**Northeast Regional Conservation Needs Program: Topic 1**

Project Title:

**Development of a Northeast Regional Coastal and Marine Ecological Classification Standard**

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**Funds Requested: $100,000**

**Project Summary**

This project will integrate NOAA and NatureServe’s Coastal and Marine Ecological Classification Standard (CMECS) and the Nature Conservancy and NatureServe’s Northeast Regional Habitat Classification System (NRHCS) in order to extend the latter system to estuarine and marine environments from Maine to Virginia. Several commonalities already exist between the two schemes; namely each has a multi-scale hierarchical framework, relies on structural environmental features, and seeks to convey physical-biological linkages. Making CMECS and NRHCS compatible will bring appropriate specificity to the application of the national CMECS standard to the region. We will coordinate with state, academic, and non-profit partners to identify and cross-walk existing state marine classification systems. Since CMECS is still in draft form, our aim is to work closely with the CMECS implementation group to appropriately apply CMECS and to provide feedback regarding thresholds and units. Lastly, we will examine the scalability of this classification by conducting pilot mapping projects at three different scales relevant to planning and conservation efforts. At the smallest scale (1:5,000,000), we will apply the classification to the Nature Conservancy’s 2010 Northwest Atlantic Marine Assessment. An intermediate-scale classification (1:250,000) will utilize datasets assembled for marine spatial planning efforts in Rhode Island, Massachusetts, and adjacent federal waters. Finally, we will classify estuary-specific, high-resolution information for Boston Harbor (1:5,000 scale). These pilots will allow us to assess the ability of CMECS to convey consistent ecological data across relevant scales. Workshops and phone meetings will happen in the first year followed by the pilot efforts in the second year.

**Development of a Northeast Regional Coastal and Marine Ecological Classification Standard.**

This proposal addresses **Priority #1** *Develop Regional Base Maps for Analyses of NE SGCN Data*

**Product:** The primary product of this proposal is an extension of the existing Northeast Regional Habitat Classification System into estuarine and marine environments using the Coastal and Marine Ecological Classification Standard (CMECS). The final report will include a description of the CMECS units and thresholds specific to the Northeast Region, and a description and justification of any units and thresholds that are different than those within the most current version of CMECS. These will be developed by a collaborative team of scientists from state Fish and Wildlife agencies, state coastal zone management agencies, academia, and private conservation organizations. Additionally, maps showing the extent and location of benthic habitats as defined by the classification system will be prepared at three different scales, based on datasets compiled by The Nature Conservancy (TNC) for the Northwest Atlantic Marine Assessment, the State of Rhode Island, and the Commonwealth of Massachusetts.

**Geographic Extent:** The area covered in the report will include all coastal states from Maine to Virginia, extending from the intertidal zone to the base of the shelf-slope break. This area includes two distinct marine ecoregions – the Acadian (Gulf of Maine/Bay of Fundy) and the Virginian (Spalding et al. 2007). These are nested within the larger Cold Temperate Northwest Atlantic Province, and the Northeast Continental Shelf Large Marine Ecosystem (Spalding et al. 2007, Figure 1).

**Background**: This proposal builds and expands on several previous NEAFWA projects and TNC projects. We will build on the RCN 2008 *Creation of Regional Habitat Cover Maps: Application of the NE Terrestrial Habitat Classification System* and its predecessor SCWCSP 2007 *Regional Habitat Maps - A Foundation for Proactive Conservation Projects.* In these projects we developed classification systems for wildlife habitats and stream reaches and used those classifications to create regional maps. These maps unified the various classification approaches used in developing state wildlife action plans (SWAP) allowing for scientists to examine the location, condition and conservation status of similar ecological features across the region regardless of state boundaries.

These maps, and the Northeast Regional Habitat Classification System, do not currently extend into estuarine and marine environments. The need for a standardized approach to classifying marine habitats resulted in the development of the Coastal Marine and Ecological Classification Standard (CMECS). This standard has been in development for approximately ten years (Madden et al. 2005), and version 3.1 is in the review stages for inclusion as a Federal Geographic Data Committee (FGDC) standard. It is informed by several existing classifications which are local or regional in nature, including Greene et al. 1999, Valentine et al. 2005, and Connor et al. 2006. CMECS is currently not a formally accepted standard, and discussions with members of the interagency implementation group have indicated that substantial changes are likely to occur over the next year or two (Mayer, G., C. Madden, and K. Goodin pers. comm.). Following acceptance and as the standard is implemented, it is anticipated that additional changes will be recommended, and a formal amendment procedure will be available. Two of the proposal investigators, King and Ford, are members of the CMECS working group and are involved with reviewing and editing the standard. This familiarity with CMECS and its review process is necessary in order to apply CMECS to the Northeast Region in a manner that allows for the anticipated evolution of CMECS. The process of delineating the estuarine and marine habitat classes for the northeast is anticipated to inform CMECS itself by providing a test case of the standard.

A few of the underlying reasons why state agencies need to classify estuarine and marine habitats is for inventory purposes in order to identify conservation needs and restoration priorities, address mandates under the Clean Water Act for protection of certain habitats, and conduct marine spatial planning to minimize use conflict, protect vulnerable and important habitats, and maximize resource use. A significant challenge in identifying estuarine and marine units has been the inherent four-dimensionality of marine-influenced systems. CMECS confronts this challenge by utilizing a spatial-temporal framework as its conceptual foundation (Figure 2).

Since CMECS is largely untested, we propose to conduct three pilot projects that apply the Northeast Regional CMECS that we develop on different scales: regional, subregional, and local. We maintain this is an important part of the classification process itself, in order to ensure that the classification product is applicable at the variety of scales at which state wildlife agencies work.

**Project Description:** The first phase of the project will be to identify specific commonalities between CMECS and the NRHCS. Both schemes are multi-scale hierarchies, rely on structural environmental characteristics to form units, and seek to convey the physical-biological linkages that exist at multiple scales. The most current version of CMECS, version 3.1, is comprised of five components: Water Column, Surface Geology, Sub-benthic, Benthic Biotic, and Geoform. Since CMECS is still being developed, it is unclear at this point how many components will be adopted, and how mature their development will be at the onset of this project in another year. The Benthic Biotic Component is well-established at this point, and will serve as the foundation for making the NRHCS compatible with a Northeast Regional CMECS.

To identify commonalities, we will convene a steering committee of scientists representing marine scientists, state wildlife agencies biologists, private organizations and others (e.g. National Estuary Program, National Park Service, and National Estuarine Research Reserve biologists actively classifying estuarine and marine habitats). Criteria for involvement will be experience in identifying estuarine and marine habitats in state waters. The main tasks of the steering committee are to 1) identify existing state marine classification units; 2) discuss and justify the classification criteria within the Northeast Regional CMECS; 3) review methods used to cross-walk and calculate each unit, 4) review results including maps and charts, and 5) quality control the final report. A workshop will be held (one in the mid-Atlantic and one in the Gulf of Maine) to introduce the Northeast Regional CMECS, identify and assemble existing state classifications, and determine overlap issues and cross-walk needs. Following these workshops, we will coordinate bi-monthly calls or Web Ex to display results of any cross-walking and mapping and flesh out the classification. Where cross-walks cannot be established or where CMECS thresholds or units aren’t preferred options, potential modifications to CMECS will be proposed.

The second phase of the project will be to test the Northeast Regional CMECS, building on existing work aimed at mapping marine habitats at overlapping scales. The regional scale mapping will be conducted with The Nature Conservancy’s *Northwest Atlantic Marine Ecoregional Assessment* (Anderson et al. 2010, Greene et al. 2010). This assessment provides a baseline of scientific information on the distribution and status of key habitats and species across the Northwest Atlantic. This comprehensive project coordinated eleven technical teams throughout the study area to review, compile and analyze data on species and habitats, focusing on the identification of the species, habitats and ecological processes that represent the biodiversity of the region, and on the collection of data and information on each targets’ ecology, and distribution. A key product of the assessment, created by the seafloor habitat technical team, was a map of benthic settings based on sediment grain size, seabed form (i.e. bottom topography) and bathymetry. Although the assessment team reviewed a variety of proposed marine classification systems, no particular scheme was endorsed or adopted; rather the information and distribution patterns were mapped directly from the data, allowing the information to be cross walked and fit into various classification schemes – as we propose to do here.

In Massachusetts and Rhode Island, the interest in developing offshore renewable energy resources motivated extensive state support of the collection and compilation of datasets to inform marine spatial planning on state-wide scales. Large portions of these efforts were designed for inventory and cataloging purposes. Similarly to the Conservancy’s assessment, no standard marine habitat classification has yet been selected as a framework for those data, and they can be utilized to test the Northeast Regional CMECS.

Watershed, or local scale classifications are also important because it is often at this scale that humans directly interact with the environment. Several projects exist within Massachusetts that are assembling (or have assembled) waterbody-specific datasets. For example, the Massachusetts Bays National Estuary Project is assembling a Boston Harbor watershed atlas. Boston Harbor is a particularly well-studied estuary due to two decades of high-resolution benthos and water quality monitoring preceding and anteceding a major overhaul of the wastewater system in the Greater Boston Area. The purpose of the atlas is directed at conservation and restoration needs. This database will be utilized to test the Northeast Regional CMECS as well as compare or cross-walk any classification schemes designed for that waterbody in the process of building the atlas. By using data collected at overlapping scales, we will be able to assess the ability of the Northeast Regional CMECS to characterize habitats consistently at the various scales relevant to spatial planning and conservation efforts. Our goal is to create maps that cleanly overlay each other and reflect the hierarchical structure of the classification.

**Timeline:**

January-April 2012 Phase 1 -Merging, identification of steering committee members

May 2012 Phase 1 -Workshops

June-December 2012 Phase 1 -Phone conferences, development of classification

January - July 2013 Phase 2 -Pilot projects apply the classification

August-December 2013 Prepare Final Deliverables

**Deliverables:** A report including a description of the classification units, detail on how each component is cross walked, the sources of data used to evaluate the component, and identification of departures from CMECS will be generated. An excel spreadsheet containing the units in the same or similar format to the existing Northeast Regional Habitat Classification System will also be generated. Three maps with habitats classified at regional (1:5,000,000), subregional (1:250,000), and local (1:5,000) scales will be included in the final report.

**Budget**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | RCN Request | Match | Total Cost | | |
| Salary1 | $ 22,435 | $ 20,435 | $ 103,650 | | |
| Travel3 | $ 5,000 |  | $ 5,000 | | |
| Supplies/Materials5 | $ 5,000 |  | $ 5,000 | | |
| Contractual6 | $ 48,780 | $ 60,780 | $ 48,780 | | |
| Indirect (23.13%)4 | $ 18,785 | $ 18,785 | $ 37,570 | | |
| Total | $ 100,000 | $ 100,000 | $ 200,000 | | |
| **Estimate of Project Costs:** | | | |  |  | |  |
| 1TNC staff time estimate of $42,870 represents approximately 200 days, a portion of this will serve as match and a portion ($22,435) will be grant-funded. The source of funds paying for the match costs is non-federal (private fundraising); and the match costs will not serve as match on any other federal grant. Personnel providing grant/match hours on this project include the Director of Conservation Science, Marine Scientist, and other TNC staff. | | | | | | | |
| 2Fringe benefits for regular TNC staff at 42% in accordance with our July 1, 2010 NICRA with the U.S. Department of the Interior (copy available upon request). Fringe benefits typically include paid time off, insurance, FICA, worker's comp, state unemployment taxes, 401(k), etc. | | | | | | | |
| 3Travel costs are for TNC staff to attend both workshops. We assume two one-day workshops. One workshop will be within driving distance; the other workshop will require air travel and overnight lodging. (travel cost for contractors are in the contract costs) | | | | | | | |
| 4Indirects costs in accordance with our July 1, 2010 NICRA with the U.S. Department of the Interior (copy available upon request). | | | | | | | |
| 5Supplies and Materials include the meeting costs for two one-day workshops, alternative video conferencing for some participants, costs associated with hosting Web Ex meeting and final production costs such as printing, supplies/materials, phone costs associated with network conference calls, costs associated with final report production, etc. | | | | | | | |
| 6Contractual costs include salaries and travel for the two non-TNC principal investigators. King is estimated at $27,530 direct costs and $25,068 match. Ford is estimated at $21,250 direct cost and $33,741 match. Travel costs are included for both PIs and one graduate student to attend the workshops. | | | | | | | |

**References**

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**Principal Investigator Qualifications**

**The Nature Conservancy**

Mark G. Anderson, Ph.D. is the Director of Conservation Science of The Nature Conservancy’s Eastern North America Division where he developed and performed ecological and biophysical assessments of large regions. Dr. Anderson co-led the science team for the Northwest Atlantic Marine assessment and the technical team for the seafloor habiatat component. Dr. Anderson has been with TNC since 1991 and his papers have appeared in journals ranging from Bioscience to Environmental Management. His most recent publication is a chapter on large scale conservation in Integrating Ecoregional Planning at Greater Spatial Scales. in S.C. Trombulak and R.F. Baldwin (eds.), Landscape-scale Conservation Planning, Springer Science. 427 p.

Jennifer Greene, M.S., is the Marine Scientist for The Nature Conservancy’s Eastern North America Division. She has an extensive background in coastal and estuarine marine science and restoration and provided scientific and technical support for the Northwest Atlantic Ecoregional Marine Assessment. Regionally, she helps lead in the development of marine spatial planning approaches, and the development of metrics for measuring marine conservation success, and supports large scale restoration projects in coastal habitats on the Atlantic Coast and in the Gulf of Mexico.

**Massachusetts Dept of Fish and Game, Division of Marine Fisheries**

Kathryn Ford, Ph.D. is the leader of the Fisheries Habitat Program within the Massachusetts Department of Fish and Game, Division of Marine Fisheries. Dr. Ford’s research focus is on mapping and classifying marine habitats in the interests of better understanding distributions of marine fisheries resources. She is a member of the Massachusetts Ocean Management Plan Science Advisory Panel, a member of the Metro Boston Habitat Coalition, and a member of the New England Fisheries Management Council Habitat Plan Development Team (PDT). Dr. Ford maintains the substrate dataset in Massachusetts and collects seafloor data (primarily acoustic and video) throughout Massachusetts and adjacent federal waters. In her capacity on the PDT, she participated in the development of the Swept Area Seabed Impact Model (SASI) which created a habitat model and seafloor vulnerability assessment in federal waters from Virginia to Maine.

**Graduate School of Oceanography, University of Rhode Island**

John King Ph.D. coordinates the Paleomagnetics and Environmental Mapping Laboratory at the Graduate School of Oceanography. The lab’s research in environmental mapping currently focuses on geophysical data acquisition, processing, and interpretation, abiotic and biotic benthic habitat linkages, classification of benthic habitat and sub-benthic paleo-environments, and benthic habitat data interpretation for ecological valuation and marine spatial planning. The King Lab has mapped 75% of the Narragansett Bay seafloor and several areas of interest to wind farm development and fisheries resources in Rhode Island and Block Island Sounds to support the Rhode Island Ocean Special Area Management Plan.

Figures

1. Proposed assessment area with bathymetry



Figure 2. The space-time conceptual framework for CMECS and CMECS components. WCC = Water Column Component. GFC = Geoform Component. BCC = Biotic Cover Component (now called the Benthic Biotic Component). SGC = Surface Geology Component. SBC = Sub-benthic Component. The SBC has both geologic and biologic components

