the Pacific Northwest Coast ecoregion. A final check was conducted to determine whether all 48 modeled benthic habitat types were present in the ecoregion; a few types were present but at <100 total hectares (inner shelf canyon unclassified (1.2 hectares), inner shelf slop unclassified (53.6 hectares), and mid shelf canyon unclassified (82.2 hectares)). It should be noted that these categories were also used in the Northern California Coast ecoregion and therefore could be combined to illustrate Pacific west coast-wide coverage (TNC 2005).

Sources

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