WORK PLAN

A Biogeographic Assessment of the Channel Islands National Marine Sanctuary and Surrounding Areas:

A Review of Boundary Expansion Alternatives for NOAA's National Marine Sanctuary Program

Prepared
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By

NOAA/NOS/NCCOS
Center for Coastal Monitoring & Assessment
Biogeography Program

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GOAL

The National Oceanic and Atmospheric Administration's (NOAA) Biogeography Program (BP) will collaborate with the National Marine Sanctuaries Program (NMSP) to conduct a biogeographic assessment of the marine region surrounding the Channel Islands National Marine Sanctuary (CINMS). This assessment is being conducted, in part, to support CINMS Management plan revisions. The intent of this work is to assimilate and analyze relevant and comprehensive spatial data to evaluate potential implications of six boundary concepts that will be evaluated in an upcoming supplement to the management plan environmental impact statement (EIS). In addition, results of this assessment will be used to suggest additional alternatives that maximize benefit to living resources in the study area. Anticipated products and activities of this assessment will include: 1) a biogeographic analysis and development of a marine geographic information system (GIS) for the area; 2) a robust quantitative ecological "cost-benefit" analysis of boundary alternatives for resources in the study area (birds, mammals, fish, invertebrates, and habitats critical to those groups); and 3) support for the development of a custom GIS tool to support Sanctuary management for future analyses of biological resources under their purview.

OBJECTIVES

1. Identify and collect relevant biological and physical data sets in the study area necessary to conduct biogeographic analyses. Organize the data sets into a Geographic Information System (GIS).

2. Conduct a marine biogeographic analysis of available data to identify important ecologically significant regions and time periods, based on species distributions, abundance, associated habitats, and their ecological function. Produce a summary assessment report of the GIS analyses and results.

3. Evaluation of boundary alternatives in the context of biogeographic patterns observed in the seascape (see item 2 above).

4. Support development of a GIS capability/tool to assist sanctuary staff in developing and evaluating resource analysis scenarios.

5. Support ONMS staff in the integration of biogeographic assessment products into the revisions of the sanctuary management plan and supplemental EIS on boundary change.

BACKGROUND

The Channel Islands NMS was designated as a Sanctuary in 1980 and encompasses an area of approximately 1,252 square nautical miles (NM) of rocky coastline, kelp beds, and sea floor. The Sanctuary extends from mean high tide seaward to a distance of six NM offshore of the following islands and offshore rocks: San Miguel Island, Santa Cruz Island, Santa Rosa Island, Anacapa Island, Santa Barbara Island, Richardson Rock, and Castle Rock. These islands and offshore rocks are located offshore from Santa Barbara and Ventura Counties in southern California. The waters surrounding the Channel Islands were selected as a Sanctuary due to their unique geological formations, dynamic oceanographic processes, rich and productive natural resources, and cultural significance. At the time of Sanctuary designation, its boundaries extended from mean high tide offshore to a distance of six nautical miles. This area was selected to provide adequate protection of these resources given the limited information on the spatial distribution of threats, uses, biota, and habitats that was available at the time.

The NMSP is currently in the process of updating the management plan for the CINMS. The management plan has not been updated since 1983, and the status of natural resources and their management issues in and around the sanctuary has since changed, as well as the information base that was known at the time. As a supplement to the management plan review process, the NMSP and CINMS will evaluate a series of alternatives for adjusting CINMS boundaries, including the six boundary concepts developed previously (see the CINMS management plan website: http://www.cinms.noss.gov/marineres/manplan.html). These alternatives have not yet been rigorously assessed from a biogeographic perspective. Identifying how these alternatives correspond to the distribution of critical biotic and habitat resources is a necessary component of assessing the potential efficacy of Sanctuary management objectives. Since the time of original designation, a wealth of *in situ* studies, local assessments (e.g., marine reserves analyses), and advancements in remote sensing have provided a variety of new spatial data that can be used to support and justify the selection of a boundary alternative.

PROJECT OVERVIEW

The NCCOS Biogeography Program, in consultation with CINMS and NMSP, will conduct a spatially-articulated characterization of the Channel Islands ecosystem and surrounding areas, extending in the north from Morro Bay to 30 kilometers south of Santa Catalina Island. Figure 1 shows the expected study extent for this assessment. This will then be examined in relation to the proposed boundary alternatives. The assessment will begin by gathering existing spatially explicit biological and environmental data. Data extent, quality, and position relative to boundary alternatives will be evaluated. Modeling, data integration, and a quantitative assessment of biotic and habitat resources will be produced for each boundary alternative. Based on existing and available biogeographic information from NOS and other institutions, and discussions with NMSP staff on their management requirements, the BP staff plans to assemble and analyze biological data on the spatial and temporal distribution of important species and their habitats. The results of this work will be used to identify potentially important ecological areas and time periods relevant to evaluating boundary expansion alternatives. The BP will only analyze biological, geological, and physical oceanogeaphic data as part of this assessment, and does not intend to include other boundary analysis criteria under consideration by NOAA/NOS/NMSP management (e.g., socioeconomics, management feasibility, etc.).

This work will complement and build upon a similar effort currently being conducted by the BP for three sanctuaries in central California (Cordell Bank, Gulf of the Farallones, and Monterey Bay National Marine Sanctuaries). The biogeographic assessment for these three sanctuaries was conducted to identify important biological zones, time periods, and ecological linkages within an analysis area that extends from Point Arena in the north to Point Sal in the south. Furthermore, this study will incorporate data and information from a comprehensive west coast assessment completed by NOS in the late 1980s that resulted in the "West Coast of North America, Coastal and Ocean Zones, Strategic Assessment: Data Atlas". This Atlas contains maps of key biological, physical, and economic characteristics of the marine environment of the West Coast. The Atlas complemented the BP's Estuarine Living Marine Resources Program (ELMR) studies to define the biological and physical characteristics of adjacent estuarine systems, and included biogeographic analyses to define estuarine assemblages and inshore-offshore linkages between ecosystems (Pattillo et. al 1997, Emmett et al. 1991, Monaco et al. 1992).

Questions to be addressed by this study include:

1. What data currently exists allowing NMSP to identify regions of importance to species, communities, and ecosystems both inside and outside of the study extent described above

2. Does an analysis of existing data reveal biologically meaningful and statistically significant patterns in the distribution of marine associated fauna and flora?

3. Which habitats and locations are unique and productive (e.g. high diversity), and how are these areas utilized by living marine resources?

4. Where existing data is insufficient to address the above questions, can we model potential distribution patterns (occurrence likelihood) to aid in the assessment?

5. How do these patterns and trends relate to the six boundary concepts previously developed?

6. Are there consistent trends in the analysis that would suggest further alternatives beyond the six boundary concepts previously developed?

7. What significant gaps exist in our knowledge and information of biological and physical characteristics of the study area?

PROJECT TASKS

Below are brief descriptions of the major tasks planned for this biogeographic assessment. Please refer to **Figure 2** for a diagram of the proposed process, and the "**schedule**" section for a timeline for completing the assessment.

Task 1. Workplan & Project and Implementation
(Estimated Completion Date: 4-18-03)

There will be several meetings with BP and NMSP and CINMS staff to refine the objectives, tasks, and products in the work plan. As such, this workplan should be considered a "living document" that will be modified during the early phases of this project to reflect the agreed upon refinements. This work plan will describe the overall project and serve as a blueprint for implementation. Although specific products are identified in this work plan, final products will depend on the quality, quantity, and availability of data for analysis. Hence, close collaboration with CINMS and NMSP staff will be required to ensure the Biogeography staff is well-informed on the resource management priorities and broader boundary analysis process for NMSP to assure that the BP staff has selected the most appropriate species, habitat types, and data sets for analysis. Once the preliminary objectives and products are defined and finalized, data collection and biogeographic analyses (described below) will be structured to address the study questions. The BP stands committed to work closely with NMSP staff to integrate study findings into a "decision-making" process to be used in the frame of braoder analysis options under consideration.

Task 1 Products:
• A preliminary list of deliverables
• A preliminary list of important species for consideration
• A final workplan

Task 2. Initial Data Collection
(Estimated Completion Date: 5-16-03)

The primary path for identifying relevant data sets for biogeographic analysis will be through telephone surveys with sanctuary staff and other regional biological experts and also through the meetings described in Task 3. To a lesser extent, data also will be collected through searches of peer reviewed literature, internet offerings, and by review of unpublished data (e.g. gray literature). In addition, the Biogeography Program will assess the utility of NOS data holdings to determine which data sets are useful for this analysis.

Task 2 Products:
• List of contacts to meet with during March 2003 data reconnaissance trip (task 3)
• Preliminary data inventory (master list)

Task 3. Additional Data Collection
(Estimated Completion Date: 6-20-03)

CINMS is sponsoring a monitoring meeting in March 2003 to convene local experts in the study region to develop a comprehensive inventory of monitoring activities currently ongoing in and around the CINMS.

BP staff will attend these meetings to gather any additional biological and/or oceanographic data that may prove useful for the project.

Task 3 Tasks/Products:
- Attend March monitoring meetings in Santa Barbara
- Develop inventory of newly acquired data and contacts

Task 4. Preliminary Assessment, Data Formatting, and Selection of Analytical Techniques
(Estimated Completion Date: 7-31-03)

Once data sets are obtained they will be formatted and organized into a preliminary database management system (DBMS) and GIS to assess their quality and content. All data acquired and used for the assessment will be standardized by BP staff into a common spatial projection. A commonly used standard is the "geographic" projection using the NAD83 datum. BP staff will consult with CIMNS staff on the preferred projection and datum. As data are standardized, BP staff will make them available through a project website where allowable by the source agency (see Task 9). This will allow CINMS staff and other interested scientists access to a significant volume of spatial data for quick and easy use on other projects.

With the DBMS and GIS in place, BP staff will evaluate and select analytical techniques that are most appropriate to use for the data collected and the desired products. Certain data sets may be synthesized in order to create complete data layers that span the study area. An effort must be undertaken to determine if and where independent biological and physical databases can be integrated or synthesized into new databases that support the biogeographic analyses. **Figure 2** shows the general analytical process that will be implemented. The analyses may range from simple presence/absence of species in specific raster-based cells to complex statistical analyses, such as canonical correlation analysis to define spatial relationships between animal distributions and habitats (**Figure 3**). The variety and limitations of the various data sets are expected to have a major influence on the character of the biogeographic analyses. A preliminary approach to analysis will be presented to selected CINMS/ NMSP and its advisors for comment and approval. Once the optimal approach to analysis and data manipulation has been identified, all data will be migrated into the appropriate DBMS and GIS format to conduct the biogeographic assessment.

Task 4 Products:
- A brief report and presentation describing the preliminary data collection and assessment.
- Standardized spatial data compendium (DBMS-GIS)

Task 5. Data Analysis
(Estimated Completion Date: 10-31-03)

The BP staff will conduct a set of biogeographic analyses to identify areas (and time periods) of key biological based on: the availability of data sets; species distributions; species life history requirements and habitat affinities; the distribution of habitats; and measures of community structure (e.g., species diversity). The complexity of these analyses will depend on the content and quality of the data sets collected described in task 4. Once a series of comprehensive spatial analyses have been performed, results will be "sampled" into each of the boundary alternatives. Statistical comparisons will be made to evaluate the relative "cost/benefit" of each alternative to biological resources in the study area. This will include a discussion of parameter estimates "included" in one boundary relative to another, and to areas outside the specific boundary, but still inside the overall study area. Where data permits, these analyses shall be performed for phytoplankton, kelp, fishes, invertebrates, birds, mammals, and habitat features (e.g., bathymetry, temperature profiles, currents, etc.). Furthermore, all data will be integrated into a spatially-articulated index in an attempt to evaluate overall spatial patterns. This index will be defined after we have a complete inventory of the data available and appropriate for analysis. An example index might include an integrated spatial estimate of biological "hot spots" using parameters of community structure for multiple taxa (e.g., species diversity and evenness for birds, fishes, mammals, etc.)

Task 5 Products:
- Quantitative and qualitative assessment results that identify biogeographic patterns and bio-physical interrelationships of single species, species assemblages, and measures of community structure within the study area defined by available data.
- Quantitative and qualitative assessments describing the physical and oceanographic character within the study area (e.g., acreage of kelp, distribution of bathymetric estimates, substrate distributions, etc.)
- Comparisons of the above results among the five boundary alternatives

Task 6. Developing GIS Products for Review
(Estimated Completion Date: 12-19-03)

Draft species, habitat, and analysis maps (e.g. species richness, diversity) coupled with statistical results will be made available to CINMS NMSP staff, interested members of the SAC, and other experts for review in a workshop format. In addition, a report will be developed that provides interpretation of the results of the biogeographic GIS analyses in non-scientific terms that can be easily integrated into the management plans. A list of specific questions and comments will be provided to reviewers to obtain feedback on specific areas of the analysis.

Task 6 Products:
- Interim analytical results (maps, statistical results) from the biogeographic GIS (workshop)
- A database on habitat affinities and utilization for selected species
- Comparisons of results among the 6 boundary alternatives
- A list of comments and questions for reviewers
- A map and/or list of data gaps
- A brief status report

Task 7. Incorporate Review Comments and Present/Deliver Final Results
(Estimated Completion Date: 5-14-04)

Once products have been reviewed by selected CINMS/NMSP staff and other experts, the BP staff will incorporate review comments and prepare final products in an appropriate format for inclusion in supplements to the CINMS management plan.

Task 7 Products:
- A final summary report describing the analysis, results, and interpretation of the results
- A GIS on species, habitats, and important biological areas in the study area
- A DBMS with data and information on species and habitats
- A map and/or list of data gaps

Task 8. Enhancing NMSP Analytical GIS Capabilities – Support in Developing a GIS Tool – MarIS
(Estimated Completion Date: 5-28-04)

GIS data to display the results of the biogeographic assessment, and enable additional analyses of species and habitat management alternatives will be provided. These data would be provided in a format consistent with a GIS tool (MaRIS) recently developed for the sanctuaries by NOS' Coastal Services Center (CSC). At a minimum, these data contained within the MaRIS system can be used in outyears to conduct the biogeographic analysis and allow simple manipulation of those data layers.

Task 9 Preliminary Products:
- Draft concept and design of GIS tool
- Develop scope of work to modify existing tools developed by CSC

Task 9. A Web Site for the Biogeographic Assessment
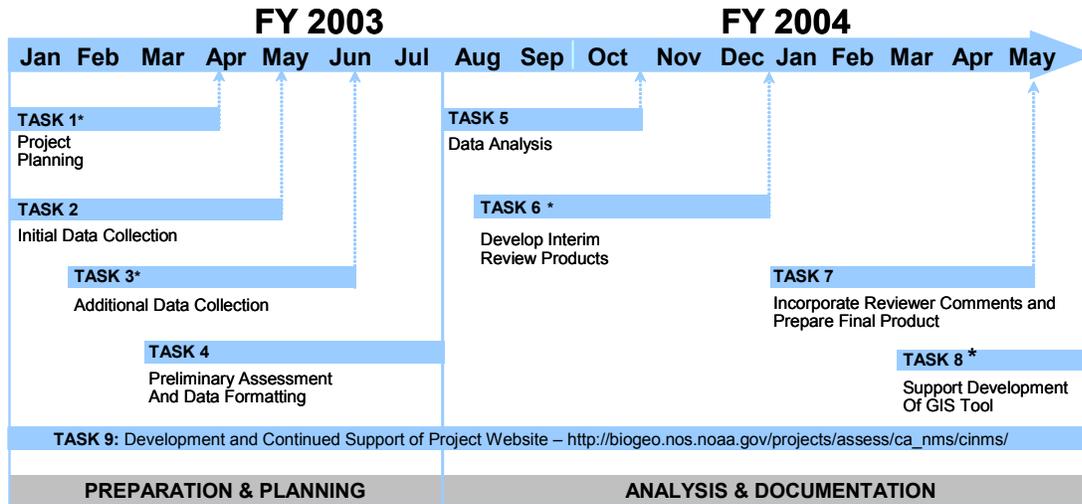(Estimated Completion Date: Ongoing throughout the duration of the project)

This web site provides background information, updates, and interim products on the CA Biogeographic Assessment. It will also be used for analytical and product review. Visit the web site at:
http://biogeo.nos.noaa.gov/projects/assess/ca_nms/cinms/

PROJECT PERIOD
January 2003 through May 2004

SCHEDULE

FY 2003									FY 2004							
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May

TASK 1*
Project Planning

TASK 2
Initial Data Collection

TASK 3*
Additional Data Collection

TASK 4
Preliminary Assessment And Data Formatting

TASK 5
Data Analysis

TASK 6 *
Develop Interim Review Products

TASK 7
Incorporate Reviewer Comments and Prepare Final Product

TASK 8 *
Support Development Of GIS Tool

TASK 9: Development and Continued Support of Project Website – http://biogeo.nos.noaa.gov/projects/assess/ca_nms/cinms/

PREPARATION & PLANNING	ANALYSIS & DOCUMENTATION

* Denotes Anticipated Site Visit by BP Staff

PROJECT TEAM

The Biogeography Team of the National Centers for Coastal Ocean Science (NCCOS) will lead this collaborative effort. Other project members include staff from the Office of National Marine Sanctuaries and the Channel Islands National Marine Sanctuary. Additional support and guidance will be provided by the Channel Islands National Marine Sanctuary Advisory Council (SAC), biogeographic assessment sub-committee.

<u>**Contact Information**</u>

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BUDGET & PERSONNEL ALLOCATIONS
Please refer to table 1 for the expected budget (by task item), and table 2 for the expected allocation of personnel (also by task).

REFERENCES

Brown, S.K., K.R. Buja, S.H. Jury, M.E. Monaco, and A. Banner. 2000. Habitat suitability index models for eight fish and invertebrate species in Casco and Sheepscot Bays, Maine. North American Journal of Fisheries Management 20:408-435.

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Rubec, P.J., J.C.W.Bexley, H.Norris, M.S. Coyne, M.E. Monaco, S.G. Smith and J.S. Ault. 1999. Suitability modeling to delineate habitat essential to sustainable fisheries. American Fisheries Society Symposium 22:108-133.

FIGURES

Figure 1. Proposed study region, extending in the north from Morro Bay to 30 kilometers south of Santa Catalina Island.
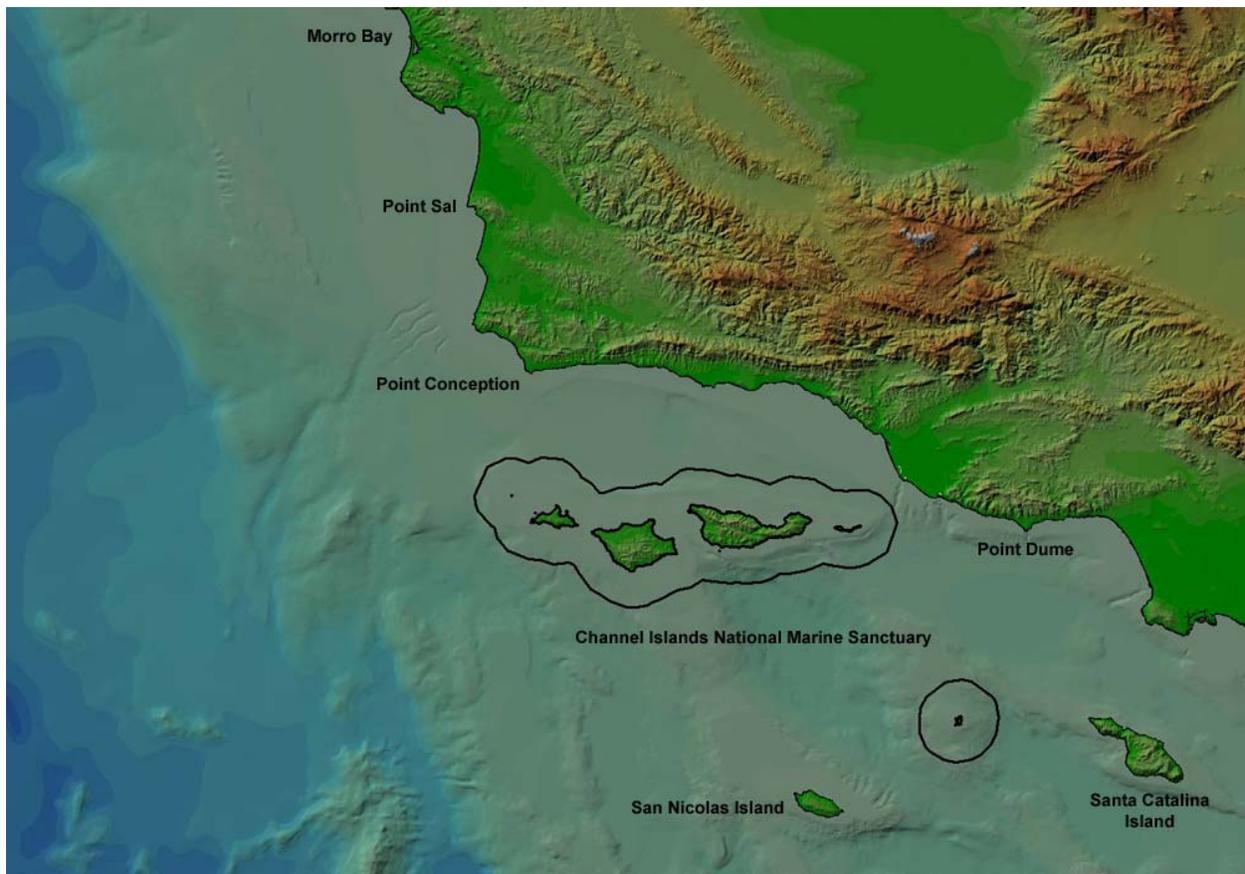
Figure 2. NOS's biogeographic assessment approach
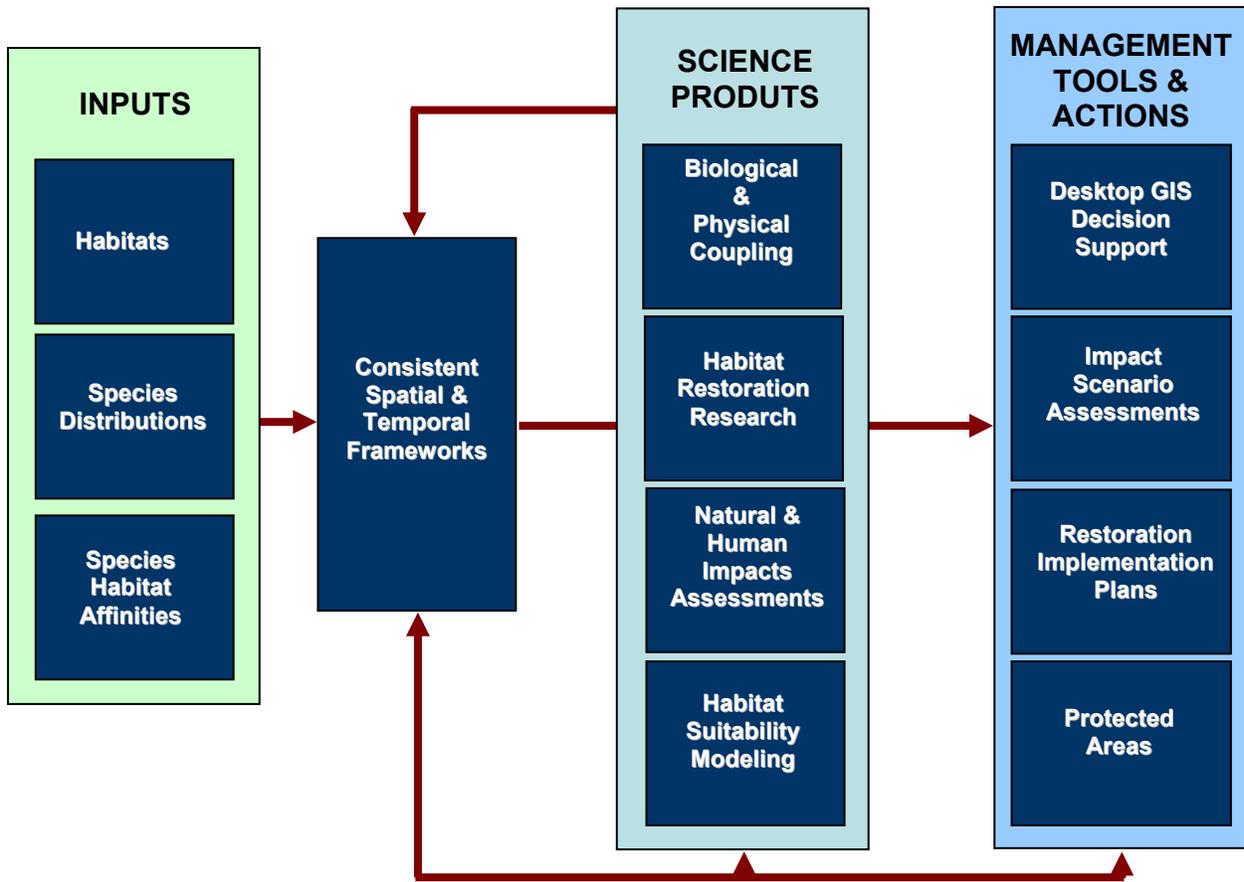
Figure 3. Forecasting important biological areas - example model input and output. This example shows the results of predicting fish diversity within a seascape using the solution from a robust statistical technique (canonical correlation). Diversity is predicted based on the inter-correlations between measures of fish community structure and variables of physical habitat (e.g., bathymetry, substrate type, bathymetric variance, etc.).
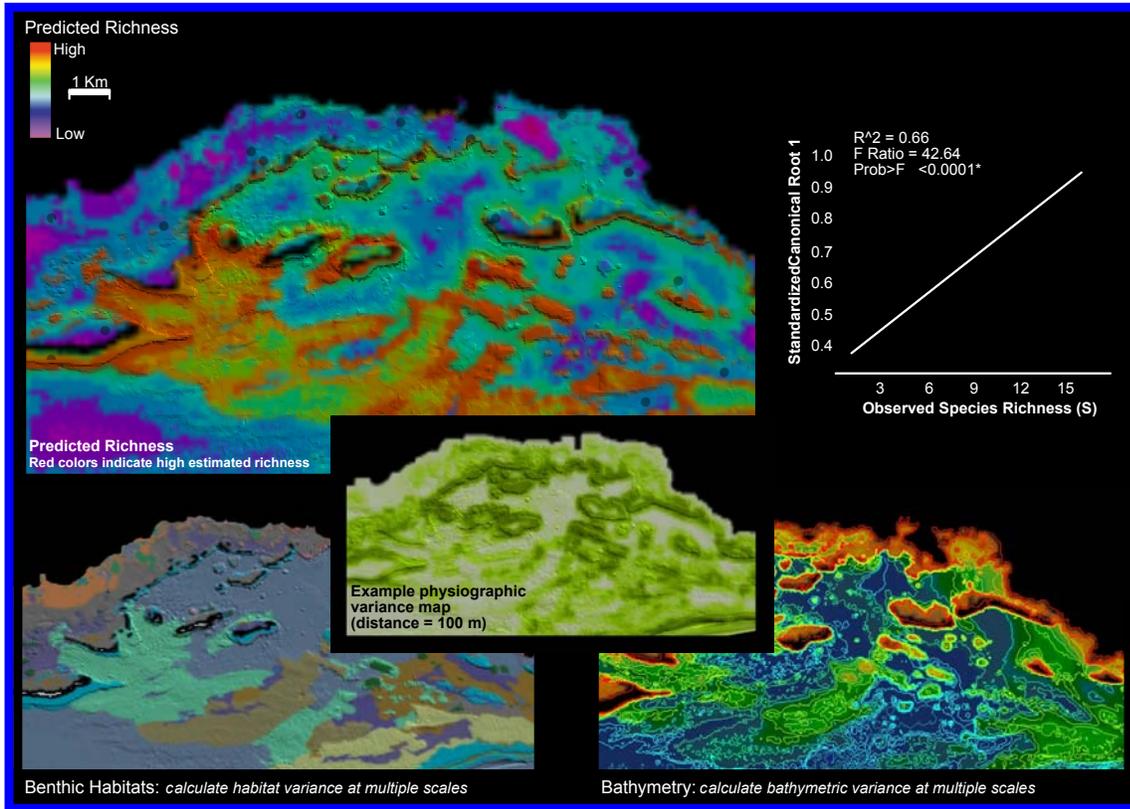
Table 1. Anticipated project budget (in thousands of dollars). Numbers in bold indicate FY03 expenditures, numbers in italics indicate FY04 expenditures (also denoted with asterisk).

	Contract Labor	Travel	Supplies and Equipment	TOTAL
Task 1: Project Planning	15	6	0	21
Task 2: Initial Data Collection	30	9	0	39
Task 3: Additional Data Collection	30	9	0	39
Task 4: Preliminary Assessment	40	6	5	51
Task 5: Data Analysis	45	6	4	55
Task 6: Interim Product*	*30*	*9*	*2*	*41*
Task 7: Final Product*	*30*	*6*	*4*	*40*
Task 8: GIS Support*	*0*	*0*	*0*	*0*
Task 9: Website Maintenance*	*5*	*0*	*0*	*5*
FY 03 Totals	**160**	**36**	**9**	**205**
FY 04 Totals	**65**	**15**	**6**	**86**
GRAND TOTAL	**225**	**51**	**15**	**291**

Table 2. Personnel allocation for CINMS and NCCOS by task item. An "X" denotes expected participation in the task. Names in *italics* (also denoted by asterisk) indicate NCCOS contract personnel that relate back to the contract costs in table 1. Percent of time per person is listed on the right. Base rate for calculating contract cost is $135K/year for one FTE (includes salary, benefits, overhead, and travel for one GS-12 equivalent).

	Task 1: Project Planning	Task 2: Initial Data Collection	Task 3: Additional Data Collection	Task 4: Preliminary Assessment	Task 5: Data Analysis	Task 6: Interim Product	Task 7: Final Product	Task 8: GIS Support	Task 9: Website Maintenance	Percent of Time
John Christensen	x	x	x	x	x	x	x	x	x	45%
Larry Claflin				x	x	x	x			25%
Michael Coyne			x	x	x	x	x		x	25%
Ken Buja						x	x	x		25%
Jamie Higgins						x	x		x	10%
Mark Monaco	x					x	x			10%
Marcia Orencia						x	x		x	10%
Matt Kendall	x					x	x			5%
Tim Battista								x		5%
Chris Caldow*	x	x	x	x	x	x	x			35%
Jenny Waddell*				x	x	x	x	x	x	25%
Wendy Morrison*			x	x	x	x	x			25%
Olaf Jensen*			x	x	x	x	x			25%
Chris Jeffrey*				x	x	x	x	x	x	15%
Chris Mobley	x					x	x			2%
Ben Waltenberger	x	x	x		x	x	x	x		5%
Sarah Fangman	x	x	x		x	x	x			2%
Michael Murray	x					x	x			3%
Sarah MacWilliams	x					x	x			3%