

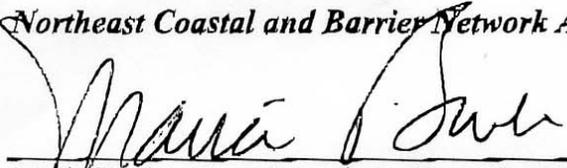
**ANNUAL ADMINISTRATIVE REPORT (FY2003) AND
WORK PLAN (FY 2004) FOR INVENTORIES AND VITAL SIGNS MONITORING**

FY2003-FY2004

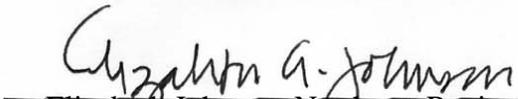
NORTHEAST COASTAL AND BARRIER NETWORK (NCBN)

Assateague Island National Seashore (ASIS), Cape Cod National Seashore (CACO), Colonial National Historical Park (COLO), Fire Island National Seashore (FIIS), Gateway National Recreation Area (GATE), George Washington's Birthplace National Monument (GEWA), Sagamore Hill National Historic Site (SAHI), and Thomas Stone National Historic Site (THST)

Northeast Coastal and Barrier Network Approval Signatures



Maria Burks, Superintendent, Cape Cod National Seashore,
Representative Network Board of Directors
1/26/04
Date



Elizabeth Johnson, Northeast Region Inventory and Monitoring Coordinator,
Elizabeth Johnson, Northeast Region Inventory and Monitoring Coordinator,
1/29/04
Date



Prepared by: Sara Stevens and Bryan Milstead, Network staff,
Prepared by: Sara Stevens and Bryan Milstead, Network staff,
1/29/04
Date

	Budget program (MS Access, aarwp_budget.mdb)
XP	Which version of Access did you use? [Enter 97 or XP for Access 97 or Access XP at the beginning of this line.]
X	The income amounts entered for Biological Inventories, Vital Signs Monitoring, Prototype \$\$ - Annual Transfer, Water Quality Monitoring and other sources matches the dollar amounts from the memos sent to the regions/networks by WASO (have you used the correct income amounts?).
X	In the Add/Edit Budget Records form, the amount shown for Total Expenses matches that for Total Income. (If it doesn't, enter a record under Expenses in the 7_Other category to make it balance; use an entry such as 'Unexpended funds' or 'Overspent Funds' in the Description column to explain the amount.)
X	For all Expense records, the Description field includes the name of the university, agency, company, or other vendor to help us document our outsourcing efforts. (If this expense involved a contract, cooperative agreement, interagency agreement, or other partnership, is it clear where the money went?)
X	For all Expense records, the correct item from the picklist for 'Where \$\$ Went' has been entered. [Think about who the check was written to; e.g., enter 'Other Non-Federal' for funding that went directly to the private sector, such as for purchases (computers, supplies, etc.), travel (airlines, rental cars, hotels).]
X	On the Status of Biological Inventories form, there is one record for each inventory that is described in the text section of the AARWP or the budget program for FY 2000-2003 (data should be included for previous years since this is our first year of building this database). Be sure to list each park that was involved in the particular inventory.
X	Each year's budget has been exported as an .rtf file (one for FY 2003 and one for FY 2004), and both files have been inserted into MS Word at the end of the AARWP document.
X	The file aarwp_budget.mdb has been renamed to include the 4-character network alpha code and the years, as shown in this example: NCCN_FY0304_aarwp.mdb
	Annual Report and Work Plan (MS Word)
X	I have carefully read the guidance for the AARWP and followed it.
X	A header or footer with the date that the aarwp was last revised has been included.
X	I gave special attention to the 'Public Interest Highlights' and 'Major Accomplishments' sections of the report. (We need good examples of the successes, applications, and highlights of the program to help us obtain funding for all 32 networks! Your 'Major Accomplishments' section is what we'll use for the I&M Program's annual Report to Congress to justify the funding spent by your network.)
X	In the 'Status of Park Vital Signs Monitoring' table, all entries are equal to or greater than the entries in last year's report.
X	Photographs that might be included in one of the reports to Congress, brochures, websites, or other materials that help the program have been submitted by the network. (See the guidelines for submitting photographs.)
X	The aarwp file has been renamed using the network's 4-character alpha code and the years (FY0304) as in the example NCCN_FY0304_aarwp.doc
X	The annual report has been approved by the appropriate individuals, per my region's procedures. (If you cannot get electronic signatures, it is okay to submit a hard copy with signatures after November 8.)
X	I have followed my region's procedures for submitting the two files (e.g., NCCN_FY0304_aarwp.doc and NCCN_FY0304_aarwp.mdb). (Most regions require you to submit the files through the regional office. The files may be zipped into a zip file if desired, and then submitted to Steven Fancy via either email or ftp).
	Review of FY 2004 Work Plan by WASO
Yes	[Enter Yes or No]: Has the FY 2004 workplan been approved by the network Board of Directors, and therefore ready for the full WASO review? (If you enter No, the WASO I&M and WRD offices will only briefly review the work plan for 'red flags'.

I. Overview and Objectives

Ecological context

The Northeast Coastal and Barrier Network (NCBN) includes eight parks stretching along the coastline of the Northeastern United States from Massachusetts to Virginia. These parks represent some of the most ecologically similar collections of lands within the Park Service. They consist of critical coastal habitat for many rare and endangered species, as well as migratory corridors for birds, sea turtles and marine mammals. They also protect vital coastal wetlands, essential to water quality, fisheries, and the biological diversity of coastal, near shore, and terrestrial environments. These parks represent islands of protected lands within the urban sprawl of the Northeast. Census estimates indicate that populations residing within this zone are growing three times the rate of the total United States population. Without scientifically based knowledge and information on the effects of urban pressure on the health of these park ecosystems, it is uncertain that management decisions are being made that maintain or can restore ecosystem health.

Program overview

In December 2001, the Northeast Coastal and Barrier Network (NCBN) Inventory Study Plan was submitted to WASO. Vertebrate and vascular plant inventories were implemented in the network in 2002 and 2003 and will continue over the next few years. Cooperative agreements have been established with scientists from the Wildlife Conservation Society, the College of William and Mary, Frostburg University, the University of Richmond, and the New Jersey Audubon Society to complete these baseline inventories. In addition to inventorying vertebrate species, the network has begun to review existing park invertebrate species data. Odonates (dragonflies and damselflies), considered indicators of wetland ecosystem health by scientists, and a taxonomic group of high public interest along the coast, will be inventoried in network parks. As part of the inventory program, compilation and cataloging of existing data into the three national I&M databases, NPSpecies, NatureBib and the Dataset Catalog, continues, and newly acquired I&M data and information are starting to be used in park planning processes.

Developing vegetation maps for the Network parks is well underway. The NY Natural Heritage Program is currently developing vegetation maps for GATE and SAHI. The Network is cooperating with the Virginia Division of Natural Heritage to conduct the field classification portions of the mapping for COLO and GEWA. Chris Lea, an ecologist from ASIS was on detail to the Network to conduct vegetation sampling and classification for THST. North Carolina State University is handling the GIS component for these three parks. A vegetation map for FIIS is complete and ASIS's map is still in progress. The Network is cooperating with NatureServe to crosswalk the state classifications to the National Vegetation Classification system.

The Northeast Coastal and Barrier Network Vital Signs Monitoring Program is in its third year of development. The network began testing variables this year in order to begin protocol development to assess and monitor estuarine nutrient inputs, visitor impacts, saltmarsh vegetation and nekton communities, and geomorphologic change. Additional components to the Network's vital signs program in development include, a contaminants inventory, exotic species (animals and plants), seagrass mapping, and weather station data acquisition. The Network's Phase II monitoring plan was completed in October 2003 and is currently being reviewed. The final Phase of the plan will be completed by December 2004 and will include draft monitoring

protocols and a draft data management and analysis plan for the Network.

Objectives

Biological Inventories

1. Locate, catalog and archive park natural resource documents, data sets, and spatial information and ensure such information is accurate, in useable formats and readily available.
2. Conduct inventories targeted at vertebrate and vascular plant species in the network parks and conduct quality assurance and review of all inventory products.
3. Conduct investigations on species and species assemblages that are of special concern to network parks and conduct quality assurance and review of all inventory products.
4. Conduct other baseline inventories identified as important to network parks and the Network Vital Signs program and conduct quality assurance and review of all inventory products.

Vital Signs Monitoring

5. Hire and retain professional staff and provide a safe, healthy, and productive work environment.
6. Develop and maintain working and decision-making processes that engage the network board of directors, technical staff, cooperators and managers of network parks.
7. Develop, implement, and maintain a network data management program. (Note: this objective is placed under Vital Signs monitoring, however, it is equally important and integrated with the Biological Inventories portion of the program.).
8. Identify and prioritize Network Vital Signs, develop protocols and implement programs to monitor these vital signs in network parks.
9. Integrate water quality monitoring into the Network Vital Signs monitoring plan.

II. Accomplishments (FY2003) and Scheduled Activities (FY2004)

A. Biological Inventories

Objective 1 – Locate, catalog and archive park natural resource documents, data sets, and spatial information and ensure such information is accurate, in useable formats and readily available. (all parks).

Task 1.1 – The NPSpecies Database.

- FY 2003 Accomplishments: **(1)** NPSpecies continued to be managed under a cooperative agreement with the University of Rhode Island (URI). This work entailed data entry, conversion and verification as well as the training of NPS park staff and cooperators in the use of NPS databases; coordinating the review of datasets by taxa experts and developing a system to consistently and accurately populate each park's database with new data. The URI cooperator provided training to natural resource managers and biologists, and worked closely with CACO park staff, Robert Cook, to coordinate data verification of the park's database with local taxonomic experts. All network parks were requested to send any new data to URI for data entry. **(2)** Part-time staff, hired through the College of William and Mary, completed entering existing data for COLO into NPSpecies. This included entering 1600 plant specimens collected in the park, housed at William and Mary. **(6)** A no-cost time extension

was added to a cooperative agreement with Dr. Les Mehrhoff, from the University of Connecticut. Dr. Mehrhoff continues to verify data on plants in the database for CACO, GATE, FIIS and SAHI and other Northeastern parks. Dr. Mehrhoff is an expert on exotic plants and curator of the herbarium at the University of Connecticut.

- Scheduled FY 2003 Activities and Products: (1) URI cooperator, Linda Fabre will continue the maintenance, update and verification the NCBN NPSpecies database in FY 2004. She will coordinate the review of datasets with taxa experts; develop a system for updating each park's database on an ongoing basis; provide training to NPS personnel and cooperators regarding the use of NPSpecies as needed. (2) An NPSpecies certification workshop will be held by WASO staff for Northeast Region data management staff, cooperators and park staff. (3) Work will continue with the Network's taxonomic experts to continue the review and certification of park NPSpecies databases. Databases ready to be verified and certified include all vertebrate and vascular plant groups for CACO, amphibians, reptiles, birds and mammals for COLO, GEWA and THST, and birds and plants for FIIS, SAHI and GATE.

Task 1.2 – The NatureBib Database.

- FY 2003 Accomplishments: (1) No Northeast Coastal and Barrier Network park units were visited in FY 2003. Scott Tiffney, Penn State University (PSU) Cooperator, received and fulfilled NatureBib data requests from park personnel, government agencies, academic staff and students, researchers, and interested private citizens. In order to fulfill NatureBib data requests bibliographies of NatureBib citations were created as Word documents, Access files, Excel files, ProCite files, and/or EndNote files.
- Scheduled FY 2004 Activities and Products: (1) Visits will be made by Scott Tiffney (PSU Cooperator) to COLO, GEWA, and THST early in FY 2004 (Oct. 2003 visits are planned) and will at that time assess the status of these parks' NatureBib databases and onsite collections. Park NatureBib database records will be edited for duplication, spelling, authority control and data comprehensiveness. Quarterly progress reports are due in November 2003, March 2004, and July 2004.

Task 1.3 – The Dataset Catalog Database

- FY 2003 Accomplishments: (1) A cooperative agreement was established with the University of Rhode Island (URI) to populate the Dataset Catalog for the NCBN. This project began in September 2003 and will continue through 2004. Data are currently being compiled and some data entry into the catalog has begun. Currently, the Dataset Catalog will be used by the Network as a "cataloging" system to compile and keep track of existing spatial datasets.
- Scheduled FY 2004 Activities and Products: (1) Spatial and tabular datasets will continue to be compiled and cataloged into the Dataset Catalog database by the URI cooperator. Existing network data on the NPS clearinghouse will be reviewed and updated if necessary and existing GIS datasets not on the clearinghouse will be compiled, reviewed for quality, prioritized based on needs of the network's monitoring program and posted to the clearinghouse.

Objective 2 – Conduct inventories targeted at vertebrate and vascular plants in the Network parks and conduct quality assurance and review of all inventory products. (all parks)

Task 2.1 – Mammal inventories (COLO, THST, GEWA, SAHI, ASIS)

- FY 2003 Accomplishments: (1) Surveys of mammals by Frostburg State University (FSU)

cooperator, Ron Barry and graduate assistant, continued at GEWA and THST. UTM coordinates were obtained by GPS at each sampling location, and habitats were assessed. The acquisition of historical records was completed and the NPSpecies database accessed for the most current information on mammals in the parks (no records existed for THST). Data were compiled in an MS Access database developed by Sara Stevens, NPS Coastal and Barrier Network Data Manager, and Tressa Dolbeare, FSU graduate assistant. Twenty-two species of mammals had been recorded for GEWA, and by live trapping, salvage (including road kills), and observation (including road kills and sign) the presence of 10 of these species were confirmed in FY 2002, plus 1 additional species in FY 2003 that had not been recorded in the park. Ten species of mammals were trapped, salvaged, or observed (including sign) at THST in FY 2002, plus 2 additional species in FY 2003, all new records for the park. (2) Historical records and current information on mammals from the NPSpecies database were obtained for COLO. Two FSU graduate assistants initiated surveys of COLO mammals. UTM coordinates were obtained by GPS at each sampling location, and preliminary characterizations of habitats were made. Data were compiled in MS Access format. Thirty-nine species of mammals had been recorded for COLO, and by live trapping, salvage, and observation (including sign) the presence of 4 of these species was confirmed in FY 2002, and in FY 2003 the presence of an additional 16 of these species. (3) A progress report on inventorying activities at GEWA/THST and COLO was submitted in January 2003 by FSU. (4) SAHI was included in an interagency agreement established in FY02 with USGS, Alan O'Connell, to inventory mammals in all Northeast Temperate Network parks. A sampling design and database were developed for this project by the cooperators in FY 2003. (5) Discussions for completing mammal inventories at ASIS, FIIS and GATE were initiated with potential cooperators and park staff in FY2003.

- Scheduled FY 2004 Activities and Products: (1) The survey of mammals in THST and GEWA is scheduled to be completed by December 2003. Data will be compiled and analyzed through the spring 2004. (2) The survey of mammals in COLO will continue through FY 2004. Data will be compiled, and analysis will begin in March 2004. A progress report will be prepared from November 2003 – January 2004. Note: the schedule of activities in THST and GEWA may be modified to accommodate the effects of hurricane Isabel, which occurred in September 2003. (3) Mammalian inventory fieldwork will begin in 2004 at SAHI by Alan O'Connell, USGS. (4) A scope of work will be developed by NCBN staff to review mammalian inventory needs at ASIS, and a cooperative agreement will be established. (5) Compilation and review of existing information on mammals found at FIIS and GATE will be completed by Allan O'Connell, USGS. Mammal inventory needs for each of the parks will be identified and scopes of work written by network staff to fill these inventory gaps. (6) All network parks have requested the need for information on bats in the parks. Network staff will review existing literature and data on bats, and further assess the need for inventories.

Task 2.2 – Avian inventories (COLO, THST, GEWA, ASIS, SAHI, FIIS, GATE)

- FY 2003 Accomplishments: (1) A cooperative agreement was established with the College of William and Mary, Center for Conservation Biology to inventory avian species at COLO, GEWA, and THST in FY 2002. Historical records research was continued in FY 2003 along with review of digital imagery for study site selection. Survey sites were established, GPSed and the respective park natural resource contacts were met and provided with copies of the survey plan and digital data layer of points in December 2002. Surveys were initiated in

January 2003 with the hiring of field techs. Five survey rounds of all park units were completed during FY 2003. Two events confounded survey efforts during this period forcing a consolidation of survey rounds during critical phases. First, eastern Virginia experienced its wettest spring on record causing critical missed surveys during the peak of spring migration. Rain or high winds precluded effective surveys for days at a time. This was followed by Hurricane Isabel in mid-September during the peak of fall migration. Many park units were closed to all but emergency personnel to assist with storm damage cleanup and repair. A secondary component to the cooperative agreement required the Center to compile and review existing avian species data for ASIS, enter the data into NPSpecies, and make recommendations for further avian inventory work needed in the park. This component is nearing completion pending the inclusion of another historical dataset that may be available in the near future. **(2)** Since a cooperative agreement (FY02) was established with the Theodore Roosevelt Sanctuary and Audubon Center to inventory avian species at SAHI, compilation of historical records has been completed. A survey plan was developed to ensure sampling of avian species present in each of the 21 habitat management zones identified by park staff, and all survey points have been marked in the field and will be GPSed by NPS personnel. Bird surveys commenced in January 2003. Winter bird, spring migration, and breeding season surveys have been completed, as have guild-specific surveys for owls, woodcock, nightjars, and rails. Fall migration surveys are now in progress. 105 species have been observed at the park to date. Vegetation surveys have been conducted to characterize and identify the dominant species in each habitat management zone. **(3)** In 2003, a cooperative agreement was developed between the NCBN and the New Jersey Audubon Society, David Mizrahi, to compile all existing avian species data for FIIS and GATE. This project involves a review of existing avian species data for both parks, entering this data into NPSpecies and submitting a report to the network identifying inventory gaps in both parks.

- **Scheduled FY 2004 Activities and Products: (1)** At least three additional survey rounds will be conducted between fall 2003 and early spring 2004 to compensate for missed surveys during FY 2003 by the college of William and Mary, Dana Bradshaw, COLO, GEWA and THST. A progress report will be completed and submitted to the network, as well as to the respective park natural resource contacts no later than December 31, 2003. A draft technical report will be submitted by March 31, 2004. A final project technical report will be submitted by July 31, 2004. This will include predicted species lists, documented survey results and bird/habitat associations, associated databases, digital data layers, and quantitative estimates of relative abundance for selected species. The ASIS project will be completed in the spring 2004. An MS Access, NPSpecies compatible database containing all historical avifauna records found during the project will be the primary product. In addition, a draft and final technical report will be submitted on, or before March 31, 2004 and July 31, 2004, respectively. This report will include project methods and protocols, expected vs. documented lists; gaps in documentation, and recommended survey protocols to reconcile the differences. The report will also identify the location and catalogue information of any individual specimens that were vouchered and stored in museum collections. Per an amendment to the cooperative agreement in late FY 2003 a final effort will involve reviewing and editing existing species data currently entered in the NPSpecies database for each of the four Coastal and Barrier Network parks. This will include correcting inaccuracies, filling in blanks, and merging new data from the current avian inventory project. Draft and final reports will be due March 31, and July 31, 2004 respectively. **(2)** A final report and database will be submitted for the SAHI avian inventory by the Tedi

Roosevelt Audubon Center. **(3)** NJ Audubon Society will continue to compile avian species records for FIIS and GATE. Inventory gaps for avian inventory will be identified and a report prepared by February 2004. All data will be entered and verified in NPSpecies by the summer of 2004.

Task 2.3 – Herpetological inventories (COLO, THST, GEWA, GATE, SAHI, FIIS, ASIS)

- **FY 2003 Accomplishments:** **(1)** Amphibian and reptile inventories began in October 2001 and continued through October 2002 at GEWA, THST and COLO through a cooperative agreement with Dr. Joseph Mitchell, University of Richmond. Due to the extreme drought in 2002 and difficulty in finding some species, the cooperator, requested and received a project extension through 2003 to add additional field time during what has turned out to be a wet year. Additional herp inventories were conducted in these parks, March-August 2003. A total of 25 species of amphibians and 27 reptiles were documented for COLO, 14 and 21 for GEWA, and 13 and 7, respectively, for THST. The draft report and the electronic database with all observations and location coordinates for COLO was completed and submitted in August 2003. **(2)** The Wildlife Conservation Society (WCS) completed their herpetological inventory field work at GATE, SAHI and FIIS and began writing reports for each park. Additional field work was completed in 2003 at GATE. An additional year was added in order to gather additional information on those species under-represented in the 2002 inventory. To address the lack of information on the current distribution and status of Eastern Mud Turtles on FIIS, an amendment to the WCS cooperative agreement was established. WCS conducted turtle trapping in 3 wetlands in the Otis Pike Wilderness Area. During the overall herpetological inventory conducted in 2002 by WCS only one Eastern Mud Turtle was captured. In 2003, 12 new individuals were captured, measured, marked with a unique number code, photographed, and released. Seven of the 12 turtles were fitted with radio transmitters and their movements were tracked, using radio-telemetry, until mid-August, 2003. An additional modification to the cooperative agreement with WCS was developed by the network, to conduct a complete herpetological inventory of ASIS. **(3)** Through an agreement with the University of Rhode Island NPS Field Technical Support Center (URI FTSC), Dennis Skidds, developed and implemented QA/QC procedures to evaluate the spatial data collected as part of the WCS inventories. Using ESRI ArcGIS 8.2 software, the raw GPS coordinates were converted into spatial datasets and animal capture locations were examined using available GIS data gathered from county, regional, statewide, and federal data repositories. Such data included hydrography, roads, and land-use/land-cover datasets, as well as DOQ's or other orthophotography. Potential errors were identified in the data for each NPS site and the findings were reported to the appropriate NPS personnel for evaluation and recommendations. Maps were then produced of the distribution and abundance of individual amphibian and reptile species in each NPS site. These maps are in the process of being updated as corrections are received from the individual parks. This project also resulted in a written QA/QC protocol applicable to the evaluation of spatial data from biological inventories throughout the Northeastern National Parks.
- **Scheduled FY 2004 Activities and Products:** **(1)** A draft report and database for COLO, submitted by Dr. Joe Mitchell, University of Richmond, is undergoing NPS review. The final reports and attachments for GEWA and THST will be finalized and submitted in 2004. **(2)** Draft final reports will be submitted for GATE, FIIS and SAHI, reviewed by the network and finalized by WCS. WCS will conduct a herp scoping visit to ASIS in the fall of 2003, write and submit a work plan and upon approval by network and park staff, begin field work in

2004. (3) QA/QC procedures will continue to be conducted by the URI FTSC on the spatial data collected during the WCS herp inventory conducted at GATE in 2003 as well as the data submitted to the network for COLO, GEWA and THST by Dr. Joseph Mitchell.

Task 2.4 – Vascular Plant inventories (THST)

- FY 2003 Accomplishments: No vascular plant inventories were conducted this year in NCBN parks. Vegetation mapping data were entered in NPSpecies for ASIS, THST, and FIIS.
- Scheduled FY 2004 Activities and Products: No vascular plant inventories are planned at this time. Vegetation mapping plots data will be acquired, reviewed and entered into NPSpecies.

Task 2.5 – Estuarine and freshwater fish inventories (CACO, THST, GEWA)

- FY 2003 Accomplishments: (1) The final report and data were submitted as part of a cooperative agreement established in FY99 with the University of Mass, Amherst, Dr. Martha Mather. This agreement included a freshwater fish inventory (including distribution and abundance) at CACO and other parks in the Northeast Temperate Network. (2) During July and August freshwater fish sampling was conducted by the fisheries biologist and crew from Shenandoah National Park, at THST, and initiated at GEWA. A significant portion of the sampling at GEWA was accomplished through an interagency agreement with the U.S. Fish and Wildlife Service. All data entry and verification were completed for the 2003 field season during August and September.
- Scheduled FY 2003 Activities and Products: (1) Revised, or new park specific databases will be prepared and submitted by Shenandoah National Park staff, to GEWA and THST, both sampled during 2003 and the most recent data will be submitted for entry into NPSpecies. Additionally, an annual progress report including data summaries and maps of sampling locations for 2003 will be completed. During the summer of 2004, sampling will be completed within GEWA. Two separate visits to GEWA are proposed (late spring and late summer) to provide a more complete inventory of the expansive Pope's Creek system.

Objective 3-Conduct investigations on species and species assemblages that are of special concern to network parks.

- FY2003 Accomplishments: (1) A cooperative agreement was established with the Rhode Island Natural History Survey (RINHS) to conduct odonate (dragonflies and damselflies) inventories at GATE, FIIS and SAHI. Field reconnaissance began in July and August 2003, as well as compilation of historic information on these species within the three parks. (2) A cooperative agreement was established with the Virginia Department of Conservation and Recreation, Division of Natural Heritage (DCR-DNH) to inventory Odonate species and diurnal Lepidoptera (butterflies and skippers) species at COLO and GEWA. As part of this agreement, DCR-DNH will compile and review existing species data for both parks, conduct field work to survey for species of Odonata and diurnal Lepidoptera, enter location, habitat, and species information into an Access database, and make management recommendations for rare and endangered species encountered. To date, field surveys have been conducted in each park for the months of May, June, and July 2003. Inclement weather limited some fieldwork, which was rescheduled to the FY 2004. Likewise, an injury to the primary investigator necessitated rescheduling fieldwork to 2004. For each field visit, detailed notes were taken on area surveyed (including GPS points), time of survey, species seen/vouchered, habitats and relative abundance of species.

- Scheduled FY 2004 Activities and Products: **(1)** The RINHS will begin fieldwork to inventory and develop a collection of odonates found at GATE, FIIS and SAHI. An access database will be developed by the RINHS staff in collaboration with NCBN staff. Progress reports will be submitted in 2004. **(2)** October 2003 – March 2004 DCR-DNH will assist NPS with developing the Access database for this project and enter information from already completed fieldwork. In addition, DCR-DNH will compile species records from literature and known collections. April 2004 – October 2004 DCR-DNH will conduct fieldwork at both COLO and GEWA, including days rescheduled from FY 2003. **(3)** A contract will be developed to inventory odonates at ASIS in 2004.

Objective 4-Conduct other baseline biological inventories identified as important to Network parks and the Network Vital Signs program.

Task 4.1 – Development of keys to National Vegetation Classification associations in the Lower New England, (LNE) North Atlantic Coast (NAC), and Chesapeake Bay (CHB) ecoregions.

NCBN Park associations--LNE: THST; NAC: CACO, GATE, SAHI, FIIS; CHB: ASIS

- FY2003 Accomplishments: **(1)** Draft vegetation keys and classification documents were prepared for the North Atlantic Coast and Chesapeake Bay ecoregions through a cooperative agreement with NatureServe. These were submitted in CD and hard copy to the NPS on July 22, 2003. **(2)** A subcontract to the New Hampshire Natural Heritage Bureau was prepared so that the ecologist previously hired by NatureServe could continue her work in her new capacity. She revised the Lower New England classification by incorporating information from revised state classifications and from NPS documents. **(3)** A three-day meeting of heritage ecologists from ME, NH, VT, MA, CT, RI, NY, PA, NJ, DE, and NatureServe Boston office was held at the Yale Forestry Camp in CT. Changes recommended from this meeting were incorporated and a new revision of the classification was produced. Draft keys and classification were submitted on hard copy and CD to the NPS in July 2003. **(4)** A modification to the existing cooperative agreement with NatureServe was developed for them to work with the New York Natural Heritage Program, Abies Ecology, Connecticut Natural Diversity Database, Pennsylvania Natural Diversity Inventory, and NPS park staff at Thomas Stone to integrate newly collected plot data into the National Vegetation Classification (NVC) and to ensure adherence to the NPS Vegetation Mapping Program standards.
- Scheduled FY 2004 Activities and Products: **(1)** The classification and keys for all three ecoregions will be submitted to heritage ecologists for review. Comments from NPS have been received so that final reports can be submitted in December 2003. **(2)** NatureServe will begin work with the Virginia Division of Natural Heritage to integrate newly collected plot data into the National Vegetation Classification and to ensure adherence to the NPS Vegetation Mapping Program standards. Field visits with VADNH are planned for summer 2004. The bulk of NatureServe's work on integrating data into the NVC will take place after November 2004 when fieldwork is completed by VADNH. NatureServe plans to make site visits to GATE and SAHI in October 2003 with ecologists from NYNHP and New Jersey Natural Heritage (for Sandy Hook). NVC descriptions will be prepared for GATE, SAHI, and THST.

Task 4.2 – Vegetation mapping-GATE, SAHI

- FY2003 Accomplishments: **(1)** Through a cooperative agreement with North Carolina State University (NCSU), Hugh Devine, and an interagency agreement with William Frament, Remote Sensing Specialist, USDA Forest Service, work was initiated to develop

specifications for aerial photography and to perform quality assurance checks of the aerial photography obtained for ten NER parks, including two NCBN parks, GATE and SAHI. Hugh Devine and his NCSU staff have been working closely with Bill Frament on training, developing air photo specifications, and answering technical questions. Preliminary quality assurance review of the aerial photography for GATE has been completed, however, NCSU staff have not been able to obtain the boundary data for the park, making it difficult to check to see if the photography covers the entire park. For example, it appears that an area of shoreline in the Staten Island unit may be missing. (2) New York Natural Heritage Program staff, Gregory Edinger and Aissa Feldmann conducted site reconnaissance visits and met with NPS staff at GATE and SAHI. They compiled and assessed background data to make preliminary predictions of natural community polygons and National Vegetation Associations for GATE and SAHI. All available in-house datalayers were compiled and reviewed for GATE and SAHI. NY Natural Heritage Program staff developed preliminary digital maps of National Vegetation Classification associations by first reviewing 1995 NAAP CIR aerial photos and then screen digitizing boundaries using 1994-99 digital ortho-corrected quarter-quadrangles (DOQQ) as the base layer (Edinger and Feldmann 2003). NY Natural Heritage also produced a draft classification of National Vegetation Classification (NVC) associations predicted to be at each National Park Service site by using EcoART. The draft classifications include all NVC types that are known to occur within the ecoregional sections containing the NPS site. GATE and SAHI are with subsection 232Aa of the North Atlantic Coast Ecoregion. A draft subset of the New York ecological communities predicted at each National Park Service site was produced using the current NY Natural Heritage classification (Edinger et al. 2002) (Edinger and Feldmann 2003). Plot and observation point data were collected for GATE and SAHI to confirm or correct identification and delineation of National Vegetation Classification associations and significant ecological communities at each site. GATE – Significant NY community occurrences: low salt marsh. SAHI – Significant NY community occurrences: None.

- Scheduled FY 2004 Activities and Products: (1) NCSU will acquire digital data files of official boundaries for GATE to check to see that the aerial photography covers the entire park. (2) The NY Natural Heritage Program will conduct additional fieldwork in September and October 2003 at GATE and SAHI. Data gaps identified during mapping process will likely require additional field surveys late spring and early summer 2004. Data will be entered in the NY Natural Heritage Field Forms Database and Biological Conservation Data System. The NY Natural Heritage Program has upgraded from the Biological Conservation Data System (BCD) to a new database known as Biotics 4. Element Occurrence Ranking Forms will be completed for all significant occurrences listed above. All new significant occurrences will be transcribed and previously documented occurrences will be updated and entered into Biotic 4 by April 2004. Species and plot data will be formatted into an Excel spreadsheet for use in the PC-ORD version 4.0 Multivariate Analysis package during winter 2003-2004. Initial results will be reported on by April 2004. First drafts of the final classification will be written late spring to early summer 2004. First drafts of the final vegetation maps for each site will be delineated late spring to early summer 2004. Accuracy assessment will be conducted spring through early fall 2004. Accuracy assessments will be conducted by NY Natural Heritage staff who were not involved in the initial data collection in order to reduce/eliminate bias. A complete final project report will be submitted by February 28, 2005.

Task 4.3 – Vegetation mapping-ASIS

- FY2003 Accomplishments: (1) Under the direction of Chris Lea, ASIS staff collected additional GPS points and plot data to improve accuracy of the park's vegetation map.
- Scheduled FY 2004 Activities and Products: (1) The existing vegetation map and classification for ASIS will be revised to the National Vegetation Mapping Program standards for accuracy. Chris Lea will lead this effort, and document the process in writing. A cooperater will be identified to complete the GIS component of this project.

Task 4.4 – Vegetation mapping-COLO, THST and GEWA

- FY2003 Accomplishments: (1) Through a cooperative agreement with NCSU, Hugh Devine, Leaf-on and leaf-off photography has been quality checked and scanned for GEWA, COLO and THST (GEWA ~47 photos, THST ~20 photos and COLO~606). Photo mosaics are complete for THST and GEWA and preliminary mosaics have been completed for COLO. Formation-level vegetation maps are complete for all three parks. The formation-level map for THST has been sent to Chris Lea for break down to the alliance level. Fieldwork to assess positional accuracy of the mosaics, thematic accuracy of the vegetation map and to collect fire fuel load data is complete for GEWA as well as the metadata for the park's mosaics. COLO fire fuel load fieldwork is also complete. (2) VADNH Ecologists began edits to the photo interpretation line work for GEWA, and began fieldwork in COLO, sampling quantitative vegetation plots. The ecologists also spent time in the field at COLO with vegetation mappers, field checking photo interpretation.
- Scheduled FY 2004 Activities and Products: (1) NCSU will complete fieldwork to assess positional accuracy of the mosaics for COLO in the fall (2003). Fieldwork to assess positional accuracy of the mosaics and to collect fire fuel load data is scheduled for fall 2003 at THST. (2) VA DNR Ecologists will submit a progress report in December 2003. Edits to photo interpretation line work for GEWA will be completed and polygons will be attributed with vegetation classifications. Data collected in 2003 will be entered into databases and analyzed within a larger VA Piedmont/Coastal Plain dataset. Fieldwork in COLO will be completed.

Task 4.6 Paleo Resource data inventory for Network Parks (All parks)

- FY2003 Accomplishments: The Network provided \$ to fund salary (290 hours) for a GS-05 Physical Science Technician (Paleontology) based at Fossil Butte National Monument, Wyoming. The technician, Jason Kenworthy, along with FOBU Chief Ranger Vince Santucci (now at GWMP) initiated a literature-based paleontological resource inventory of NCBN parks to identify published occurrences of fossils. Phone and email interviews with NCBN park staff were also undertaken. Similar interviews with researchers from outside institutions including, among others, the Smithsonian Institution, United States Geological Survey, Virginia Natural History Museum, and University of Wisconsin's Center for Climatic Research provided information on research and museum collections of fossils found within and immediately surrounding NCBN parks. As a result of the inventory, five NCBN parks (ASIS, CACO, COLO, GATE, GEWA) were identified with fossils and a sixth, THST, contains geologic formations known elsewhere to be fossiliferous. The fossils preserved in Network parks range from microfossils such as foraminifera and pollen to a large number and variety of mollusks and sharks teeth. Large marine mammal fossils have also been found. Natural and human impacts on these paleontological resources were also identified to facilitate future monitoring and resource management decisions. Kenworthy and

Santucci (2003) summarized the findings in a final report.

Task 4.7 Inventory of Contaminant Sources in Network Parks (All parks)

- FY 2003 Accomplishments: (1) Cooperators from Rutgers University conducted site visits at CACO and FIIS to evaluate possible contaminant sources and ecological stressors. A web-based questionnaire was created for input from park personnel to obtain basic information concerning each park. Historical contaminant data was gathered from state and federal sources for review and evaluation. FIIS historical land use practices and data are currently being reviewed and compiled into a site specific document to establish the baseline conditions in the park. The comparability of data from multiple sources is a major problem. A compatible field form, Environmental Contaminant Template and data dictionary was created to standardize the way data for the project was digitized, stored, displayed, summarized, and inputted into risk-assessment software. A Field Form was developed that is compatible with the Environmental Contaminant Template for data entry.
- Scheduled FY 2004 Activities and Products: (1) An environmental contaminants questionnaire will be distributed to all parks to obtain basic information. NPS staff will be interviewed, by telephone or in person, to evaluate historical and current sources and/or threats. (2) A research assistant hired by Rutgers University will gather and review existing contaminant data from all sources (State, Federal, Non-Profit Organizations etc) and produce a data synthesis report for each park. The data will be digitized using a Microsoft Excel template that was developed for standardized data entry. The digitized data may then be entered into the risk assessment software to rank possible stressors. (3) Park specific reports that include a baseline inventory of current xenobiotics in the environment based on the historical data and current information will be produced by June 2004. (4) A complete contaminants risk assessment will be completed for Cape Cod National Seashore.

B. Vital Signs Monitoring

Objective 5: Hire and retain professional staff and provide a safe, healthy, and productive work environment.

- FY2003 Accomplishments: (1) Chris Lea, an ecologist from ASIS, was detailed to the Network for 8 months to provide technical expertise for the network vegetation mapping program. The Network provided backfill to ASIS to replace Chris. (2) Mark Duffy, a GIS specialist from ASIS was detailed to the Network for 11 months to manage the geomorphologic change component of the Network's monitoring program. Mark was detailed to the Network for 75% of his time. The Network provided backfill to ASIS for Mark's time. (3) The Network established a full-time, permanent, GIS Specialist position (GS12) to oversee the geomorphologic change component of the Network's monitoring program. Assateague Island N.S. seashore allowed the Network to Duty Station this person at their Park Headquarters. Mark Duffy successfully competed for the position and was hired. (4) Marc Albert, transferred to the Boston Office from Golden Gate Park and was hired as a part-time GS-11 Term Biologist to compile information on exotic plants, and review park planning documents for the Phase II report. (5) Arthur Rodriguez, a graduate student at the University of Rhode Island jointly supported by the Network and the CESU to develop a GIS based toolbox to help managers interpret shoreline change data, was accepted into the SCEP program and duty stationed at Assateague Island N.S. for 12 weeks. (6) Melanie Ransmeier, an intern with the Geological Resources Division, was hired for 10

weeks to develop a data management plan for the Geomorphologic Change Monitoring Program. (7) Jason Kenworthy, of Fossil Butte N.M. worked for the Network for 8 weeks and completed an inventory of Paleontology resources for Network Parks. (8) Two Biotechs were hired to assist the Estuarine Nutrients program and stationed at Gateway N.R.A for 3 months. (9) The Network contributed to \$ towards the salaries of two biotechs assisting Chris Lea develop a Vegetation Map for Assateague Island N.S.

- Scheduled FY 2004 Activities and Products: (1) Marc Albert will become a full-time, term biologist for the Network. (2) Susan Huse, a database programmer from the Alaska Support Office, will join the Network as a part-time GS11 database developer. Sue will begin developing NCBN data management SOP's in cooperation with network cooperators and their projects. She will also develop access databases for each component of the network's monitoring program.

Objective 6-Develop and maintain working and decision-making processes that engage the network board of directors, technical staff and managers of network parks.

- FY2003 Accomplishments: (1) A technical steering committee meeting was held at GEWA for two days in May 2003. A meeting report has been written and is available. (2) Network staff met with all cooperators individually in 2003 to discuss status of projects and network needs for the Phase II monitoring plan. (3) Although no meeting was held this year with the board of directors, communication was conducted between board members and network staff throughout the year. In FY2003 the Board of Directors reviewed and accepted the Network 2003 annual work plan, designated an NPSpecies point of contact for the network, and approved the hiring of Mark Duffy to network staff. The Board of directors also revised and amended the network charter in FY03.
- Scheduled FY 2004 Activities and Products: (1) A meeting will be held at SAHI in December 2003, to introduce new park Superintendents and staff from FIIS, GATE and SAHI to the Network's I&M program. Both network staff and cooperators will be presenting at this meeting. Additional park meetings will be arranged to review the Network's Phase II plan submitted October 1, 2003, and to gain approval of the 2004 work plan. (2) Network staff will meet with all cooperators to discuss and review protocol development and the Phase III plan. (3) A Technical Steering Committee meeting will be held to review and discuss the Network's Phase II Vital Signs monitoring plan and the completion of Phase III.

Objective 7- Develop, implement, and maintain a Network data management program.

Task 7.1 Creation and compilation of digital boundary and orthophotography base layers for NCBN parks. (All parks)

- FY2003 Accomplishments: (1) Through an amendment to a cooperative agreement with the University of Rhode Island, NPS Field Technical Support Center (FTSC), base cartographic datalayers were created of digital orthophotos and park boundaries to be the best available boundary and base data assembled in a consistent fashion for the CACO, FIIS, GATE and SAHI. In implementing the process the cooperators created a consistent naming convention of these datalayers for the region. In many cases, park boundaries overlaid several DOQQs, requiring that these images be mosaiced into one seamless image. ERMapper 6.3 compression software (Earth Resource Mapping Ltd.) was used to compress images to Enhanced Compression Wavelet (.ecw) format. These images are intended to meet the network's general cartographic needs. For this project, boundary data were obtained from the

National Park Service, National Database of boundaries in the Geographic Coordinate System. (2) A cooperative agreement was established with North Carolina State University, another NPS FTSC, to compile and create base GIS data, following the project guidelines above.

- Scheduled FY 2004 Activities and Products: (1) Base cartographic datalayers for ASIS, COLO, THST and GEWA will be submitted to the network by NCSU.

Objective 8-Identify and prioritize Network Vital Signs, develop protocols and implement programs to monitor these Vital Signs in Network parks.

Task 8.1 Test existing protocol for assessing and monitoring salt marsh ecosystems in Network parks. (CACO, FIIS, GATE, ASIS, COLO, GEWA, THST and two Northeast Temperate Network (NETN) Parks, ACAD and BOHA)

- FY2003 Accomplishments: (1) Study sites were selected at COLO, FIIS, and GATE (Jamaica Bay unit & Sandy Hook unit) by the cooperator, URI, M.J. James-Pirri and NPS collaborator, Dr. Charles Roman. (2) Four field technicians were hired to carry out field sampling. Sampling for nekton and vegetation was completed for these three Parks. Nekton were sampled twice (once in June and once in Aug) and vegetation was sampled once (July) at each of the above study locations. At the Big Egg marshes (GATE) only nekton was sampled since vegetation data is currently being collected by Park staff in conjunction with restoration (spray) efforts. Raw data will be entered into databases later this year.
- Scheduled FY 2004 Activities and Products: (1) Additional study sites will be selected by April of 2004. Four field technicians will be hired to carry out field sampling. Nekton and vegetation sampling will take place from June through August of 2004. Nekton will be sampled twice and vegetation will be sampled once. A Coastal Fellow, Charles Ferris, at the University of Rhode Island, hired as a field technician in 2003 will be presenting a poster on the 2003 field sampling effort at the Coastal Fellows annual Fall semester seminar at URI. (2) The existing protocol developed as part of prototype monitoring program at CACO, will be reviewed and standardized to meet I&M program protocol format, to be submitted as part of the Phase III network monitoring plan.

Task 8.2 Test variables and develop protocol and for assessing and monitoring geomorphologic change in Network parks. (CACO, FIIS, GATE, ASIS, COLO, GEWA, THST, SAHI)

- FY2003 Accomplishments: (1) A scientific and technical geomorphological workshop was held at the University of Rhode Island in October 2002. Using information from this workshop and two previous workshops (2000 & 2001), and input from network cooperators and park resource specialists, a network geomorphological workshop report was produced and is currently under peer review. (2) An interagency agreement with USGS and NASA was developed to conduct LIDAR surveys and initial processing of data for four network parks (ASIS, CACO, FIIS, GATE). NASA Wallops Island cooperators collected data using the EAARL (Experimental Advanced Airborne Research Lidar) LIDAR system while USGS Coastal Center - St. Petersburg, FL performed initial processing of the data. NPS provided field and logistical support and ground control for the survey. NPS staff at the University of Rhode Island Environmental Data Center provided additional product development and data processing support in cooperation with USGS. (3) LIDAR surveys for ASIS, CACO, and FIIS have been received from NASA

and USGS, and have been processed into an ESRI GRID format. In all, thirteen surveys ranging from 1998 to 2001 have been processed. The ASIS and CACO surveys have been distributed to the individual parks, along with tools for utilizing the data including default classification schemes/legends, and the ArcView Grid Analyst extension. **(4)** Horizontal shoreline position data sets collected at ASIS, CACO, FIIS, and GATE, by NPS, or many collected by the late Dr. James Allen, a USGS coastal geomorphologist, were obtained and combined to form shoreline databases for each park. These databases are an initial attempt to standardize the collection and archival processes for shoreline data and increase data management efficiency. The FIIS database is complete. **(5)** Survey questions were developed to examine the current and potential use of coastal geomorphology data and analyses by network park managers and researchers. The questionnaire and associated discussions have been summarized for ASIS and CACO, and will be for FIIS and GATE. **(6)** The network has worked closely with the NPS Geologic Resources Division, Assateague Island National Seashore, and the Environmental Data Center at the University of Rhode Island to develop a general framework for a network data management plan for geomorphological data. A first draft of the plan was completed in September 2003, has been reviewed by the network's geomorphologic program specialist, and is awaiting further revision. Part of the data management plan includes database design for shoreline, and general topographic data. These designs were then applied to the prototype data sets for Assateague Island National Seashore and to other park geomorphologic data as appropriate. Modified data sets based on the database design have been distributed to several of the network parks. **(7)** The accuracy of LIDAR surveys are greatly increased by the presence of a geodetic GPS base in close proximity to the survey area. In its working partnership with NASA and USGS to develop LIDAR based products for coastal parks, the NPS is assuming responsibility for providing logistical support including operating GPS base stations coincident with airborne surveys. To meet this responsibility, the network and Assateague Island National Seashore shared the purchase of a dual-frequency geodetic GPS (Trimble 5700). This equipment will allow the NPS to provide ground support to various ground and airborne activities that require a survey grade GPS base as reference for airborne GPS and other data collection systems.

- **Scheduled FY 2004 Activities and Products:** **(1)** Upon completion of the workshop report review, development of a geomorphologic monitoring protocol for the network will begin. **(2)** Initial EAARL LIDAR data products from a 2002 survey will be reviewed and distributed to parks and other cooperators for review and comment. EAARL is an experimental technology and development of final products involves an iterative process. Network and park play an active role in the partnership by attempting to use test deliverables and providing feedback to NASA and USGS; and by performing quality and accuracy checks on developmental products. **(3)** Airborne surveys will be coordinated at COLO, GEWA, THST, and SAHI. Planning will be in cooperation with NASA and USGS by defining aerial extent of surveys and providing ground support by operating a geodetic grade global positioning system (GPS base station). Network staff will participate in post-survey data processing with USGS and NASA to continue the development of base topographic data and various value added or derived products including high-resolution digital imagery. **(4)** Processed FIIS LIDAR survey data will be distributed to park personnel. GATE LIDAR surveys scheduled to arrive from USGS, will then be processed and distributed to park personnel. Additional data sets from ASIS,

CACO, FIIS and GATE are expected as well. These newer data sets include data collected with a new sensor (EAARL – Experimental Advanced Airborne Research LIDAR) that can collect multi-return data, allowing true three-dimensional data to be recorded. (5) GPS shoreline databases will be completed for CACO, ASIS, and GATE and distributed to the parks. Database structure and data will be modified following comment and feedback from park staff and researchers. (6) Revise draft data management and distribute revision for broader review and comment. (7) Develop network expertise in the operation of geodetic grade GPS total station (Trimble 5700 Total Station) through formal and informal training sessions. Develop safe packaging and efficient shipping plan for the rapid transport and deployment of the geodetic GPS equipment. Support NASA airborne data collection by operating GPS base in proximity to designated survey area. Develop a plan to inventory existing survey monuments other reference markers in network parks. Work with parks to establish a high quality, well-documented ground control network for use in monitoring and other field activity.

Task 8.3 Aerial Data Collection and Creation of Products for Park Vital Signs Monitoring within the Northeast Region Coastal and Barrier Network by USGS scientists.

- FY2003 Accomplishments: (1) Prior to EAARL flights, geographic survey extents were defined to target regional monitoring program needs for relevant parks. In addition, flight availability and scheduling was determined. An initial survey plan was formed which included flights over ASIS, CACO, FIIS, and GATE during fall of 2002. (2) Using aircraft from NASA Wallops Flight Facility and the NASA Experimental Advanced Aircraft Research Lidar (EAARL), aerial lidar surveys were conducted over NE barrier parks (Table 1). Processing capabilities were developed for the extraction of bald-earth and first-surface (general landscape features including vegetation) from the EAARL lidar surveys. Processing algorithms were written to extract x,y,z, point data from raw NASA data. These points comprise first- and last-surface values extracted from the EAARL data waveform. Once the point data is captured for a complete mission, it is merged together. Next, a filter is applied to exclude outliers from the data. Recently, EAARL data processing was expanded to include creation of geotiffs for GIS applications. After the data sets are filtered, the points are rasterized to a 1-meter georeferenced grid. The format for raster data is a geotiff, projected on the Universal Transverse Mercator (UTM) grid, referenced to the NAD-83 horizontal and NAVD-88 vertical datums. Maps are indexed on a 2 by 2 kilometer grid (referenced to UTM zones). Thus, for each new survey processed, initial products include bald-earth and first-surface topographic geotiffs for parks within the Northeast network. Processing and delivery status for the EAARL data is shown in Table 2. To date, the USGS has provided Mark Duffy with digital copies of all geotiffs and most ASCII point data sets derived from earlier NASA Airborne Topographic Mapper (ATM) lidar surveys. In addition, the USGS has worked with the National Park Service in an ongoing QA/QC of the lidar datasets. Initial complications with some of the CACO ATM data sets were rectified and new geotiff products delivered. (3) Multi-sensor aerial surveys are a preferred method for the collection and extraction of certain key Vital Sign indicators, specifically shoreline and dune elevation features. As part of its product development, the USGS is converting raw NASA remote sensing lidar data sets into GIS-compatible information layers tailored to Vital Signs monitoring. These layers have been defined by the NPS and are applicable to the management needs of National Seashores. Using acquired lidar elevation data, the

USGS has successfully delineated significant geomorphological features such as dunes and shorelines. Preliminary GIS digital and map products for Vital Signs monitoring have been created for ASIS and provided to the Network for review. The products include: a. Coastal dune inventory (vector features, tables, and associated maps) – completed initial product for ASIS 980403 Index Tiles 2-6. Have provided tiles 4-6 to ASIS; b. Digital shoreward edge of vegetation files for ASIS; and c. Shoreline extraction (comparable to Park GPS shorelines) from all complete island ATM lidar surveys for ASIS.

Table 1. EAARL lidar survey dates and geographic extents.

Survey Date	Park	Notes
11Sept2002	ASIS	Ocean City, MD: Comparison with ATM over ASIS
12Sept2002	ASIS	Ocean City, MD: Comparison with ATM over ASIS
07Oct2002	ASIS	ASIS beach
08Oct2002	CACO, FIIS, GATE	CACO, FIIS, NJ coast
24Oct2002	GATE, ASIS	Sandy Hook, NJ coast, ASIS, DE coast
25Oct2002	GATE	Jones Beach, NY. Sandy Hook, NJ coast
08Nov2002	FIIS	FIIS

Table 2. EAARL Processing and product delivery status. Products include bald-earth and first-surface topography.

Survey Date	Park Identifier	Processing Status			Product Delivery Status
		Merged Files	Filtered Data	Geotiffs Created	
11Sept2002	ASIS	√	√	√	Quicklook plots delivered
12Sept2002	ASIS	√	√	√	Quicklook plots delivered
07Oct2002	ASIS	√	√	√	Quicklook plots delivered
08Oct2002	CACO, FIIS, GATE	√	√	√	Quicklook plots delivered
24Oct2002	GATE, ASIS	√	√	√	Quicklook plots delivered
25Oct2002	GATE	√	√	√	Quicklook plots delivered
08Nov2002	FIIS	√	√	√	Quicklook plots delivered

- Scheduled FY 2004 Activities and Products: (1) Biennial surveys are recommended as the appropriate collection interval for data acquisition and processing. As surveys are flown, data will be processed and products will be created and delivered to park managers. (2) The focus of activities during FY 2004 is the creation of change detection products. EAARL lidar surveys from 2001 and 2002 have already been processed to a GIS-compatible format. These will be used to generate accurate, detailed change maps and feature inventories for use in the Vital Signs and Monitoring Program. In addition, the methodology will be refined and described in a USGS Open-File Report (projected completion date is summer of 2004). a. Work with parks to develop a definition of respective features (dune, vegetation edge, and shoreline). Extract features of interest from recent EAARL lidar data and apply change detection methodology to EAARL-derived data sets for parks in the Northeast Region Coastal & Barrier Network. Create resulting change detection maps and/or vector inventories and provide to park managers. ASIS will be the first of the NE parks undertaken. b. Develop documentation of processing methods and techniques, and create metadata associated with products.

Task 8.4 Test variables and develop protocol and for assessing and monitoring visitor impacts in Network parks. (CACO, FIIS, GATE, ASIS, COLO, GEWA, THST, SAHI)

- FY2003 Accomplishments: **(1)** A complete and thorough scoping process of the degree and extent of visitor impacts to natural resource conditions at network areas was completed at ASIS, COLO, FIIS, GATE, GEWA, THST and SAHI by Christopher Monz, Ph.D. and Yu-Fai Leung, Ph.D cooperators from St. Lawrence University and North Carolina State University respectively. Findings from this process were summarized in two project reports and several publications (see below) and informed the additional tasks in the project. The general location and extent of visitor impacts to resources was documented photographically. **(2)** A thorough search of the available literature was conducted to inform the process of determining impacts of significant concern and the initial phase of vital sign selection. Publication and presentation of meta-analysis of previous findings was accomplished. **(3)** Scientifically rigorous and thorough conceptual models of the mechanisms of visitor impacts to coastal resources (vegetation, wildlife and soils) were developed in order to inform the process of selecting appropriate vital signs of ecological significance. **(4)** Preliminary site selection for testing of vital signs measurement protocols was accomplished during the initial and follow-up scoping phases for ASIS, COLO, FIIS, and GATE. Preliminary methods development was accomplished concurrently during this FY by means of a) basic trials of established methodologies during site visits; b) examination of the feasibility of new methodologies in the literature review; c) discussion of potential collaborative monitoring efforts with other network projects.
- Scheduled FY 2004 Activities and Products: **(1)** The formal scoping phase of the project has been completed, but additional site visits in FY 04 may yield some more information on impact concerns from managers. Additional publication of results from this process will be accomplished. **(2)** Additional literature reviews and analysis will be completed on specific aspects of the project such as a) the applicability and efficacy of remote sensing technologies in measuring visitor impacts to soil and vegetation resources through the creation of social trails; b) the applicability of behavior observation techniques in measuring wildlife-visitor interactions; and c) appropriate sampling schemes for visitor impact assessment within the context of the NPS Vital Signs Program. **(3)** Protocol development will involve extensive activity in FY04 including the following: On-site testing of vital signs measurements at ASIS, COLO, FIIS and GATE; development, testing and verification of remote sensing methodologies for assessment of visitor impacts to soil and vegetation through the creation of social trails; development and testing of techniques for assessment of wildlife-visitor interactions; development of specific procedures for the collection of data at all network areas; reporting of findings in NPS reports, professional presentations and in scientific journals.

Task 8.5 Test variables and develop protocols for the use of high spatial resolution satellite remote sensing data for estuarine and terrestrial vegetation habitat mapping in NCBN parks. (FIIS)

- FY2003 Accomplishments: **(1)** A cooperative agreement was established with Y.Q.Wang of the Natural Resource Science Department Remote Sensing Lab at the University of Rhode Island. The primary goal of this project is to explore efficient remote sensing data sources and technical approaches to map both terrestrial and submerged aquatic vegetation in the Fire Island National Seashore. The project is aimed at developing a long-

term coastal resource monitoring program using the most recent technologies in advanced remote sensing data and geographic information. The initial objectives of this project are to: map the terrestrial near-shore vegetation and seagrass beds within the FIIS boundary using high spatial resolution Quick Bird 2 multi-spectral satellite remote sensing data; map the estuarine and submerged aquatic habitats using hyperspectral remote sensing data; compare and validate the agreement between satellite derived vegetation maps and the delineation result from the previous project, so that we can repeat monitoring of vegetation change in a reasonable time frame and cost; compare and validate agreement between satellite derived SAV maps and the delineation result from the Army Corp of Engineer aerial photograph survey, so that the network can conduct dynamic monitoring of SAV in a reasonable time frame and cost; and develop working protocols that are transferable among NPS projects for the use of high spatial resolution satellite remote sensing data for estuarine and terrestrial vegetation habitat mapping. This project began officially on July 1st 2003. During the period of July 1st, 2003 and October 3rd the cooperators focused their efforts on collecting and organizing existing GIS and image data of the Fire Island National Seashore. They have setup a website located at http://www.ltrs.uri.edu/research/fiis_web/index.htm which details their progress and data sources. (2) The investigators have also conducted two field trips to Fire Island. The first field trip was conducted by project co-PI, Michael Traber in August. The purpose of this trip was to investigate the layout and logistics of vehicle and boat travel. The information gathered during this trip was used to plan for future field trips. During the trip Michael used a boat and navigated the waters of Great South Bay within the park boundaries to become familiar with the site and any navigational hazards. The second field trip was conducted between September 21-24th, 2003. During this field trip Y.Q. Wang and Michael Traber conducted field sampling of the terrestrial vegetation located on Fire Island. URI personnel were guided by Diane Abel, National Park Service in Patchogue, during the first day of sampling. During the three days of sampling, 477 georeferenced images, 99 field verification points, 36 vegetation transects, and 11 polygons were acquired. The data is currently being processed.

- Scheduled FY 2004 Activities and Products: (1) Michael Traber, co-PI on the project, is coordinating the acquisition of the satellite imagery. Michael will be submitting a formal Data Acquisition Request to Digital Globe Inc. for Quickbird multispectral imagery and to USGS for Hyperion hyperspectral imagery once we receive the official approval of the NPS funding for this project. The date of the acquisition has been set for late April, 2004. The investigators will start the image processing, classification, and vegetation mapping as soon as they receive the images. (2) A second field trip has been scheduled for between October 6th and 9th for the purpose of verifying the location of known SAV (submerged aquatic vegetation) within the FIIS boundary. A towed underwater video system linked to a GPS will be used to conduct transects of SAV beds. The collected video will be used to aid in classifying the collected imagery. A second round of terrestrial and SAV surveys have been planned to coincide with the imagery acquisition, scheduled in late April or early May, 2004.

Objective 9-Integrate water quality monitoring in the Network Vital Signs monitoring plan.

Task 9.1 Compile and review existing freshwater quality information in network parks.

- FY2003 Accomplishments: **(1)** Section I of the *Wetland and Water Quality Issues for Parks of the Northeastern US: A Scoping Report for the Coastal and Barrier Network* by Principle Investigator: Mary-Jane James-Pirri, from the University of Rhode Island, and National Park Service Research Collaborator, Charles T. Roman, has been completed and was sent out for park-review, May 6, 2003. This first section of the report includes information on impaired waters (303d and 305b waters) gathered for ASIS, CACO, COLO, GATE, GEWA, FIIS, SAHI, and THST. **(2)** Section II of the report provides a description of wetland types present within each park, including wetland areas statistics from available GIS data. Information and synthesis of wetlands area statistics for each park unit is currently in progress. This section is approximately 75% complete as of September 2003. **(3)** Section III of the report will be completed in FY04.
- Scheduled FY 2004 Activities and Products: **(1)** Section I of the report is complete and changes will be made upon completion of review. **(2)** Section II will be completed in early Fall of 2003. **(3)** Section III will be written in Fall 2003, after Section II is completed. Section III will include information on threats to wetlands, description of ongoing monitoring programs, and specific recommendations for future monitoring and restoration (if applicable) for each park unit.

Task 9.2 Test variables and develop protocol and for assessing and monitoring nutrients inputs to estuarine ecosystems in Network parks. (CACO, FIIS, GATE, ASIS, COLO and ACAD (Northeast Temperate Network NETN Park)

- FY2003 Accomplishments: **(1)** University of Rhode Island cooperators downloaded all GIS datasets, with the exception of watershed coverages, listed in the Appointment Conditions from federal databases including, but not limited to USGS and EPA. The aforementioned datasets include: GIS Census Data 2000 (census blocks and total population density) and Land Use Classification (USGS National Land Cover 1992 <http://seamless.usgs.gov/>). Watershed delineations were collected on the state level and this dataset is complete for all parks as well. **(2)** Agricultural, Water, Sewage, and Atmospheric N Deposition Data Collection and Analysis--Agricultural data collected during FY 2003 has been collected from national databases including: USDA-NASS 1997 Census of Agriculture (fertilizer use, livestock population, and crop coverage), EPA personal communications (Sewage Treatment Plant discharges and corresponding water consumption) and the National Atmospheric Deposition Program. This data has been particularly difficult to collect and analyze as many USDA and EPA datasets are largely incomplete or flawed. The data collected thus far is complete and assumed to be accurate.
- FY 2004 Scheduled Activities and Products: **(1)** GIS Data Collection--As all GIS datasets have been collected, the data will have to be analyzed within the predetermined sphere of influence for each park. The research assistant who has collected the GIS data is currently (09/2003) enrolled in a GIS course and we expect the GIS data to be fully analyzed by the beginning of 2004. Agricultural, Water, Sewage, and Atmospheric N Deposition Data Collection and Analysis--Currently, all data required as input parameters for the Manage N Loading model and the N-loading model generated by Valiela et al. (1997) have been collected. During FY 2004, these analyses will be performed in association with the collected GIS data. Upon completion, the suite of data analyses will be compiled and submitted by the end of FY 2004.

Task 9.3 Test variables and develop protocol for assessing and monitoring estuarine nutrient

enrichment in Network parks. (CACO, FIIS, GATE, ASIS, COLO and ACAD (a Northeast Temperate Network NETN Park)

- FY2003 Accomplishments: **(1)** NCBN established a cooperative agreement with the Virginia Institute of Marine Science to create a 4-month graduate student internship, and hired two additional summer students through the Student Temporary Employment Program, to assist USGS with field tests at COLO, FIIS, and GATE. **(2)** USGS conducted field tests in order to develop protocols for monitoring ecosystem responses to estuarine nutrient enrichment at COLO, FIIS, and GATE. Probabilistic sampling designs were developed in collaboration with park resource managers and the National Coastal Assessment team of the US EPA National Health and Environmental Effects Research Laboratory; sampling regimes were designed to meet individual park needs while maintaining statistical validity. During a four-week index period at FIIS and COLO and two four-week index periods at GATE, weekly spatial surveys and continuous monitoring of the following potential vital signs were conducted: attenuation of photosynthetically active radiation, chlorophyll-a, turbidity, temperature, salinity and dissolved oxygen. **(3)** USGS established two sites for monitoring population-level characteristics of seagrass beds at CACO using an existing global monitoring protocol, SeagrassNet. Dr. Frederick Short (University of New Hampshire) provided on-site training in the SeagrassNet methodology. Quarterly sampling was conducted in July.
- Scheduled FY 2004 Activities and Products: **(1)** Outcomes of FY 2003 pilot tests will be analyzed and used as a basis for developing region-wide protocols. **(2)** Probabilistic sampling designs will be developed for the remaining Northeast Coastal Parks, in continued collaboration with park resource managers and USEPA National Coastal Assessment team and assisted by URI graduate student Julia Brownlee. **(3)** CACO seagrass sites will be monitored in October, April, and July, to provide baseline data for interpreting future annual monitoring data. **(4)** A final report on protocols for monitoring ecosystem response variables in all parks will be submitted, including operating procedures for the calibration, maintenance, and deployment of electronic water quality instrumentation and recommendations on appropriate quality assurance plans for data.

III. Staffing

Inventory and Monitoring Staff (NCBN)

Elizabeth Johnson, I&M Regional Coordinator (NPS)

Bryan Milstead, NCBN Coordinator (NPS)

Sara Stevens, NCBN Science Information Coordinator (NPS)

Mark Duffy, NCBN GIS Specialist (NPS)

Marc Albert, NCBN Term Biologist (NPS)

Susan Huse, NCBN Term Database Manager (NPS)

Arthur Rodriguez, GIS specialist, Graduate Student URI (SCEP program, ASIS)

Linda Fabre, NPSpecies Coordinator (URI Cooperator)

Dennis Skidds, Web page development/Data Management Assistance (URI cooperators)

Julia Brownlee, Data Management Assistance (GIS) (URI cooperators)

Sarah Sand-Administrative assistance (contract employee)

NCBN Technical Steering Committee

Bryan Milstead, NPS-University of Rhode Island
Sara Stevens, NPS-University of Rhode Island
Elizabeth Johnson, NPS-University of Rhode Island
Carl Zimmerman, NPS-ASIS
Charles Rafkind, NPS-COLO
George Frame, GATE
Allan O'Connell, USGS-Pautuxent
Charles Roman, NPS-University of Rhode Island
Hilary Neckles, USGS-Augusta, ME
Howard Ginsberg, USGS-University of Rhode Island
John Karish, NPS-Penn State University
Mary Foley, NPS-BOSO
Nancy Finley, NPS-CACO
Glenn Gutenspergen, USGS
P. A. Buckley, USGS-University of Rhode Island

NCBN Board of Directors

Michael Hill, ASIS
Maria Burks, CACO
Alec Gould, COLO
Dave Spirtes, FIIS
Billy Garrett, GATE
Vidal Martinez, GEWA/THST
Gay Vietzke, SAHI
Bryan Milstead, NCBN Coordinator
Elizabeth Johnson, I&M Regional Coordinator

NCBN Contractors and Cooperators

University of Richmond, Dr. Joseph Mitchell
RI Natural History Survey, Jacqueline Sones, Virginia Carpenter Brown, Nina Briggs.
NatureServe, Lesley Sneddon
College of William and Mary, Dana Bradshaw
Frostburg State University, Ron Barry
National Park Service, Vince Santucci
New Jersey Audubon Society, David Mizrahi
North Carolina State University, Hugh Devine
NY Natural Heritage Program, Greg Edinger and Aissa Feldman
Penn State University, Scott Tiffney
Rutgers University, Mark Robson
St. Lawrence University, Chris Monz
North Carolina State University, Yu-Fai Leung
Theodore Roosevelt Sanctuary
USGS, Allan O'Connell
USGS, Hilary Neckles

USGS, John Brock
NASA, Wayne Wright
University of Rhode Island, Mary-Jane James-Pirri
University of Rhode Island, Scott Nixon
University of Rhode Island, Y.Q. Wang
University of Richmond, Joe Mitchell
URI Environmental Data Center, Peter August, Charles LaBash, Roland Duhaime, Dennis Skidds, Julia Brownlee, Linda Fabre
VA DNR-Natural Heritage Program, Chris Ludwig
Wildlife Conservation Society, John Behler

IV. Reports, Publications and Presentations (2003)

Reports

Barry, R. E. Mammal surveys at George Washington Birthplace NM, Thomas Stone NHS, Colonial NHP, Fredericksburg and Spotsylvania NMP, and Richmond NBP. Progress Report for Cooperative Agreement No. 1443DCA309701200, Task Order No. T-3097-01-300 of the Chesapeake Watershed Cooperative Ecosystem Studies Unit. January 2003.

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V. Status of Park Vital Signs Monitoring

Coastal and Barrier Network 2001	Air Quality	Water Quality	Water Quantity	Geologic Resources	Plants	Animals	Landscape Characteristics
Planning and Design							
# parks monitoring w/ NRC funding	8	8	0	8	8	8	8
# parks monitoring w/ other funding	1	6	0	4	4	5	0
Protocols Implemented							
# parks monitoring w/ NRC funding	0	0	0	0	0	0	0
# parks monitoring w/ other funding	1	4	0	2	3	5	0
Analysis/Synthesis Available							
# parks monitoring w/ NRC funding	0	0	0	0	0	0	0
# parks monitoring w/ other funding	1	3	0	0	2	5	0

Note: Air (CACO), Water (CACO,GATE, FIIS, ASIS, COLO, GEWA), GEO (CACO,ASIS,GATE, FIIS), Plants (ASIS, CACO, GATE, COLO), Animals (ASIS, CACO, GATE, FIIS, COLO).

VI. USGS Protocol Development and Monitoring-Related Research Needs

- Develop a protocol template and assist Network cooperators to develop standardized protocols.
- Assist the Networks with the task of adapting monitoring protocols developed for Prototype Parks for Network use.
- Continue supporting the development of methods to use LIDAR technology to monitor shoreline change in coastal Parks.
- Work with the Networks to develop protocols to move Vegetation Mapping from a snap-shot in time to a long-term monitoring program.
- Take a lead role in developing Landuse/Landcover change monitoring protocols for the Networks

Appendix 1: Summary of Major Accomplishments

Northeast Coastal and Barrier Network - This network of eight parks includes Cape Cod NS, Assateague Island NS, Colonial NHP, Fire Island NS, Gateway NRA, George Washington Birthplace NM, Sagamore Hill NHS, and Thomas Stone NHS. As part of its Vital Signs Monitoring efforts, the network is drawing from the monitoring design and protocol development work initiated by the Cape Cod NS Prototype Monitoring Program, and includes active participation from scientists with the USGS, EPA, and a number of universities in the Northeast region.

Vital Signs Monitoring

FY 2003 Network Objectives for Vital Signs Monitoring:

- Hire and retain professional staff and provide a safe, healthy, and productive work environment.
- Develop and maintain working and decision-making processes that engage the network board of directors, technical staff, cooperators and managers of network parks.
- Develop, implement, and maintain a Network data management program. (Note: this objective is placed under Vital Signs monitoring, however, it is equally important and integrated with the Biological Inventories portion of the program.).
- Identify and prioritize Network Vital Signs, develop protocols and implement programs to monitor these Vital Signs in Network parks.
- Integrate water quality monitoring in the Network Vital Signs monitoring plan.

Summary of Major Network Accomplishments During FY 2003 - Based upon the results and information gathered during scoping workshops held by the network FY2000-2003, common high-priority issues and data needs have been documented for network parks. In FY 2003, with the assistance of the network's technical steering committee, made up of NPS and USGS scientists, conceptual ecosystem models were developed and used to help further guide the selection of vital signs monitoring for long-term monitoring. Monitoring funds received by the network in FY 2003 were used to gather existing information on network freshwater and estuarine water quality, visitor impacts, saltmarsh communities, geomorphology, and contaminants. Vital signs (or indicators) of ecosystem health were identified and prioritized specific to each issue. Cooperative agreements were established and funding was provided to the University of Rhode Island, Rutgers University, North Carolina State University, St. Lawrence University and the U.S. Geological Survey to assist with further development of the network's vital signs monitoring program and the identification and evaluation of existing information and data needs for the network parks.

Work during FY 2003 included conducting a *geomorphologic change* scoping workshop to discuss the development of a plan and eventual protocol for monitoring in the network. Scientists who attended the workshop were from the Virginia Institute of Marine Science, USGS, and the US Army Corp. of Engineers. An interagency agreement with USGS and NASA was also developed to conduct LIDAR surveys and initial processing of data for four network parks. Cooperators from NASA Wallops Island, collected data using the EAARL (Experimental Advanced Airborne Research Lidar) LIDAR system while USGS Coastal Center - St. Petersburg, FL performed initial processing of the data. NPS provided field and logistical support and ground control for the survey. NPS staff at the University of Rhode Island Environmental Data Center provided additional product development and data processing support in cooperation with USGS. The network has also worked closely with the NPS Geologic Resources Division, Assateague Island National Seashore, and the Environmental Data Center at the University of Rhode Island to develop a general framework for a network geomorphological change data management plan.

In the Northeast Coastal and Barrier Network a *saltmarsh monitoring* program is being developed. Saltmarsh has been identified as a key ecosystem for monitoring in network parks. Two existing monitoring protocols, developed, tested and implemented as part of the Cape Cod Prototype Monitoring program are being tested and adapted by the network. These protocols have been successfully implemented in eleven Fish and Wildlife Refuges along the Atlantic Coast. Implementation of these protocols in network parks would allow coordination with U.S. Fish and Wildlife Service refuges in implementing monitoring and comparing data. A cooperative agreement with the University of Rhode Island was established to begin protocol development for adapting this protocol regionally in Network parks.

During FY 2003, as part of an interagency agreement with USGS to develop an *estuarine nutrient enrichment* component to the network's vital signs and water quality monitoring program, potential monitoring variables were selected by assembling and synthesizing information from diverse sources, including technical workshops and meetings, existing programs, and site visits to NCBN and Northeast Temperate network parks. USGS conducted field tests of potential variables for monitoring ecosystem responses to estuarine nutrient enrichment at three network parks during 2003. Probabilistic sampling designs were developed in collaboration with park resource managers and the National Coastal Assessment team of the US EPA National Health and Environmental Effects Research Laboratory. A second component of this project is being completed by cooperators from the University of Rhode Island. The cooperators are developing techniques to *monitor potential sources of nutrient inputs* in park watersheds. Funded with network Water Resource Division funds in FY 2002, the cooperators are conducting a baseline inventory of potential sources of nutrients within watersheds of each of the NCBN parks. This project will provide an inventory of recent changes in nutrient loading proxies at 10-year intervals back to 1970, as well as interpretation for each park. A manual of procedures for updating this inventory at each location, including detailed data source guides, is being developed as part of the final product.

The development of a *visitor impact monitoring protocol* continued in FY 2003 as well. A complete and thorough scoping process of the degree and extent of visitor impacts to natural resource conditions was completed at seven network parks by Christopher Monz, Ph.D. and Yu-Fai Leung, Ph.D cooperators from St. Lawrence University and North Carolina State University respectively. Findings from this process were summarized in two project reports and several publications and informed the additional tasks in the project. A thorough search of the available literature was conducted to inform the process of determining impacts of significant concern and the initial phase of vital sign selection. Scientifically rigorous and thorough conceptual models of the mechanisms of visitor impacts to coastal resources (vegetation, wildlife and soils) were developed in order to assist in the process of selecting appropriate vital signs of ecological significance.

A two year project titled, "*Wetland and Water Quality Issues for Parks of the Northeast US: A Scoping Report for the Coastal and Barrier Network*", is nearing completion (Dec. 2003). The final report for this project will summarize threats and establish how those threats are altering structure and function of wetlands within the Network parks. As part of this same project, existing monitoring programs are being evaluated and improvements suggested if appropriate. Information from state 305(b) and 303(d) reports is being summarized and discussed in light of the need to identify pristine as well as impaired waters in the network for addressing GPRA goals for water quality.

Finally, a new cooperative agreement and project was established in FY 2003, with Y.Q.Wang of the Natural Resource Science Department at the University of Rhode Island. The primary goal of this project will be to explore efficient remote sensing data sources and technical approaches to map both terrestrial and submerged aquatic vegetation in network parks. The project is aimed at developing a long-term coastal resource monitoring program using the most recent technologies in advanced remote sensing data and geographic information. The

initial objectives of this project are to: map the terrestrial near-shore vegetation and seagrass beds within park boundaries using high spatial resolution Quick Bird 2 multi-spectral satellite remote sensing data; map the estuarine and submerged aquatic habitats using hyperspectral remote sensing data; compare and validate the agreement between satellite derived vegetation maps and the delineation result from the previous project, so that the network can repeat monitoring of vegetation change in a reasonable time frame and cost; compare and validate agreement between satellite derived SAV maps and the delineation result from the Army Corp of Engineer aerial photograph survey, so that we can conduct dynamic monitoring of SAV in a reasonable time frame and cost; and develop working protocols that are transferable among NPS projects for the use of high spatial resolution satellite remote sensing data for estuarine and terrestrial vegetation habitat mapping.

Biological Inventories

FY 2003 Network Objectives for Biological Inventories:

- Locate, catalog and archive park natural resource documents, data sets, and spatial information and ensure such information is accurate, in useable formats and readily available.
- Conduct inventories targeted at vertebrate and vascular plant species in the Network parks and conduct quality assurance and review of all inventory products.
- Conduct investigations on species and species assemblages that are of special concern to network parks and conduct quality assurance and review of all inventory products.
- Conduct other baseline inventories identified as important to Network parks and the Network Vital Signs program and conduct quality assurance and review of all inventory products.

Summary of Major Network Accomplishments During FY 2003: The Northeast Coastal and Barrier Network Species Inventory Study Plan was completed in FY 02. This plan described vertebrate and vascular plant inventory gaps in network parks that had been identified through reviewing existing information, holding scoping workshops with taxonomic experts and park staff. Although some vertebrate and vascular plant inventories had been done in many of the parks over the years, few park-wide, baseline, systematic inventories had been completed. The network has also been working over the past few years to gather and compile existing data and information, including historical records, that in the past were scattered among cooperators and other scientists. This information is being entered into three nationally developed databases, creating a scientific record of what has and did exist in the network parks. To conduct network inventories and the information compilation and archiving, a number of cooperative agreements were established in FY02-FY03. Inventories of birds, mammals, fish, amphibian and reptiles have been initiated in network parks. Agreements were established with well known scientists from University of Richmond, College of William and Mary, Wildlife Conservation Society and Frostburg State University. Additionally, the network is cooperating with a number of nonprofit organizations such as the New Jersey Audubon Society and the Rhode Island Natural History survey.

Vegetation mapping, another biological inventory, has been identified as a high priority for completion in all network parks. Again, although there are some historical vegetation maps for some of the network's parks, no park-wide, systematically developed vegetation maps exists. Although currently considered an inventory, the network is considering ways to use these and future maps in monitoring long-term vegetation community change in the parks. So far, vegetation maps have been completed for Fire Island and Assateague National Seashores and all other network park mapping is currently in process and will be completed by 2005. Draft vegetation keys and classification documents were prepared for the North Atlantic Coast and Chesapeake Bay ecoregions, applicable to all of the Northeast Coastal and Barrier Network parks, through a cooperative agreement with NatureServe. These keys will be a very important component when monitoring vegetation in the future.

Species inventories conducted in FY 2003, include *bird, mammal and herpetological inventories* at three network parks, Colonial National Historical Park, George Washington's Birthplace National Monument and Thomas Stone National Historic Site. New species have been added to all park lists. Field sampling for amphibian and reptile inventories was completed in 2003, at Fire Island NS, Gateway NRA and Sagamore Hill NHS by the Wildlife Conservation Society. Many species have been added to these park lists and information on species of special concern has been collected for the first time. During the initial inventory at Fire Island NS in 2002, a 100 year old Eastern Box Turtle was captured, as well as one individual of the *threatened and endangered* Eastern Mud Turtle. To address the lack of information on the current distribution and status of Eastern Mud Turtles at Fire Island NS, an amendment to the Wildlife Conservation Society cooperative agreement was established. As a result of this agreement, 12 new Eastern Mud Turtle individuals were captured in 2003, measured, marked with a unique number codes, photographed, and released. Seven of the 12 turtles were fitted with radio transmitters and their movements were tracked, using radio-telemetry, until mid-August, 2003. Results of this radio telemetry work will provide the park with much needed information on the existing mud turtle population and its preferred habitat and movements within the park.

An essential component of any scientific work is the final data review and evaluation, as well as the need to "*make the information useful and available*" to park managers. In order to meet this need, the network has developed a cooperative agreement with the University of Rhode Island Field Technical Support Center to review all inventory data products and provide feedback to each cooperator, as well as develop park specific, species occurrence maps that can be used by park management and planners.

Water Quality Monitoring

The *water quality monitoring* component of the network's vital signs monitoring plan, funded by the NPS Water Resources Division, will be fully integrated with the design and implementation of the network-based vital signs program. A single, integrated monitoring plan that incorporates the "core vital signs" and water quality components is being developed by the network and Phase II of this plan was completed in October 2003. As a result of the first network Vital Signs Scoping Workshop, held in April 2000, network freshwater and estuarine water quality workgroups were formed. Recommendations by both of these groups included identifying stressors common to all network park units, as well as those entities currently monitoring them. Stressors affecting water quality may include such things as adjacent land use, atmospheric deposition, altered stage and hydroperiod, and both human and wildlife use of park waters, and it is likely that state or regional agencies are already collecting data available to park units, or state programs that may be expandable with NPS contributions of staff time or funds to more directly address park management concerns.

To address these recommendations, a cooperative agreement was established in FY 2001 with scientists from the University of Rhode Island to put together a report identifying *threats to specific wetlands or wetland* complexes within the Northeast Coastal and Barrier Network parks. This report will also establish how those threats are altering the structure and function of the wetlands or at least establish the potential for alteration, as well as identify habitat restoration or other management scenarios aimed at protecting and enhancing wetland values for the long-term. The report, titled "*Wetland and Water Quality Issues for Parks of the Northeastern US: A Scoping Report for the Coastal Barrier Network*" is divided into three Sections. Each Section discusses specific attributes of wetlands or water quality issues within these NPS units. Section I provides a summary of available information on water quality from 305(b) Reports and 303(d) Lists. Section II provides a description of wetland types present within each park, including wetland areas statistics from available GIS data, and historical trends in wetlands. Section III provides a description of any ongoing inventory or monitoring programs related to park wetlands and water quality, a description and discussion of threats to wetlands, and specific recommendations for restoration, monitoring, management alternatives, and/or research needs.

In FY 2002, NPS Water Resources Division funding for network water quality monitoring was used to establish a cooperative agreement with Scott Nixon a well known nutrients scientist at the University of Rhode Island, to compile and review information on potential *sources of nutrients* within watersheds of each of the Network parks. When complete in FY 2004, this project will provide an inventory of recent changes in nutrient loading proxies at ten year intervals back to 1970, as well as interpretation for each park and a manual of procedures for updating the inventory at each location, including detailed data source guides.

Estuaries have been identified as key ecosystems within the coastal parks, and *estuarine nutrient enrichment* an important component of the network's monitoring program. Although Northeast Coastal and Barrier network parks represent a wide range of sizes, watershed geologies, tidal range, and fresh water sources, estuaries within these parks share fundamental characteristics, including temperate zone flora and fauna and the threat of nutrient enrichment as a primary management concern. These broad similarities are the basis for development of a uniform regional protocol for monitoring estuarine nutrient enrichment within the coastal park units. In FY 2003, the network funded the second year of a multi-stage project to identify, test and develop a protocol to monitor estuarine nutrient enrichment in network parks.

Public Interest Highlights (NCBN 2003)

NCBN Park's Paleontologic Resources Contribute Much to the Understanding of the History of Life on Earth

While none of the NCBN parks were specifically established to preserve fossils, the fossils found within these parks contribute much to the understanding of the history of life on earth. Currently over 160 NPS units (out of 388) are known to contain fossils, including those from the NCBN. One fossil, in particular, is of great historical significance. The mollusk, *Chesapecten jeffersonius*, found near Yorktown in COLO, represents the first fossil ever figured and described from North America by Martin Lister in 1687. The original fossil itself may have been collected from within the current boundaries of COLO, although the exact locality is unknown. Other paleontological resources are summarized below:

- ASIS fossils include approximately 60,000-year-old clam-like bivalves in addition to various crabs, corals, and other bivalves (probably a few hundred thousand years old) now in the park's museum collections.
- CACO fossils include a variety of microfossils including pollen and foraminifera ranging in age from approximately 10,000-100,000 years ago.
- COLO fossils include hundreds of different species of bivalves and gastropods (snails) approximately 4.5-3 million years old.
- GATE fossils include a number of oysters, scallops, gastropods, barnacles, and coral that are approximately 75,000-100,000 years old.
- GEWA fossils include a wide variety of well-preserved sharks teeth and marine mammal (whales, porpoises) bones approximately 24-11 million years old.

Testing of New Optical Water-quality Monitoring Equipment within the Northeast Coastal and Barrier Network

In cooperation with YSI Massachusetts, USGS and the NCBN provided design feedback and prototype testing of new optical water-quality monitoring equipment at FIIS. The penetration of adequate sunlight through the water column is a critical factor influencing the distribution of important seagrass habitat. The attenuation of visible light through water is a useful measure to understand threats to seagrasses, but optical sensors are vulnerable to fouling by small fauna, flora, and sediment when deployed for long periods. Antifouling technology, developed by YSI for other instruments, was applied to a new sensor array. USGS provided technical recommendations to YSI on signal processing and data logging considerations as well as design of appropriate sensor arrays to meet estuarine monitoring needs for the NPS Coastal and Barrier Network. USGS

tests of the YSI prototype at FIIS yielded very promising preliminary results.

Multi-party Collaboration in Seagrass Monitoring in the Northeast Coastal and Barrier Network

Protocol development for monitoring seagrasses in the Northeast Coastal and Barrier Network provided an opportunity for multi-party collaboration. Lead scientists from the USGS Patuxent Wildlife Research Center invited scientists from NPS Cape Cod National Seashore, NOAA Waquoit Bay National Estuarine Research Reserve, and Massachusetts Department of Environmental Protection to participate in training using SeagrassNet protocols. SeagrassNet is a global monitoring project with stations throughout the world oceans. Co-founder Dr. Frederick Short from the University of New Hampshire provided on-site training in SeagrassNet methods. Also assisting with the work was a group of regional high-school students participating in a summer science enrichment program under the supervision of a CACO Student Conservation Association intern.

Airborne Surveys in the Northeast Coastal and Barrier Network

The Northeast Coastal and Barrier Network is entering the third year of a five year (2002-2006) project with the USGS and NASA to acquire high resolution (1m horizontal, 10-15cm vertical) topographic data for eight network parks. In addition to base topographic data, the project is constructed to develop a number of value added products by extracting specific geographic features from the elevation data. These features include shoreline position, dune and bank features such as crest and toe, and the seaward edge of persistent vegetation. The primary method for data acquisition is NASA's EAARL (Experimental Advanced Airborne Research Lidar) LIDAR, a multiple return raster laser deployed in a twin engine aircraft. The EAARL systems multi-return capability allows the generation of both terrain (first return) and surface (last return) digital models as well as a truly three-dimensional model based on the full wave form return (first to last) of the laser pulse. The multiple return feature has outstanding potential for both general data acquisition (e.g. vegetation and landcover mapping) and for specific applications (e.g. fire fuels mapping, habitats). A preliminary schedule for biennial surveys was established and four parks (ASIS, CACO, FIIS, GATE) were surveyed in 2002 with the remaining parks (COLO, GEWA, THST, SAHI) scheduled for 2003. Survey frequency and other planning and scheduling details will be developed as part of formal monitoring protocols. As detailed in the agreement, USGS serves as the lead agency in developing processing methods and applications, while the NPS provides logistical and ground support to the mission.

The primary focus of the NPS in this partnership is the creation of digital topographic data and derived products for its network monitoring program. However, concurrent related research activity at both NASA and the USGS to develop a multi-sensor airborne system for coastal mapping closely parallels this project, and has significant potential to benefit the NPS. In addition to its terrestrial uses, the EAARL LIDAR is designed with bathymetric capabilities and has been successfully operated in South Florida-Caribbean marine areas for the mapping of subaqueous topography and coral reef rugosity. However, the more turbid mid Atlantic waters may limit the effectiveness of the bathymetric laser. Tests are being performed at Assateague Island as part of a USGS/NPS NRPP research project but conclusive results are awaiting additional research and fieldwork. Besides the LIDAR instrument, the NASA aircraft has recently been configured with a cartographic quality, high resolution, multi-band digital camera. At LIDAR survey altitude, the camera is expected to yield imagery with a twelve to fifteen centimeter horizontal resolution. The camera is also equipped with a high precision timing device that will allow accurate co-registration of the camera imagery with the LIDAR data. This array is expected to operate over network parks in fall 2003. Plans for the addition of a hyperspectral instrument to the sensor array have been discussed but have no firm timetable for deployment.

NCBN Avian Inventories Identify 6 Bald Eagle Nests at Colonial National Historical Park (COLO)

During 2003 Northeast Coastal and Barrier Network biological inventories, cooperators from the College of William and Mary, Center for Conservation Biology located 6 bald eagle nests on Colonial National Historical Park property. The proximity of one of these nests to upcoming celebration preparations on Jamestown Island has prompted a separate agreement with between the park and the Center for Conservation Biology to monitor this nest for signs of disturbance. A system of remote video monitoring will be used to record and archive activity within the nest simultaneously with disturbance around the nest over the course of the construction activity to take place on Jamestown.

Photographs of Network Activities

(high resolution copies of these images can be downloaded from: http://pawcatuck.edc.uri.edu/temp_NCBN/)



Gateway National Recreation Area: Kathy Mellander (NPS), Aissa Feldman (New York Natural Heritage, & Mike Byers (NPS) conducting site surveys for the Gateway Vegetation Mapping Program.



Cape Cod National Seashore: The staff of the Cape Cod Prototype and Don Cahoon (USGS) measuring Salt Marsh Penetration Depth. October 2003.



Colonial National Historic Park: Hilary Neckles (USGS) selecting sites for an automated Water Quality Sampler for the Estuarine Nutrient Monitoring Program. Spring 2003.



Colonial National Historic Park: Hilary Neckles (USGS) and Blaine Kopp (USGS) selecting sites for an automated Water Quality Sampler for the Estuarine Nutrient Monitoring Program. Spring 2003.



Colonial National Historic Park: A student from Frostburg State University weighs a captured rodent during mammal inventories. Summer 2003.



Sagamore Hill National Historic Site: The NCBN staff visit to Sagamore Hill. Linda Fabre, Bryan Milstead, Scott Gurney (SAHI), Sara Stevens, Deb Diquinzio, Lorenza Fong (SAHI: Superintendent). March 2003.



George Washington Birthplace National Monument: Park Staff conducting “rod and reel” ichthyologic inventories. August 2003.



George Washington Birthplace National Monument: U.S. Fish and Wildlife and Park Staff use a “shocker” boat to conduct fish inventories. August 2003.



George Washington Birthplace National Monument: U.S. Fish and Wildlife and Park Staff conduct fish trawls. August 2003.