Northeast Coastal and Barrier Network
Protocol Development Summary
(Sept. 2005)

Protocol: Landscape Change

Parks Where Protocol will be Implemented: CACO, GATE, FIIS, SAHI, ASIS, GEWA, COLO, THST

Justification/Issues being addressed:
Landscapes are ecological systems that exist at the scale of kilometers and comprise recognizable elements such as salt marsh, estuaries, forest patches, heathlands, as well as human settlements. Landscape change defined by the network, includes both "landcover" and "landuse" change. The term landcover will be used by the network to refer to types of naturally occurring vegetation or classes of vegetation. Landuse will be used to describe and refer to alterations to the landscape by humans. The primary goal of this protocol will be to monitor landscape change based on landuse and landcover classes that can be distinguished by remote sensing. Both terrestrial and sub-tidal environments within and around all of the Northeast Coastal and Barrier Network (NCBN) parks will be monitored. All NCBN parks have identified landscape change monitoring as an important and necessary tool for future management practices.

Monitoring Goals, Questions and Objectives to be addressed by the Protocol:

NCBN Goal:
Monitor landscape change in and around NCBN parks and provide managers synthesized information for management decision making.

Monitoring Questions:
What are the landscape patterns (land cover and land use) within and around each park and how are these patterns changing over time?

Monitoring Objective 1:
Determine long-term trends in spatial and temporal patterns of landscape change in and around NCBN parks using remotely sensed imagery.

Vital Sign:
Landscape change

Measures:
Specific measures have yet to be determined.

Justification of Each Vital Sign:

Landscape changes may be expressed as loss of habitat area (see above) or as changes in habitat configuration. Landscapes metrics that define the degree of habitat fragmentation and patch isolation are necessary to provide a more complete picture of land cover change. At the most basic level, an understanding of the size distribution of patches and

the distance between them will help land manager to understand and manage threats to the coastal ecosystem habitats.

Basic Approach for all Vital Signs:
This protocol is in a development phase in which methods for landscape mapping are being reviewed and compared to determine the most time and cost efficient way to monitor in the network parks. Efficient remote sensing data sources and technical approaches to map both terrestrial and submerged aquatic vegetation in NCBN parks are being explored. The goal will be to develop a long-term coastal monitoring program using advanced remote sensing data and geographic information technology. Currently methods are being tested on Fire Island National Seashore (FIIS).

Terrestrial near-shore vegetation and seagrass beds are being mapped for FIIS using high spatial resolution QuickBird-2 multi-spectral satellite remote sensing data. It is being determined whether the high spatial resolution satellite data can meet the current NPS vegetation mapping standards. This repeatable data acquisition will facilitate the development of a dynamic monitoring program for the network. Estuarine and submerged aquatic habitats are also being mapped using hyperspectral remote sensing data. Recent developments of new multi-spectral and hyperspectral sensors offer a cost-effective solution to seagrass information extraction. Increased spectral and spatial resolutions of these sensors allow for greater penetration into the water column and the acquisition of more spatially and spectrally detailed images of submerged habitats. Because hyperspectral sensors are able to image energy throughout the visible to thermal infrared portion of the spectrum, digital image processing techniques can extract the information efficiently and it is less labor intensive.

As part of this protocol testing phase, satellite derived vegetation maps will be compared with the FIIS NPS vegetation mapping delineation, recently completed. Methods will be compared and a determination made whether repeat monitoring of vegetation change using remote-sensing technology is feasible in a reasonable time frame and cost. Because the FIIS NPS vegetation map does not include submerged aquatic vegetation (SAV) satellite derived SAV maps will be compared with current efforts to delineate SAV beds via photographic surveys. Again, methods will be compared and a determination made whether repeat monitoring of change in SAV beds using remote-sensing technology is feasible in a reasonable time frame and cost. Once this testing phase is complete, and cost and time efficiency determined feasible for use in the network's long-term monitoring program, a protocol will be written detailing the use of high spatial resolution satellite remote sensing data for estuarine and terrestrial vegetation habitat mapping.

Principal Investigators and NPS Lead:
Protocol development will be done through a cooperative agreement with the University of Rhode Island (URI). Principal Investigators will be Y.Q. Wang and Michael Traber. NPS Leads: Bryan Milstead and Sara Stevens.

Development Schedule, Budget, and Expected Interim Products:

The URI principal investigators (PIs) will develop and draft the full inclusive monitoring protocol to include an extensive narrative describing the full protocol as well as specific SOPs meeting the NPS I&M Program standards. The PIs will produce a draft landcover change protocol ready for external peer review by the end of 2006. After peer review, revision and approval, the implementation of the protocol will be based on the recommended sampling scheme determined in the written protocol.

Literature Cited

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