

NORTHEAST COASTAL AND BARRIER NETWORK (NCBN)

FY2021 Annual Report



NCBN Parks:

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 Birthplace National Monument (GEWA), Sagamore Hill National Historic Site (SAHI), and Thomas Stone National Historic Site (THST)

(Photo by Robin Baranowski, Ghost Crab, ASIS)

NCBN FY2021 Highlights

As everyone is aware there were lots of adjustments that had to be made to our program through the second half of the fiscal year in 2020 due to COVID, and this past fiscal year, even more. Because of travel restrictions and no travel approved for all of FY21, any monitoring data that NCBN staff collected (shoreline data, SET data, water level data and salt marsh vegetation and nekton) did not occur in FY21. Because our cooperators from Rutgers University, Stony Brook University and Virginia Institute of Marine Science were under different COVID and travel related guidelines, they were able to collect data for us during the summer of 2021 and shoreline for the fall and spring at GATE.

As a result of limited fieldwork conducted by NCBN staff, we were able to dedicate time to several other efforts such as data management, analyses, and development of communication products for the parks. The following bullets highlight some of the projects from the year.

- In FY20-FY21 the network contracted with both, Neptune and Company and Western Ecosystem Technology to provide quantitative support. NCBN staff and contractors worked closely to analyze NCBN salt marsh vegetation and nekton data, our estuarine nutrient enrichment (water quality) and seagrass data, as well as our tidal wetland elevation data (SET). The salt marsh monitoring analysis and report is complete, and both the water quality, seagrass, and tidal wetland elevation data are still being analyzed with reports being completed in early FY22.
- The NCBN Estuarine Water Quality and Seagrass Monitoring Lead, Holly Plaisted, developed a research needs summary for Cape Cod National Seashore, following review of the latest NCBN Estuarine Nutrient Enrichment trend analysis for the park. The identified research would address the causes for large-scale loss of seagrass within Cape Cod Bay, that has been documented through the Network's long-term monitoring program and would provide key information for park resource management and future research. Holly presented the summary to CACO staff during their weekly management meeting to discuss with the park the need to pursue funding for this important research need.
- NCBN Assistant Data Manager/Biotech, Scott Rasmussen, attended four advanced level GIS courses offered through The University of Rhode Island. The four core classes: Geospatial Data Acquisition and Management - database creation and standard workflows for data management; Techniques in Geospatial Data Analysis - analyze patterns, proximity analysis, and data enrichment; Advanced Topics in Geospatial Data Visualization - interactive web map design, application usability, story map flow, and data dashboards; and Emerging Technologies in Geospatial Data Collection - advanced level skills in mobile data collection through field operation applications. The new skills that Scott has acquired throughout the year will enhance the NCBN's GIS capacity, benefitting all NCBN protocols as well as park-specific project needs.
- NCBN Assistant Data Manager/Biotech, Scott Rasmussen created a Fire Island National Seashore Deer Monitoring Field Application for the park. This tool in ArcGIS Online utilizing Field Maps, is an Esri application for field data collection. The intention is to improve data collection and data management for Fire Island Deer Monitoring efforts. "The deer monitoring map created in Field Maps has given NRM at FIIS the ability to quickly collect deer population data in the field without having to juggle around a notebook and GPS unit. All the necessary field data is plugged into the unit, while a GPS point is being collected all at the same time. Six different field staff used it in the field for the FY2021 deer surveys (first year using it) and it was very user friendly,

with no issues to report. After the data is collected in the field, we can produce maps much quicker and deer population data can practically be exported right into our already established database, which is probably one of the best perks to the feature. It really did help." -Jordan Raphael, FIIS Biologist

Field Activity Summary Table for FY2021

Vital Sign(s)	Park(s)	Actual Months of Sampling (or cancellations)
Forest Health Monitoring	COLO, THST, GEWA, SAHI, ASIS	Only GEWA and THST were sampled in 2021. No other parks were sampled due to COVID-19.
Estuarine Nutrient Enrichment Monitoring – Water quality	CACO, GEWA, FIIS	Sampling took place in July and August. Sampling occurred at FIIS through our Task Agreement with Stony Brook University, and at GEWA through our Task Agreement with the Virginia Institute of Marine Science. Holly Plaisted completed the sampling at CACO.
Estuarine Nutrient Enrichment Monitoring – Seagrass condition	ASIS, CACO, FIIS	Sampling took place in April, June – August.
Tidal Wetland Elevation Monitoring	NCBN: CACO, FIIS, GATE, ASIS, COLO NETN: BOHA, ACAD NCRN: NACE, GWMP	May 2021: sampling at ASIS Sampling at other parks cancelled due to Covid-19 travel restrictions
Shoreline Change Monitoring	ASIS, CACO, FIIS, GATE (JBU, SIU, SHU), GEWA, SAHI	ASIS, CACO, and GATE (JBU, SIU, SHU) all successfully conducted shoreline surveys for fall 2020 and spring 2021. FIIS only conducted a fall 2020 survey. Due to Covid19 travel restrictions, GEWA and SAHI were not surveyed in FY2021.
Coastal Topography Monitoring	ASIS, GATE	Both fall and spring surveys were completed.
Salt Marsh Vegetation and Nekton Monitoring	FIIS, ASIS, SAHI	No data collection occurred during the summer of 2021.
Weather and Climate	All NCBN Parks	Data mining and summarization of weather and climate variables. Reporting on 2020 data, January 2021

Inventories

1. NCBN staff provided support to the National IMD Inventory Coordinators in organizing a number of new inventories for NCBN parks. These inventories include: ASIS-Invasive Crab Inventory, FIIS, SAHI, GATE-Nesting Diamondback Terrapin inventory, CACO-Coyote inventory. NCBN staff attended all start-up calls with the IMD and park staff, and supported reviewing proposals and identifying potential cooperators.

2. NCBN staff worked with the IMD NPSpecies lead to create 1000+ observation records for 104 benthic invertebrate species recorded as part of a post-Hurricane-Sandy benthic habitat mapping inventory conducted at ASIS. Efforts were begun for a similar upload of records associated with a concurrent CACO survey.
3. NCBN data management staff provided database and data QA/QC support for four herpetological inventories conducted at FIIS, GATE, SAHI, and WIFL in 2014-15. Data entry was completed via shared ERMN interns. The NCBN data manager enhanced QA of those data by repurposing a relational database associated with a previous inventory and created SQL queries to rapidly verify 100% of records within a compressed time frame. He also researched applicable guidance/agreement language for collaborators working with sensitive species data provided by a federal agency.
4. A professional services contract was developed and completed to have Neptune and Company analyze all existing 2014-2015 herp data, compare it to the original inventories and create reports for COLO, GATE, FIIS and SAHI. Report should be completed in FY22.
5. NCBN Program Manager developed a FAQ document for parks on the Inventory 2.0 process that was distributed to all Network staff via the IMD office.

Vital Signs Monitoring

Tidal Wetland Elevation monitoring (SET)

1. Description: Wetlands exist within a narrow range of elevation which is influenced by local hydrologic conditions. The monitoring of wetland elevation and other processes are important for determining the resilience of these wetland communities in the face of changing climate. Elevation monitoring normally occurs twice a year occurring in the fall and spring. Sampling trips consist of Surface Elevation Table (SET) and marker horizon measurements. Water level data loggers are typically serviced during these trips.
2. Data Collection: COVID-19 issues in FY21 did not allow for any SET or marker horizon sampling to occur in the fall of 2020 or the spring of 2021, the exception being ASIS which was sampled in December 2020 and May 2021. With the support of NCBN co-workers and the staff at FIIS, water level loggers at ACAD, CACO, FIIS and ASIS were downloaded and restarted.
3. Data Management: All SET and marker horizon data collected through 2019 have been entered into the NPS SET database and checked for errors (QA/QC), and water level data have been checked, loaded into Aquarius and approved. No data were collected in 2020 due to COVID-19 concerns. 2021 data collection will be completed in Fall 2021, and subsequently entered, QC'd, and published. Data Managers from NCBN and several partner networks began collaborating on a SET SQL Server database initiative to develop SQL Server Reporting Service (SSRS) reports that can be pulled into R or other analysis and visualization tools using REST services. Reports will also be made available through SRSS via the web for quick queries by network ecologists and technicians. These SSRS reports will be used to produce export queries that render accepted/certified data in flat, machine-readable formats. This will aid the production of Data Packages to make NCBN data reporting products machine readable, well documented, and consumable by Data.gov and other data aggregation tools. Datasets containing SET and Marker horizon data through 2019 are available at the below links.

NCBN Data – all NCBN park data (through 2018)

CACO – 2019 data

FIIS – 2019 data

GATE – 2019 data

ASIS – 2019 data

COLO - 2019 data

4. Analyses: Western Ecosystems Technology Inc is completing an analysis of SET and marker horizon data from NCBN, NETN and NCRN. The final report is due in the fall of FY22.
5. Reporting and Publications: Published a rebuttal manuscript with colleagues (11 co-authors) in Biogeoscience.
Breithaupt, J. L., Smoak, J. M., Bianchi, T. S., Vaughn, D., Sanders, C. J., Radabaugh, K. R., et al. (2021). Reply to comment by R. Parkinson on “Increasing rates of carbon burial in southwest Florida coastal wetlands” by J. Breithaupt et al. Journal of Geophysical Research: Biogeosciences, 126, e2021JG006245. <https://doi.org/10.1029/2021JG006245>
6. Protocol Changes: No protocol changes were made in FY21
7. Protocol Reviews: No protocol reviews were made in FY21

Salt Marsh Vegetation and Nekton Monitoring

1. Description: Salt marshes provide critical ecosystem services, including flood-mitigation, erosion control, maintaining water quality, and providing essential habitat to many fish, bird, and other species. The structure and function of salt marshes are sensitive to natural and human-derived disturbances such as storms, nutrient loading and watershed development, tidal restrictions, ditching, sea-level rise, and other climate drivers. The NCBN vegetation and nekton monitoring programs are designed to detect shifts in species composition and abundance to provide an early warning to larger ecosystem threats or alterations and to inform sound management decisions.
2. Data Collection: Due to restrictions on travel and field work presented by the COVID-19 pandemic, field crews were not hired for the summer, FY2021 field season.
3. Data management accomplishments and status: All data for the previous field seasons were entered/verified/validated/accepted and posted to the NPS DataStore.
4. Analyses: This year the NCBN contracted with Neptune, Inc. to analyze all the Network’s existing salt marsh vegetation and nekton data. The project attempted to evaluate salt marsh condition through the application of a multimeric index developed by USGS for evaluating salt marsh health, as well as conduct simulations and power analyses to determine the monitoring program’s ability to detect ecologically important changes over time and to help the NCBN evaluate whether current sampling methods are sufficient.
5. Reporting/presentations/brief: A final report from Neptune, Inc. was submitted and reviewed by NCBN staff.
6. Protocol changes/deviations: No changes were made to either protocols in FY2021. NCBN staff met with UMASS scientists to discuss their research on the use of drones and other remote sensed data to monitor salt marsh vegetation, in consideration of adopting new methods for monitoring salt marshes in the parks at a broader scale.
7. Protocol reviews: No reviews conducted.

Shoreline Change and Coastal Topography Monitoring

1. Description: This program is divided into two monitoring protocols; Ocean Shoreline Position and Coastal Topography. An important issue in all coastal parks is the magnitude and rate of shoreline change. The Ocean Shoreline Position Protocol is implemented at

- CACO, GATE, FIIS, ASIS, SAHI, and GEWA. Dune, cliff, and bluff erosion and migration often involve direct threats to resources, infrastructure, and human safety and are a major management issue in many parks. Coastal Topography profiles are monitored at GATE and ASIS and are used to describe the beach-dune-bluff system. These data provide information about the temporal and spatial changes on beach-dune-bluff morphologies in the parks.
2. Data Collection: Shoreline Position was monitored in the fall of 2020 and spring 2021 at CACO, FIIS (Fall only), GATE and ASIS, and coastal topography monitoring occurred at ASIS and GATE. Park staff have continued to collect these data at ASIS, CACO, and FIIS, while the team at Rutgers University, led by Dr. Norbert Psuty, collected the data for us at GATE. NCBN staff collect the data for GEWA and SAHI, which were not collected in FY21.
 3. Data management accomplishments and status: All data through 2020 have been entered, verified, validated, certified, and posted to the NPS Data Store. 2021 data collection will be completed in Fall 2021, and subsequently entered, QC'd, and published. NCBN Data Management staff completed collaboration on a successful IMD Network Project Request proposal submitted by NCBN, GULN, and SECN to develop a shared SQL Server database for shoreline position change monitoring. Data Managers worked closely with IMD Central Office developers and fellow IMD Network staff to complete project scoping and functional analysis within a compressed development window of slightly over two-months. This represents the third NCBN protocol database that has been successfully migrated to SQL Server.
 4. Analysis: no trend analysis was due to be completed in FY21.
 5. Reporting/presentations/brief: A draft 15-year trend report for ASIS: Shoreline Position and Coastal Topographical Change Monitoring submitted to the network. The draft report has undergone external peer review and will be completed and published in FY22.
 6. Protocol changes/deviations: Travel restrictions due to COVID 19 prevented data collection at GEWA and SAHI for fall 2020 and spring 2021.
 7. Protocol reviews: The annual operational review for both the Ocean Shoreline Position and Coastal Topography Protocols was completed in February 2021. Following the review, post survey check-ins were added to the annual operational review process as an additional QA step in the data collection process. Following review of CACO shoreline data, a task was added to the 2021 task agreement with Rutgers University, to develop a specific SOP for CACO for use of the NCBN shoreline change protocol. Because this park is very different from other parks in the Network, a specific SOP is necessary. Prior to the retirement of Mark Adams who collected the data at CACO for many years, a debriefing meeting with Mark, NCBN and Rutgers staff occurred in Sept 2021.

Estuarine Nutrient Enrichment Monitoring (Water Quality and Seagrass)

1. Description: Nutrient enrichment of the coastal zone is a worldwide consequence of human population growth. To assess how estuarine natural resources are affected by changing nutrient inputs, NCBN implements long-term systematic monitoring of estuarine nutrient enrichment within six parks (CACO, FIIS, GATE, ASIS, GEWA, COLO). Monitoring began in the mid- 2000's following the development of the Network's monitoring plan (Stevens et al. 2005). Seagrass condition and distribution in parks with significant seagrass resources (CACO, FIIS, ASIS) was also selected as "vital signs" or indicators of estuarine nutrient enrichment condition. Water quality is monitored at each of the six parks on a biennial basis and seagrass is monitored annually at the three parks.
2. Data Collection: (ENE water quality component) Water quality data were collected on schedule at three parks: CACO, FIIS, and GEWA. CACO data were collected by NCBN protocol

lead, Holly Plaisted, with assistance from park staff and NCBN intern, Colleen Keegan. FIIS data were collected through our cooperative agreement with Dr. Brad Peterson from SUNY Stony Brook, and at GEWA through an agreement with Betty Niekirk, Virginia Institute of Marine Science (VIMS). Seagrass condition data were collected at ASIS, CACO and FIIS. Data were collected at CACO by Holly Plaisted and USGS scientist, Hilary Neckles, with assistance from park staff. FIIS data were collected by Stony Brook University and at ASIS by VIMS. Both were funded through cooperative agreements with NCBN. In addition, Stony Brook completed the bay-wide assessment of seagrass distribution in Great South Bay/Moriches Bay, FIIS. Bay-wide assessment began in 2006 and is repeated every other year. ASIS and FIIS work was funded through cooperative agreements with NCBN. Continuous temperature data were collected throughout FY2021 as directed by the protocol at each of the seagrass monitoring sites.

3. Data management accomplishments and status: All 2020 spatial water quality data have been entered, verified, validated, certified, and made available on Data Store and STORET. Completed data entry into Aquarius, QC, and certification/approval of continuous logging station (2005-2020) and seagrass monitoring site temperature data (2003-2020). Discrete, Tier 3 Seagrass Monitoring data from 2020 (FIIS) have been entered, verified, validated, certified, and posted to the NPS Data Store. No Tier 2 Seagrass Monitoring was conducted in 2020 due to COVID-19 concerns. Both the Tier 2 and Tier 3 Seagrass Monitoring Protocol databases were modified to accept data at the "Certified" Data Processing Level. Export queries were created for the production of data packages.
4. Analyses: Trend analysis of all years (2006-2020) and components (water quality and seagrass condition) of the ENE protocol are near to complete. The compressive trend report and park-specific summaries are planned to be produced in FY2022.
5. Reporting/presentations/brief: Trend analysis of all years (2006-2020) and components (water quality and seagrass condition) of the ENE protocol are near to complete. The compressive trend report and park-specific summaries are planned to be produced in FY2022.
6. Protocol changes/deviations: No changes were made to the protocol or SOPs. Most, but not all fieldwork was accomplished. Specifically, seagrass monitoring was not implemented at CACO and FIIS due to the pandemic. At the end of the summer, Holly and NCBN collaborators from SUNY Stony Brook, established a new FIIS tier 3 seagrass monitoring site in Moriches Bay. Holly, consulted with senior seagrass ecologists in the region on the placement of site.
7. Protocol reviews: Completed annual operational review for the NCBN ENE protocol. No changes were made to any SOPs, but modifications to field equipment were. NCBN designed and had fabricated new dock-mounted logging station mount for GATE, had other mounts modified for continuous water quality monitoring instruments, and had fabricated new mounts for PAR monitoring in seagrass sites

Forest Health Monitoring (GEWA, THST, COLO, SAHI) This monitoring is in collaboration with NETN and MIDN)

1. Description: Monitoring trends in forest condition and health among nine network parks. Schoodic Institute interns were hired to serve on the forest crew.
2. Data collection: Due to COVID-19, forest monitoring was only conducted in GEWA and THST, and all 2020 and 2021-scheduled plots were sampled in 2021. COLO, ASIS and SAHI were not sampled.

3. Data management: 2021 data were entered, verified and certified. Testing of the new SQL forest database continued into FY21 and was finalized prior to the field season. All final datasets associated with this protocol are posted to Data Store and are publicly accessible. The forest NETN R package was redesigned to work with new SQL database to import, export, compile and summarize forest data. R Markdown reports that conduct weekly QC checks and summarize results of QA/QC were also developed.
4. Analyses: Compiled data and analyzed trends for focused condition assessment on forest regeneration in 39 R1 parks. This included developing a forest Trends R package that uses case bootstrap to test for significance of trends.
5. Reporting and outreach: The first multi-network trend analysis of forest data, which included 12 years of invasive plant data from 39 parks, was published in Ecological Applications, and Network and park level summaries of the results from this paper were distributed to parks. NETN and ERMN presented a webinar on regional invasive trends along with a new planning tool to help parks prioritize invasive species management. ERMN and NETN staff also helped MIMA develop an invasive species management plan using this new tool. Information on the webinar, invasive management planning tool and invasive trend summaries are available on a newly developed sharepoint site.
6. Presentations:
 - Miller, K.M. 2020. Forest health monitoring in eastern national parks: Lessons learned and future concerns. Forest Ecosystem Monitoring Cooperative Conference. December 17, 2020 (Invited Plenary).
 - Perles, S.J., K.M. Miller (co-presenters), E. Sharron. 2020. All hope is not lost: Trends in invasive plants in eastern national parks and a strategic tool to protect park resources. Inventory and Monitoring Division Webinar. December 10, 2020.
7. Protocol changes/deviations: No major changes were made to the protocol content but updates to the SOPs were completed as necessary.
8. Protocol Reviews: Annual operational review for MIDN/NCBN/NETN was completed on 11/20/2020.

Weather and Climate Monitoring

1. Description: Weather and climate play significant roles in driving both physical and ecological processes. For example, the active processes that shape the North Atlantic coastline are largely the result of meteorological events such as wind-driven waves. For research and long-term ecological monitoring, weather and climate data provide the potential for correlations to be made with observed physical and ecological pattern data.
2. Data Collection: Temperature, precipitation, wind, and tidal data downloaded from the NOAA National Centers for Environmental Information website for each of the parks and park-based tables and figures created. (<https://www.ncei.noaa.gov/>).
3. Data Management: The data for the area each NCBN park resides in will be collected yearly in January, for the previous year, and made available to NPS and the public through resource briefs (available on NCBN website and IRMA) and nps.gov shared articles.
4. Analyses: Simple summaries prepared.
5. Reporting and Publications: The data were presented in the form of resource briefs and an nps.gov shared articles listed below:

Northeast Coastal and Barrier Network. 2021. 2019 Weather in Review: Colonial National Historical Park. <https://irma.nps.gov/DataStore/Reference/Profile/2283946>
 Article: [2019 Weather in Review: Colonial National Historical Park](#)

Northeast Coastal and Barrier Network. 2020. 2019 Weather in Review: Fire Island National Seashore. <https://irma.nps.gov/DataStore/Reference/Profile/2276808>
Article: [2019 Weather in Review: Fire Island National Seashore](#)

Northeast Coastal and Barrier Network. 2021. 2020 Weather in Review: Assateague Island National Seashore. <https://irma.nps.gov/DataStore/Reference/Profile/2284836>
Article: [2020 Weather in Review: Assateague Island National Seashore](#)

Northeast Coastal and Barrier Network. 2021. 2020 Weather in Review: Cape Cod National Seashore. <https://irma.nps.gov/DataStore/Reference/Profile/2284912>
Article: [2020 Weather in Review: Cape Cod National Seashore](#)

Northeast Coastal and Barrier Network. 2021. 2020 Weather in Review: Colonial National Historical Park. <https://irma.nps.gov/DataStore/Reference/Profile/2284915>
Article: [2020 Weather in Review: Colonial National Historical Park](#)

Northeast Coastal and Barrier Network. 2021. 2020 Weather in Review: Fire Island National Seashore. <https://irma.nps.gov/DataStore/Reference/Profile/2284911>
Article: [2020 Weather in Review: Fire Island National Seashore](#)

Northeast Coastal and Barrier Network. 2021. 2020 Weather in Review: Gateway National Recreation Area. <https://irma.nps.gov/DataStore/Reference/Profile/2284910>
Article: [2020 Weather in Review: Gateway National Recreation Area](#)

Northeast Coastal and Barrier Network. 2021. 2020 Weather in Review: George Washington Birthplace National Monument. <https://irma.nps.gov/DataStore/Reference/Profile/2284825>
Article: [2020 Weather in Review: George Washington Birthplace National Monument](#)

Northeast Coastal and Barrier Network. 2021. 2020 Weather in Review: Sagamore Hill National Historic Site. <https://irma.nps.gov/DataStore/Reference/Profile/2284820>
Article: [2020 Weather in Review: Sagamore Hill National Historic Site](#)

Northeast Coastal and Barrier Network. 2021. 2020 Weather in Review: Thomas Stone National Historic Site. <https://irma.nps.gov/DataStore/Reference/Profile/2284122>
Article: [2020 Weather in Review: Thomas Stone National Historic Site](#)

6. Protocol Changes: An SOP was developed for data download and preparation for reporting for each park
7. Protocol Reviews: no reviews were necessary

Additional Data Management Activities

1. In December 2020, the NCBN Data Manager concluded a 120-day temporary promotion as the National Inventory and Monitoring Program Data Scientist, during which he served as a liaison between the IMD Central Office and the Network Data Manager community. The Data Manager served on various working groups to advance the goals of the Long-Term Data Management (LTDM) Governing Board, lead monthly Data Manager “Fireside Chat”

calls, created a methodology for evaluating options for adopting new technologies or systems within IMD, and served on the search committee for the permanent IMD Data Scientist position.

2. Between May and September 2021, the NCBN Data Manager served in a second detail as the Acting Regional GIS Program Manager for IR1. During his tenure, he chaired and drafted the charter for the IR1 GIS Steering Committee and led several initiatives to research and brief IR1 Senior Leadership concerning the core functions and current status of the IR1 GIS Program, as well as recommendations for funding and staffing moving forward. He also developed a new GIS Technical Assistance Request system for the Region, as well as several new mechanisms to enhance communication among GIS users in the region.
3. NCBN, MIDN, and NETN Data Mangers researched the possibility of migrating from office-based file servers to cloud-based NPS SharePoint Online repositories. They worked with Regional and National IT staff to stand up a testing instance to evaluate performance of accessing various file types across the NPS network using multiple software platforms. The NCBN Data Manager prepared the NCBN SharePoint Online site by establishing Document Libraries, posting help documentation, and administering staff access using NPS Active Directory credentials. This project will be a first for IMD Networks and will serve as a template for subsequent migrations.
4. NCBN data management staff worked with the IMD NPSpecies lead to create 1000+ observation records for 104 benthic invertebrate species recorded as part of a post-Hurricane-Sandy benthic habitat mapping inventory conducted at ASIS. Efforts were begun for a similar upload of records associated with a concurrent CACO survey.
5. NCBN data management staff provided database and data QA/QC support for four herpetological inventories conducted at FIIS, GATE, SAHI, and WIFL. The Data Manager coordinated data entry by ERMN interns, enhanced QA of those data by repurposing a relational database associated with a previous inventory, and created SQL queries to rapidly verify 100% of records within a compressed time frame. He also researched applicable guidance/agreement language for collaborators working with sensitive species data provided by a federal agency. These data - as well as data products and reports from previous inventory projects at the parks - were assembled and delivered to cooperators for subsequent analysis.

Science Integration into Management

1. Direct support of park planning:
 - NCBN staff participated in CACO RSS and FIIS RSS. ENE water quality and seagrass monitoring efforts were cited as priority activities to maintain in effort to meet water quality and seagrass condition goals.
2. Support for park management actions/issues:
 - NCBN staff support COLO by handling the data management tasks for their park landbird monitoring program. And in 2021 created a data summary resource brief for the park. NCBN Program Manager provided a complete review of the draft, COLO Climate Change Science Communication Plan.
3. Regional support:
 - Holly Plaisted served on IR-1 NRPP panel.
 - NCBN Staff continue to provide publication formatting and support on Interior Region 1 NRCAs, RSS, and Vulnerability Assessments and other documents for publication.

Partnerships and Collaboration

1. Other activities that support parks, regions, and I&M (multi-network or national)
 - NCBN Staff participated in monthly WRD calls, and data/information requests from Andrew Birch.
 - NCBN Staff, Holly Plaisted supported NCBN parks and WRD with securing instrumentation needed for COAST ocean acidification monitoring project. Holly is the main Region1 contact for this project.
 - NCBN Staff Participated in NER Climate Refugia Workshops.
 - NCBN Program Manager reviewed and provided comment on an NRPP proposal being developed by the R1 Coastal Ecologist, as well as acted as a reviewer for 2021 Climate Adaptation Science Center proposals related to monitoring.
 - The NCBN SET monitoring lead is a member and co-leader of the NPS I&M SET database group which meets monthly to discuss the NPS enterprise database used by networks collecting SET data as part of their monitoring program. The group consists of members from the NCBN, NETN, NCRN, SECN and SFCN. The members are working together to improve the design and operation of the SET database used by the I&M program. Current projects involve work on a SET data visualizer which will be used to assist networks with QA/QC, trend analysis and reporting of SET and marker horizon data.
 - The NCBN Estuarine Monitoring Lead and the NCBN Assistant Data Manager, continued working on the funded NRPP project: Seagrass Vulnerability to Environmental Conditions Under Changing Temperature Regimes at Three Northeastern National Parks. She worked closely with USGS scientists to implement the project. Compiled all the Estuarine water quality and seagrass datasets for modeling; worked with USGS and ASIS GIS specialist to create a seagrass spatial sampling design and overseeing the creation of GIS data sets for the three-year (2019-2021) modeling effort.
 - The NCBN Data Manager is a member of the WASO GNSS POSNAV subcommittee of the NPS GIS Council. The LTDM Metadata-Minimum-Requirements Working Group, took the lead on drafting recommendations to the LTDM Governance Board. The data Management Wiki Toolkit Working Group and a Beta tester for NPS instance of DokuWiki as a platform that can serve as a directory to the body of knowledge gathered for and used by IMD Data Managers.
2. Region 1 Planning:
 - NCBN Program Manager participated in ongoing discussions among Region 1 networks (NER and NCR) on areas of collaboration and cost sharing. Discussions included evaluations of various program areas including forest monitoring, birds, water quality, data management, science communication.
3. Other NPS, federal, and external partnership activities (with state agencies, universities, etc.)
 - The NCBN continues to be a member of the Chesapeake Bay Sentinel Site Cooperative which is a collaborative group of SET users in the Chesapeake Bay region.

- The NCBN Tidal Wetland Elevation Monitoring Lead, is also a member of the SET metadata standardization group which is overseen by the US Global Climate Change Program and is working on standardizing metadata for SET users in the US and abroad.
- The NCBN continues to be a member of the SET cross-collaboration group of government and academic SET users which met throughout the year to discuss and share analytical methods being used for trend analyses of SET data. The group was started by NPS quantitative ecologist Dr. Ellen Cheng and has participants from the NPS, USFWS, NOAA, EPA, The Smithsonian Institution, Clemson University and The University of Delaware.
- NCBN Staff maintain close working relationships with many coastal ecosystem scientists, including USGS scientists, Boston University professors and students working on coastal ecosystem science, Seagrass scientists from Mass. Division of Marine Fisheries, Cape Cod Center for Coastal Studies, and actively maintain close working relationship with EPA REGION 1 - New England marine scientists. The network is newly collaborating with the Piscataqua Region Estuaries Partnership (PREP) as well.
- NCBN continues to be an active and long-term member of the SeagrassNet global program: participating in long-term program sustainability.
- This year, Seagrass Lead, Holly Plaisted, shared CACO and FIIS monitoring results with the MA Seagrass Workgroup in response to large-scale losses observed throughout MA.
- NCBN Staff stationed at the University of Rhode Island continue to provide teaching support and mentoring opportunities to students. Dennis Skidds taught an advanced, graduate level course on GPS/GNSS. Robin Baranowski started the fall semester in September teaching a section of Field Botany. Both classes had to be taught remotely and took a great deal of time for Robin and Dennis to create new material that was able to be taught remotely. Sara Stevens mentored six students in developing their resumes and assisting them in finding internship opportunities in the government. Sara has also been the guest lecturer in three classes.

Communication

1. Reports and Publications

Saintilan, N., K. Kovalenko, G.R. Guntenspergen, et al. In Review. Nature. Global patterns and drivers of tidal marsh response to accelerating sea-level rise.

Curdts, T. 2020. How to create web mapping applications for visualizing shoreline change rates using ArcGIS Online: Standard operating procedure for the Northeast Coastal and Barrier Inventory and Monitoring Network (Version 1.0). Standard operating procedures (SOP). Northeast Coastal and Barrier Network, National Park Service, Kingston, RI <https://irma.nps.gov/DataStore/Reference/Profile/2284378>

2. Outreach products

Investigating the Influence of Rising Water Temperature on Eelgrass in the Northeast USA. Holly K. Plaisted. Northeast Naturalist Conference, April 2021.

NCBN Stewardship Savvy Podcast, Episode #1: Our first episode of Stewardship Savvy features Mark Adams, a GIS specialist at Cape Cod National Seashore who has been with the National Park Service since 1991. In this episode, we follow Mark into the history of coastal change at Cape Cod, and the history of GIS (geographic information system) technology, as he's seen it. Created by SIP Intern, Colleen Keenan

[Stewardship Savvy \(U.S. National Park Service\) \(nps.gov\)](#)

In the Field: Restoring Big Egg Marsh. An interactive webpage created by Bridget Ye, who followed Gateway NRA Scientist, Dr. George Frame, along with two SCA interns collecting salt marsh data in Jamaica Bay.

[In the Field: Restoring Big Egg Marsh \(U.S. National Park Service\) \(nps.gov\)](#)

Breeding Bird Populations at Colonial National Historical Park (2015–2019)

Web article: <https://www.nps.gov/articles/000/colo-breeding-bird-populations-2015-2019.htm>

Resource Brief: <https://irma.nps.gov/DataStore/DownloadFile/658936>

Organizational Excellence

1. Safety

This NCBN Biotech took on updating and managing the Network's safety plans, safety site and related documents. Robin created extensive, individual safety plans for five of the Network monitoring protocols. She also created an updated sharepoint site to house all of the NCBN safety plans and documents. Robin provided training to NCBN at a number of staff meetings on any new safety procedures that she developed. In order to develop the protocol safety plans, Robin worked closely with each of the protocol leads, as well as both park and regional safety officers. The following are the links to the safety site and safety plans for each protocol:

- [NCBN Safety SharePoint site](#)
- [Coastal Geomorphology](#)
- [Salt Marsh Nekton](#)
- [Salt Marsh Vegetation](#)
- [Tidal Wetland Elevation](#)
- [Water Quality and Seagrass](#)

2. Staffing

- NCBN Program Manager, Sara Stevens
- NCBN Data Manager, Dennis Skidds
- Biologist/Tidal Wetland Elevation Monitoring Lead, Jim Lynch
- Biologist/Estuarine Monitoring Lead, Holly Plaisted
- Assistant Data Manager/Geomorphological Monitoring Biotech, Scott Rasmussen
- Biotech (STF), Science Communication/Botanist, Robin Baranowski
- SIP Science Communication Intern, Bridget Ye

3. Interns- SIP Science Communication Interns, Colleen Keenan, summer 2021 (12 weeks) and Bridget Ye, summer 2021 (12 weeks) and fall/winter 2021-22 (26 weeks).

4. **NCBN board members and technical/steering committees:**

Park Name	Board Member
Cape Cod NS	Brian Carlstrom
Fire Island NS	Alexcy Romero
Gateway NRA	Jen Nersesian
Sagamore Hill NHS	Jonathan Parker
Assateague Island NS	Hugh Hawthorne
George Washington Birthplace NM/THST	Melissa Coburn
Colonial NHP	Jerri Marr

Technical Steering Committees	
Coastal Geomorphology (Dennis Skidds and Scott Rasmussen)	
Dr. Norb Psuty	Rutgers University
Andrea Habeck	Rutgers University
Neil Winn	Assateague Island NS
Mark Adams	Cape Cod NS
Lisa Baron	Southeast Coast Network
Mark Bracewell	Gulf Coast Network
Estuarine Nutrient Enrichment/Seagrass (Holly Plaisted)	
Betty Neikirk	Virginia Institute of Marine Science
Erin Shields	Virginia Institute of Marine Science
Bradley Peterson	Stony Brook University
Stephen Heck	Stony Brook University
Sophia Fox	Cape Cod NS
Kelly Medeiros	Cape Cod NS
Salt Marsh SETs (Jim Lynch)	
Philippe Hensel	NOAA
Don Cahoon	USGS
Kelly Medeiros	Cape Cod NS
Lisa Baron	Southeast Coast Network
Geoff Sanders	Cape Cod NS
Sue Adamowicz	USFWS
Laura Mitchell	USFWS
Aaron Weed	Northeast Temperate Network
Salt Marsh Vegetation and Nekton (Sara Stevens and Dennis Skidds)	
TBD	

5. **Budget**

This year due to the changes in our monitoring schedule and travel due to the pandemic, we had to adjust our budget, utilizing funds that typically would go to travel, field supplies, and seasonal staff and their travel. Our total travel ceiling is \$30,000 annually, of which we only spent \$1,386. this year. This additional funding was used towards the Rutgers Task Agreement that we otherwise would not have been able to fully fund.

Category	Amount
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INCOME	
Vital Signs Monitoring (base)	\$866,100
WRD	\$82,300
TOTAL INCOME	\$948,400
EXPENDITURES	
Personnel (BOC 11 & 12)	\$686,402
Travel (BOC 21)	\$1,386
Transportation (BOC 22)	
Rent, communication, utilities (BOC 23)	\$332
Services and contracts (BOC 25)	\$24,259
Supplies and materials (BOC 26)	\$23,370
Equipment (BOC 31)	\$43,571
Agreements (BOC 411c)	\$132,470
Other (BOC 24, 99, or not included in above BOCs)	\$36,610
TOTAL EXPENDITURES	\$948,400
TOTAL FIXED COSTS*	\$691,534
TOTAL WATER MONITORING EXPENDITURES**	\$230,577
% BUDGET FIXED (total fixed/total income)	73%

*Fixed costs: permanent employees, utilities, leases, mandatory training, mandatory equipment service contracts, uniforms.

**Annual WRD Funding (\$82,300), covers approximately 36% of total NCBN WQ monitoring costs.