

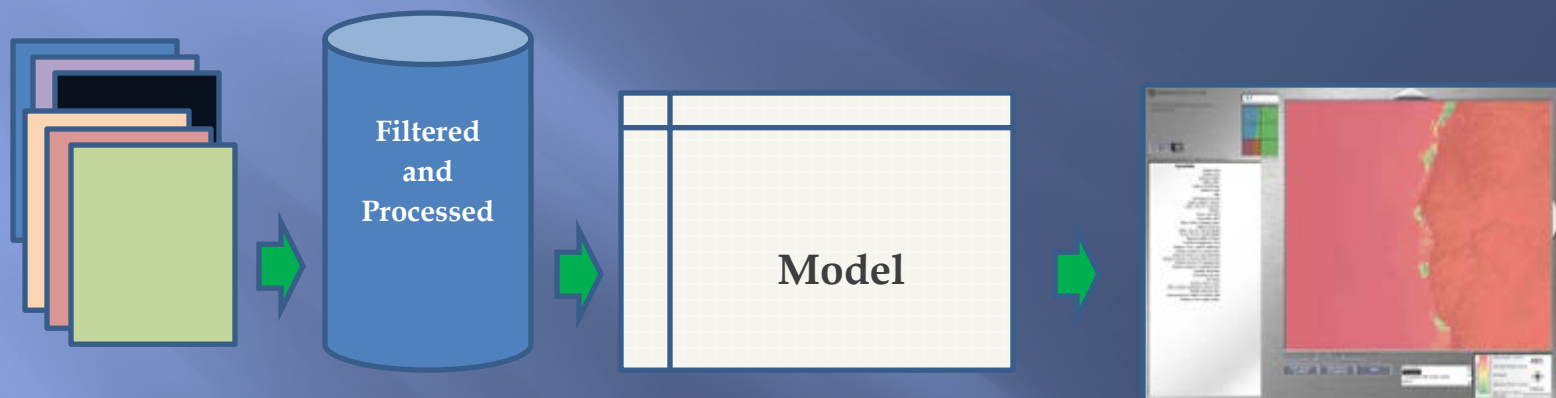
Marine Renewable Decision Tools

Emerging Oregon and West Coast Efforts

Decision Support on the Ocean

- ▣ Oregon Wave Energy Trust:
Cumulative Effects Analysis Framework
- ▣ Bureau of Ocean Energy Management:
Bayesian Analysis for Spatial Siting (BASS)

Decision Support Elements



Raw Data

Data Library

Decision Engine

User Interface

Ecosystem Service Analysis

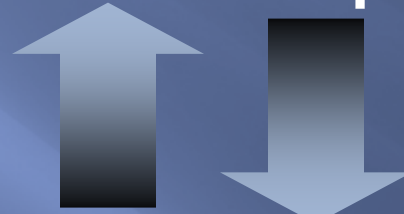
Ecosystem services are the benefits people obtain from ecosystems. Changes in these services affect human well-being in many ways.

-Millennium Ecosystem Assessment Report

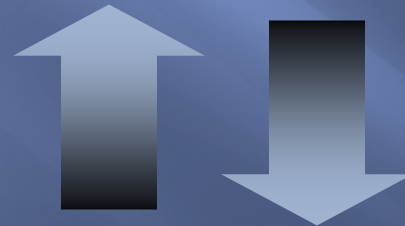
Ecosystem Services allow an integrated approach capturing many values and resources.

Linking Data to Decisions

Decision Support



Services

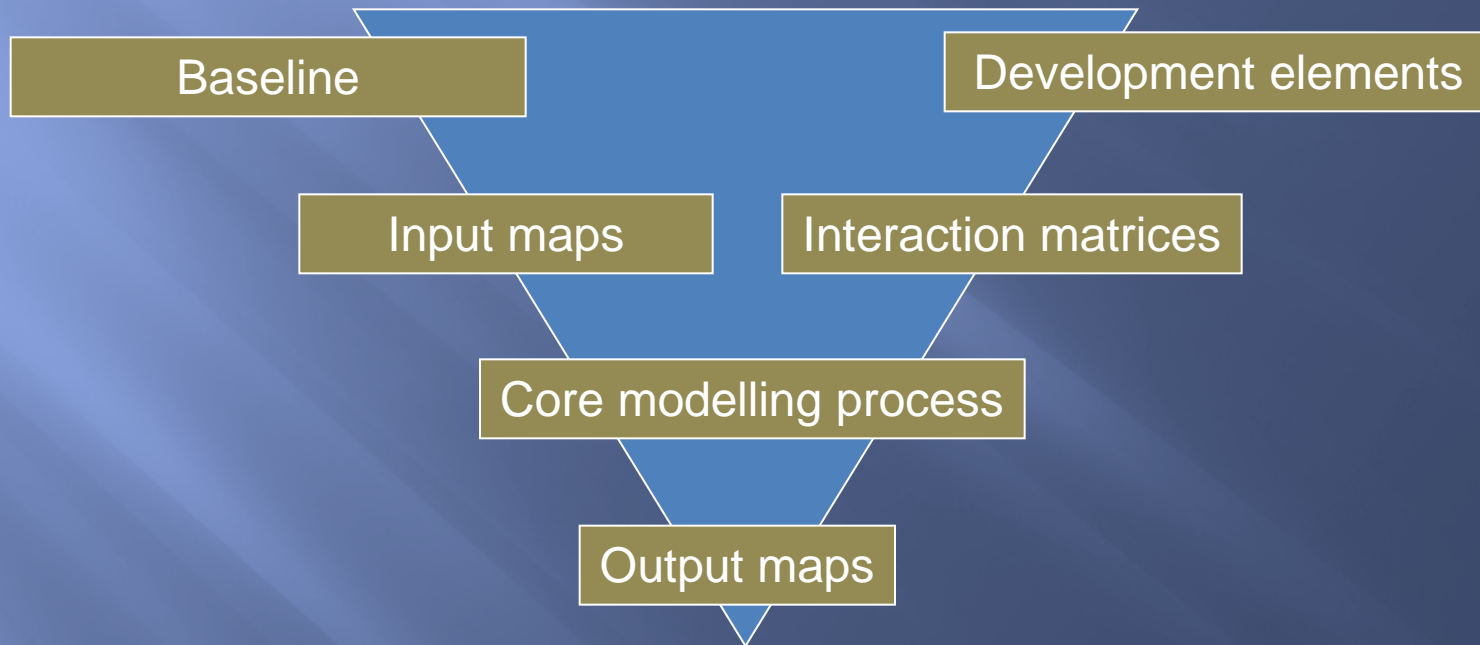


Functions



Attributes

Analytical framework structure



Function Mapping

- ▣ Representing How Well the Water Supports...
 - Ecology: e.g. Cetaceans, Pinnipeds, Kelp, Fish Species
 - Physical: e.g. Coastal Resilience/Erosion, Sediment
 - Social/Use: e.g. Fishing Effort, Navigation, Recreation, Visual



Cumulative Effects Structure

Services/Functions

Physical

Biological

Existing Use

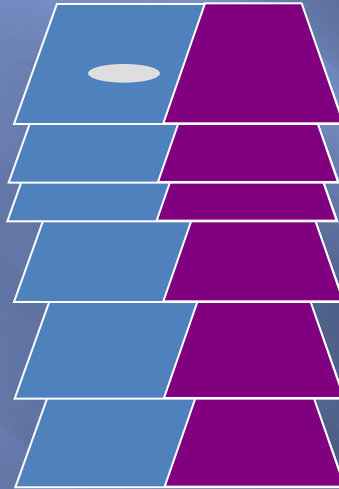
Social

Economic

Environmental receptors & functions

Possible areas of cumulative effects

Sensitivity normalized in relation to level of impact, risk or ecosystem & society services



Impact levels for the relevant activity, specific to the sensitivities in the defined area are collated



Environmental sensitivities & functions

Activities

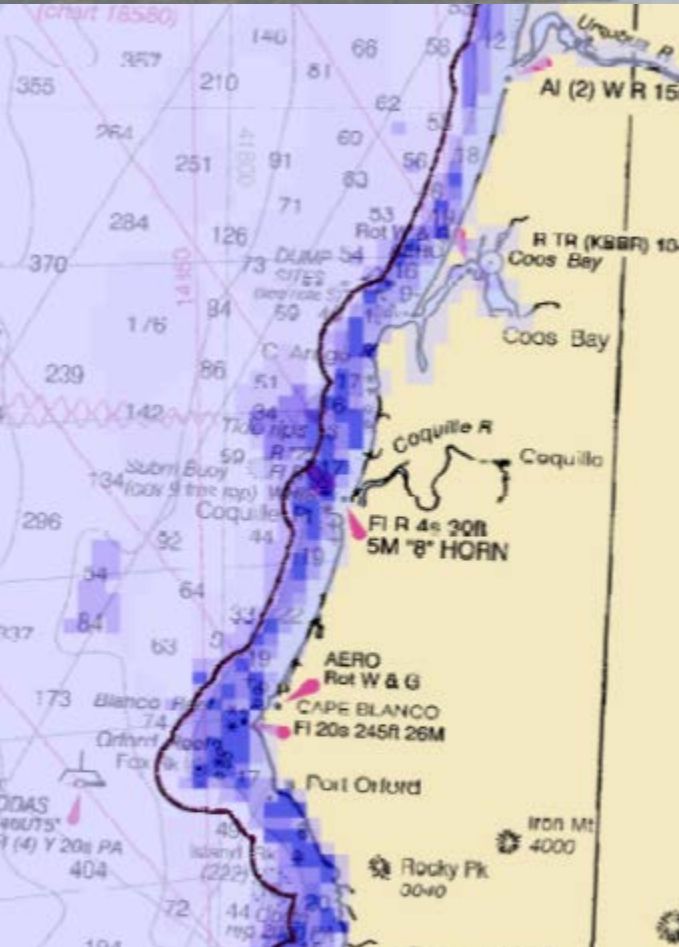
Devices

Supporting technology

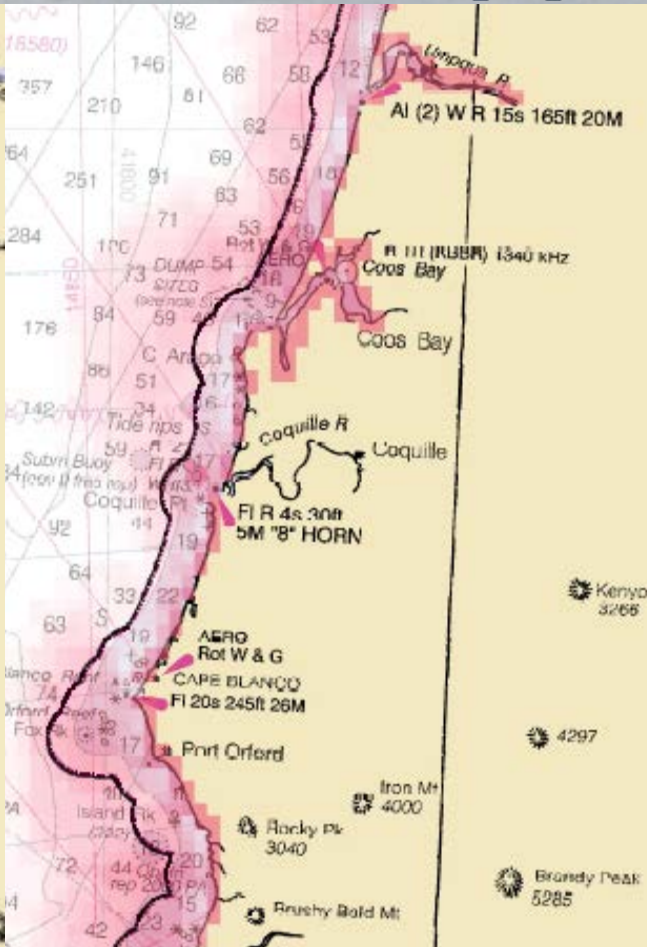
Associated operations

A series of Weighted Product Models (WPM) – Combined in Scenarios

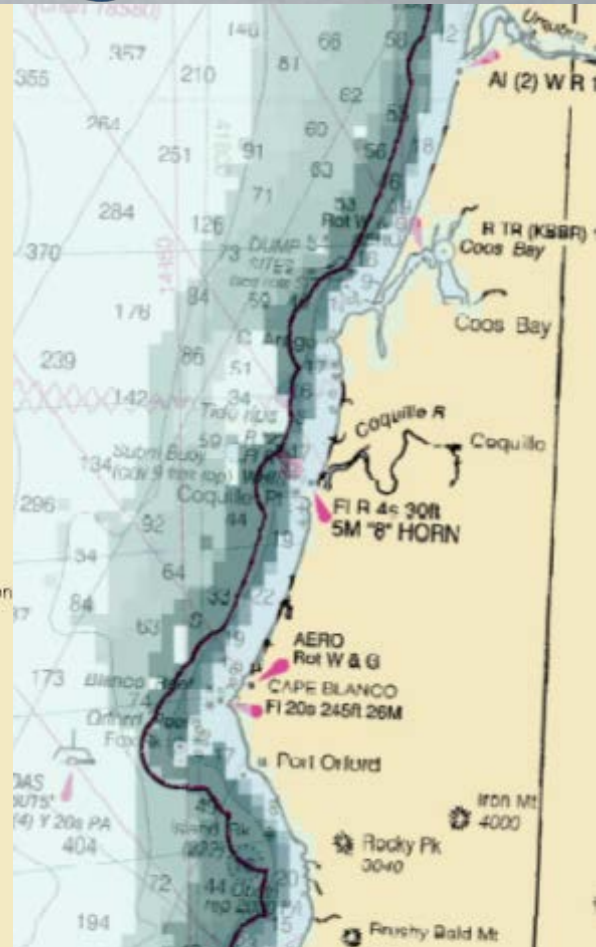
Function Mapping



Gray Whale Support



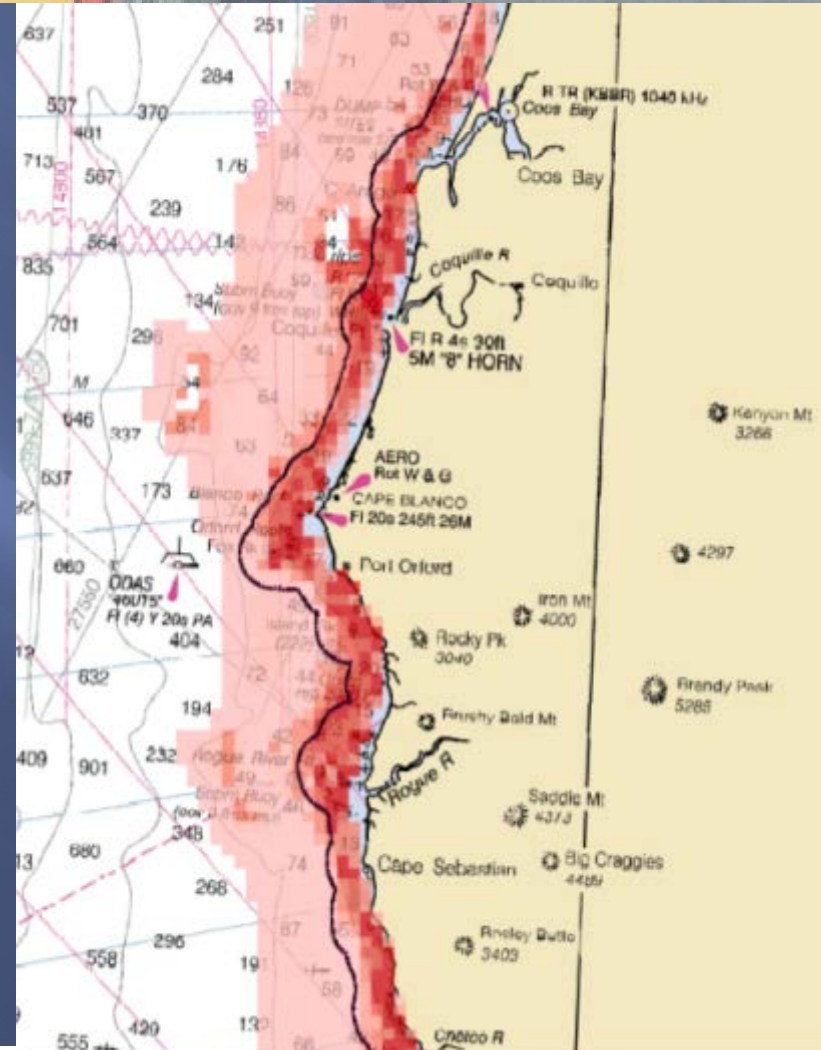
Visual Resources



Device Suitability

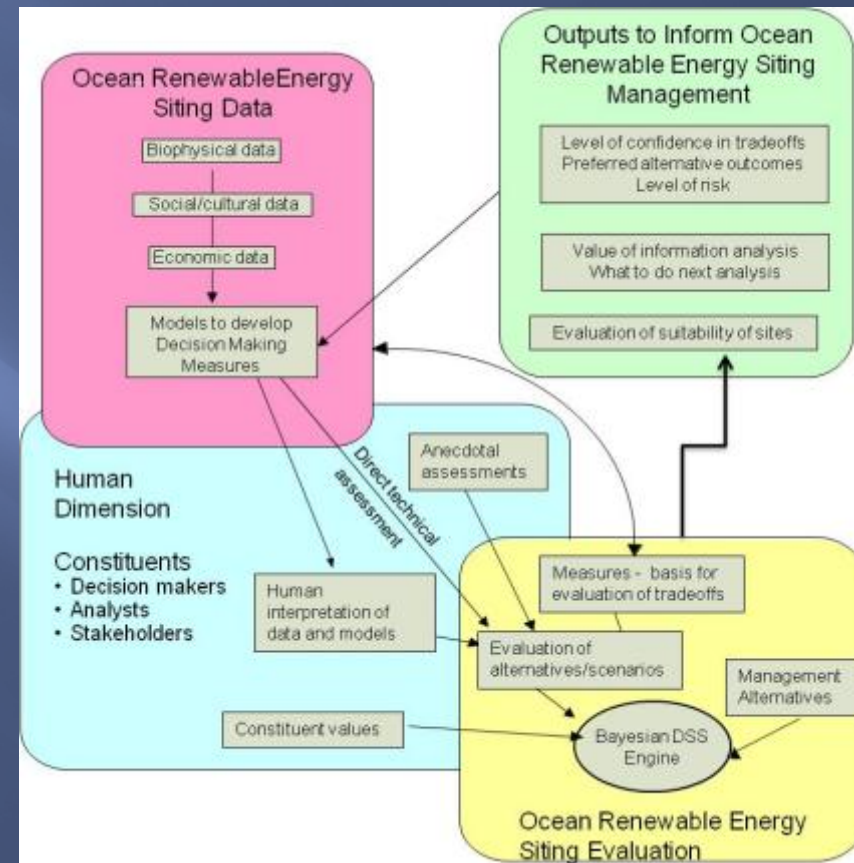
Combined Functions

- ▣ Scenario Based Analysis
 - Functions are related to other uses
 - Proposed Development Scenario related to functions
 - Combined impact delta from natural baseline for cumulative impact

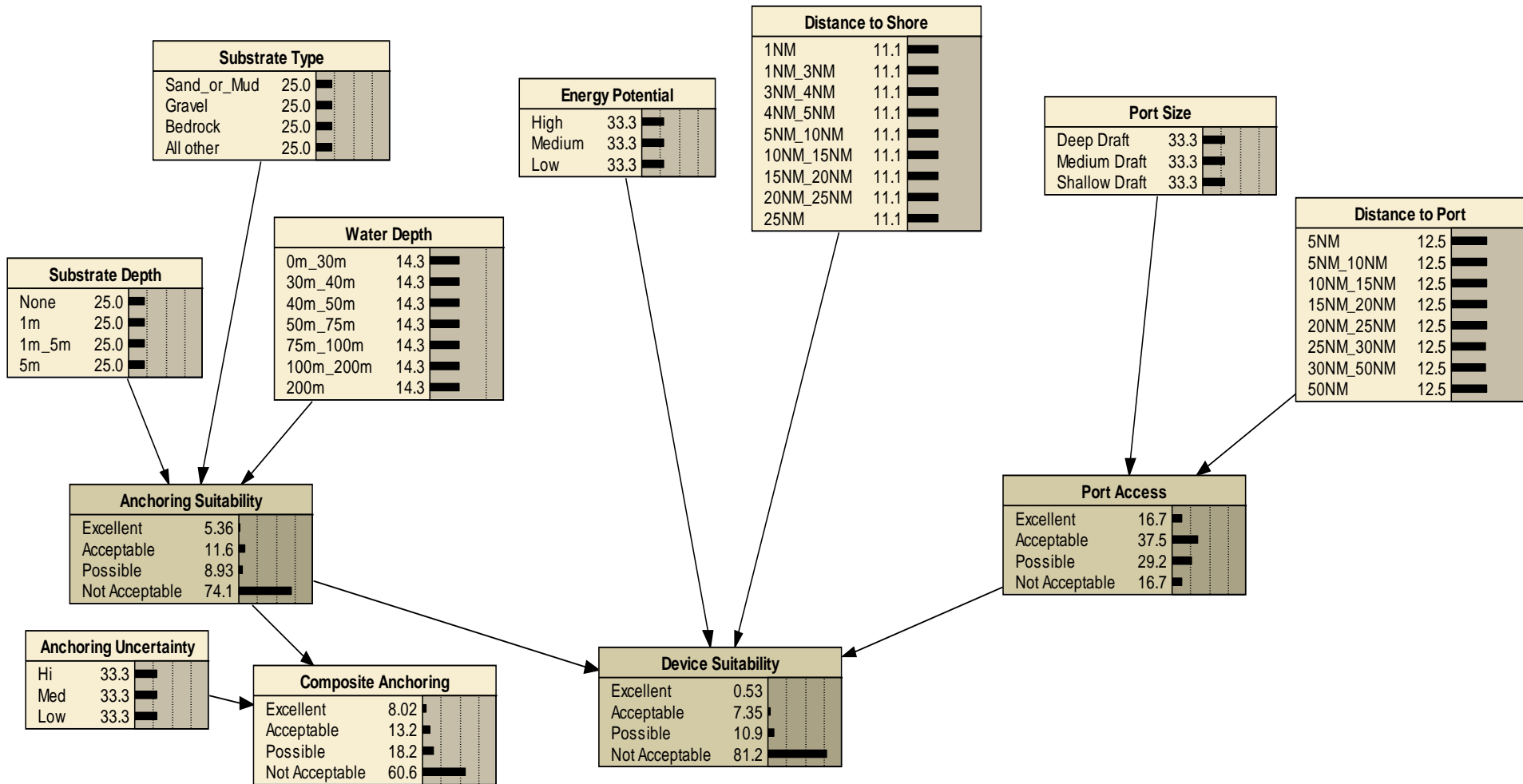


Bayesian Analysis

- ▣ Probability Driven
 - Conditional probabilities to capture complex uncertainty
- ▣ Partners
 - Oregon State University
 - Robust Decisions
 - The Nature Conservancy

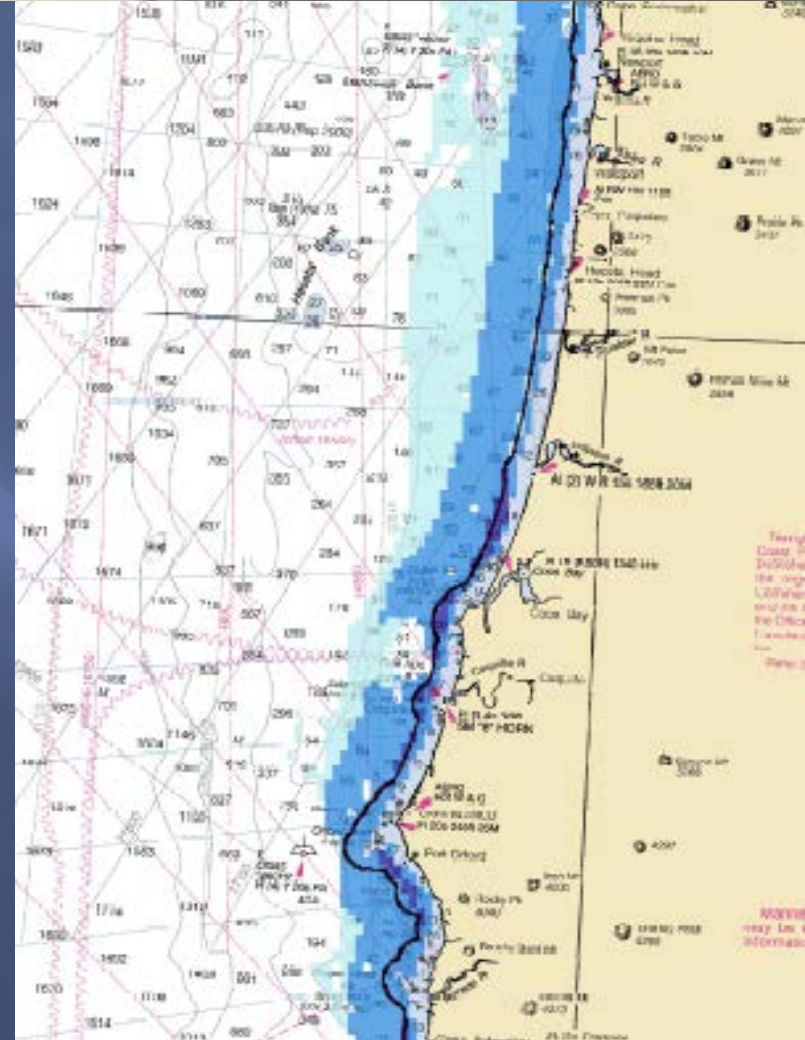


Bayesian Belief Networks

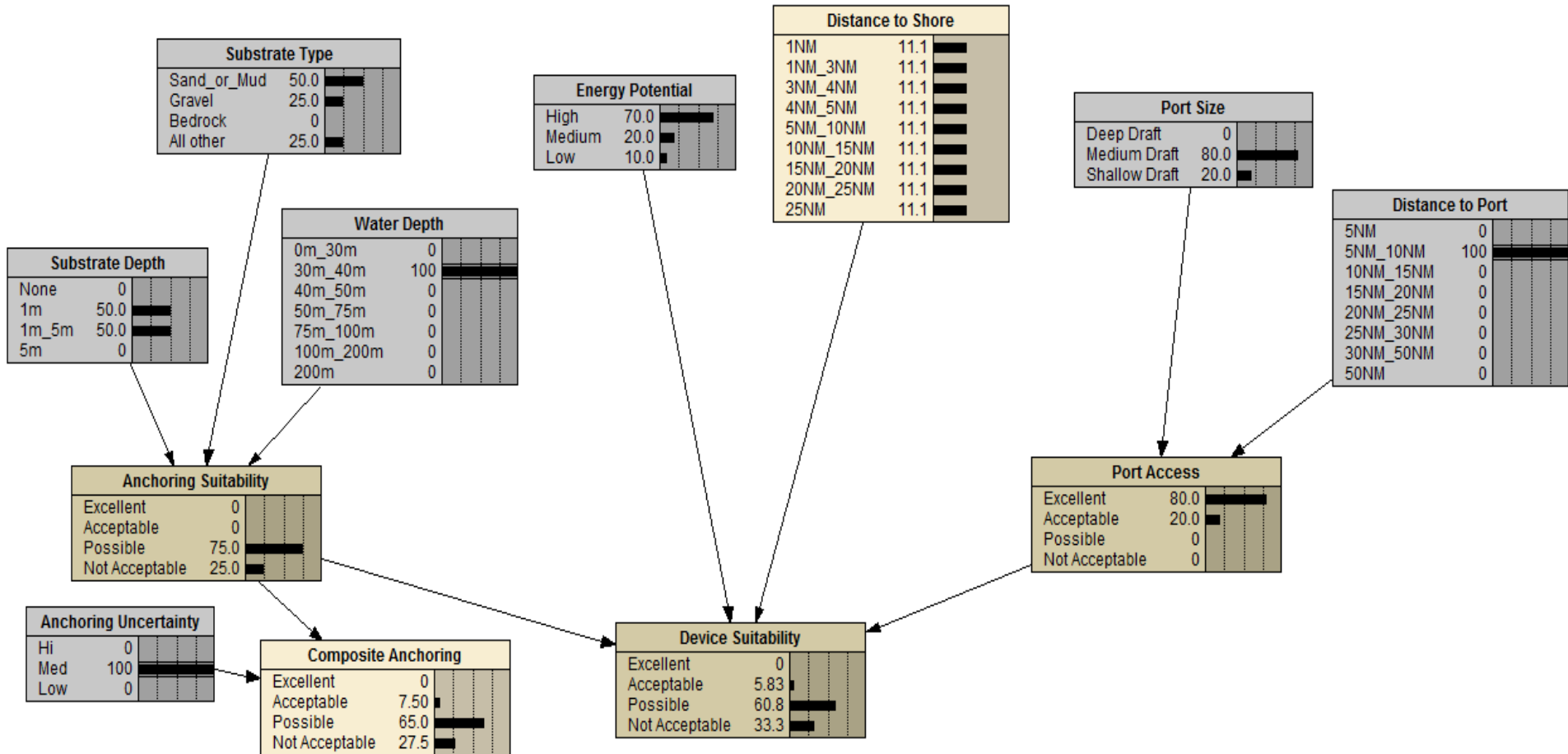


Guided Spatial Analysis

- ▣ Multiple Models and Inputs
- ▣ Various Reviewers
- ▣ Allows for Non-Existent Data

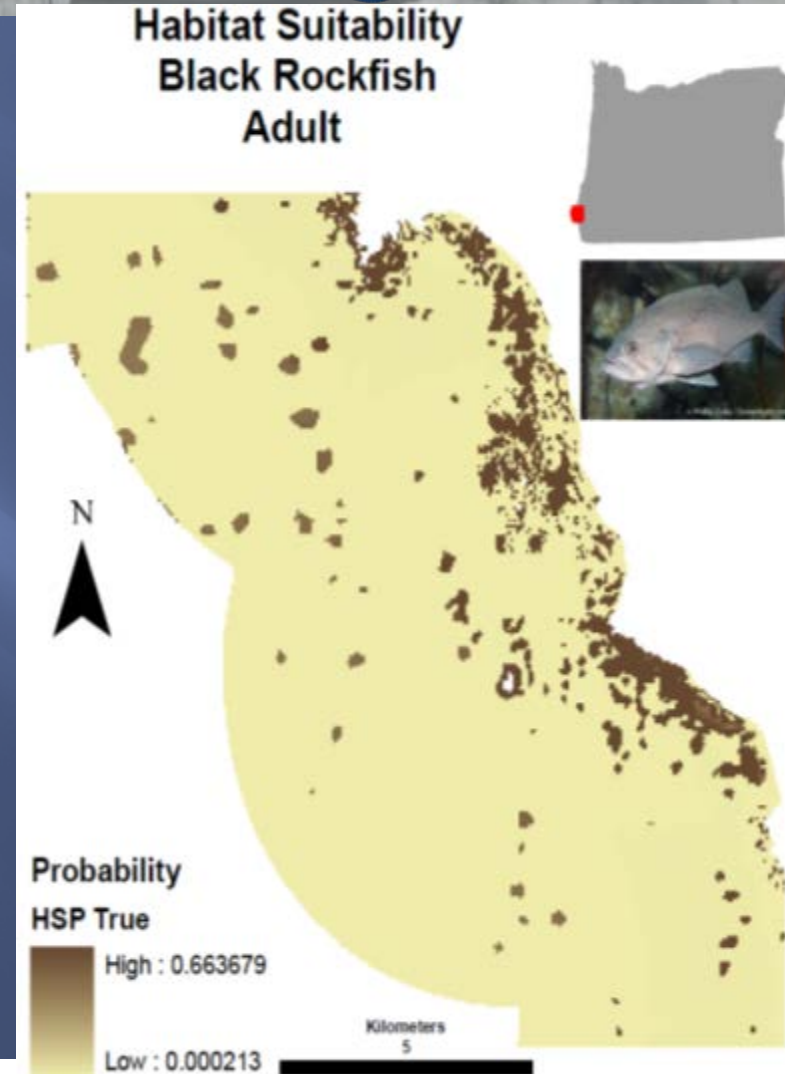


Partial Information Management



Ecological Modelling

- ▣ Black Rockfish Example
 - ▣ Two different bathymetry data sets (50M and 4M)
 - ▣ Different assumptions about habitat “believability”
- ▣ Manages uncertainty and varying data quality



Expert Input Drives Analysis

Netica - [anchor Table (in net pointabsorber_coded2)]

File Edit Table Window Help

Node: anchor Apply Okay

Deterministic Function Reset Close

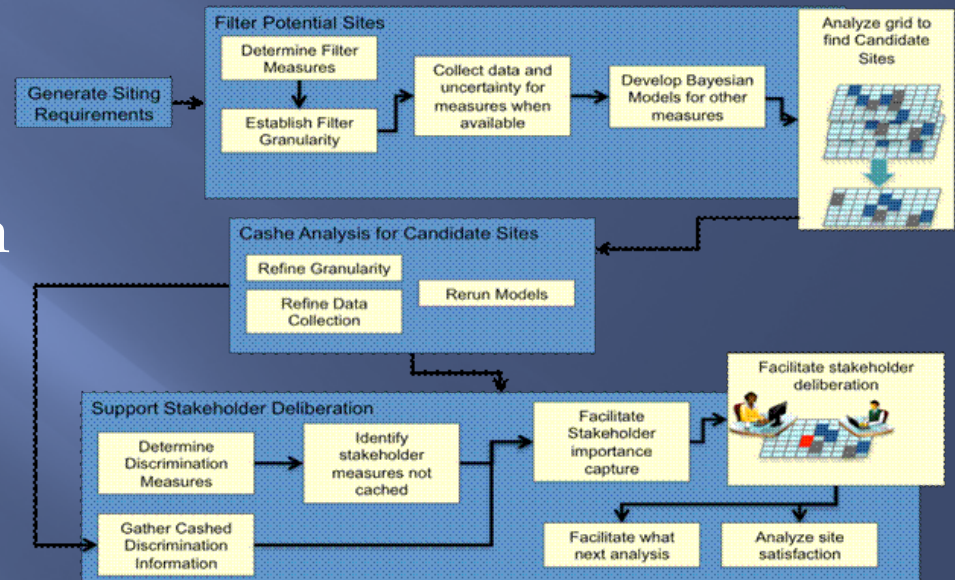
Water Depth	Substrate Depth	Substrate Type	Anchoring Suitability
30m_40m	None	Sand_or_Mud	Not Acceptable
30m_40m	None	Gravel	Not Acceptable
30m_40m	None	Bedrock	Not Acceptable
30m_40m	None	All other	Not Acceptable
30m_40m	1m	Sand_or_Mud	Possible
30m_40m	1m	Gravel	Possible
30m_40m	1m	Bedrock	Not Acceptable
30m_40m	1m	All other	Not Acceptable
30m_40m	1m_5m	Sand_or_Mud	Possible
30m_40m	1m_5m	Gravel	Possible
30m_40m	1m_5m	Bedrock	Not Acceptable
30m_40m	1m_5m	All other	Not Acceptable
30m_40m	5m	Sand_or_Mud	Acceptable
30m_40m	5m	Gravel	Acceptable
30m_40m	5m	Bedrock	Not Acceptable
30m_40m	5m	All other	Not Acceptable
40m_50m	None	Sand_or_Mud	Not Acceptable
40m_50m	None	Gravel	Not Acceptable
40m_50m	None	Bedrock	Not Acceptable
40m_50m	None	All other	Not Acceptable
40m_50m	1m	Sand_or_Mud	Acceptable
40m_50m	1m	Gravel	Possible

Conditional Probability Tables

- Engine for decisions
- Creates probabilities
- Allows for analysis of value of information

Final Tool

- Web-Enabled Tool for Decision Support
 - Collects preferences from reviewers
 - Presents spatial results from preferences
 - Supports informed alternatives analysis
 - 2012 Roll-out





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