

NORTHEAST COASTAL AND BARRIER NETWORK (NCBN)

FY2023 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)



Application of the Northeast Coastal and Barrier Network's long-term monitoring datasets consistently provides the basis for new and ongoing research, revealing evidence of both biological and physical change in coastal ecosystems, not only in the parks but in resources at the local, state, national, and international levels. Our valuable long-term datasets continue to aid scientists and managers in understanding coastal park systems and how they are changing.

NCBN FY2023 Highlights

NCBN long term monitoring data contributes to the better understanding the relationship between warming waters and seagrass loss.

The factors leading to eelgrass (seagrass) presence and abundance are complex, but the long-term NCBN seagrass monitoring dataset documents the reduction of eelgrass presence in our parks along with increased summer temperature which supports other work linking eelgrass loss to additive effects of high thermal stress (Lefcheck et al., 2017). Coastal Park management action needed to improve the success of eelgrass must include an awareness of the role of temperature in exacerbating other stressors. Results of our monitoring indicate that eelgrass presence on a regional scale is threatened by warming waters.

Plaisted HK, Shields EC, Novak AB, Peck CP, Schenck F, Carr J, Duffy PA, Evans NT, Fox SE, Heck SM, Hudson R, Mattera T, Moore KA, Neikirk B, Parrish DB, Peterson BJ, Short FT and Tinoco AI (2022) Influence of Rising Water Temperature on the Temperate Seagrass Species Eelgrass (Zostera marina L.) in the Northeast USA. Front. Mar. Sci. 9:920699. doi: 10.3389/fmars.2022.920699

NER I&M networks worked closely with regional parks, IPMT, and the Resource Stewardship and Science Directorate to develop strategies that resulted in IRA and BIL-ER funding proposals. Projects were based on more than 18 years of I&M monitoring data that helped inform and prioritize management parks' actions. Proposals were submitted for invasive species and deer management, as well restoration of forests, meadows, marshes, and seagrass. The collaborative approach has greatly enhanced I&M's science integration into park management.

Over two decades of NCBN water quality and seagrass monitoring data results have been used to develop three proposals to identify and take management actions to stop declining seagrass trends across the Northeast and Mid-Atlantic through restoration and resilience building of existing seagrass meadows.

- Natural Resource Condition Assessment/Focused Condition Assessment: ***Assessing conditions for eelgrass restoration and climate change resilience at CACO, FIIS and ASIS.*** The two-year project was approved for funding and will begin FY24. PI: Dr. Alyssa Novak, Boston University
- IRA: ***Building Seagrass Resilience from NC to ME through Climate-Adapted Restoration.*** Pending Funding decision.
- BIL-ER: ***Develop Seagrass Seed Transfer Zones ME-NC, Restore NER Coastal Park Seagrass Seed Banks and Meadows.*** Pending Funding decision.
- ***Inventory of Eelgrass genomic diversity to Inform National Park Service Long-Term Ecological Monitoring.*** (ASIS, FIIS, CACO) Three-year project, funding was provided for year 1 through NCBN funding. Cooperators: UNCW, Stephanie J. Kamel, PhD and Jessie C. Jarvis, PhD, PIs.

Long-term NCBN data and modeling support Climate Adaptation Action Plan for Pleasant Bay, MA

NCBN estuarine water quality and seagrass data, as well as the results of an NCBN-NRPP funded project, are being used to develop a Climate Adaptation Action Plan, developed by the Pleasant Bay Alliance of Massachusetts, and funded through a grant from the MA Municipal Vulnerability Preparedness (MVP) program. The Pleasant Bay Alliance is a municipal organization formed by the Massachusetts towns of Orleans, Chatham, Harwich and Brewster to coordinate the resource management plan for Pleasant Bay

and watershed. The goal of the Climate Adaptation Action Plan is to protect natural resources and enhance the resilience of low-lying public access points and public water infrastructure (e.g., water supply, stormwater, sewer) to adverse effects related to climate change. This plan identifies opportunities to take action to restore and enhance eelgrass meadows in the bay based on the Northeast Coastal and Barrier Network, long-term water quality and seagrass data and NRPP modeling efforts that have recently been completed.

Testing New Data Collection Methods for Monitoring Coastal Wetland Elevation

This year the NCBN Coastal Marsh Protocol Lead, co-authored a manuscript with NPS and USGS colleagues describing the results of additional methods for collecting coastal marsh elevation data that would enhance and expand the existing method using Surface Elevation Tables (SETs). Both the NPS and many other agencies and organizations around the world use the SET method described in the NCBN Surface Elevation Table and Marker Horizon Protocol. The research was accepted and published recently in the journal *Estuaries and Coasts*.

Comparing Wetland Elevation Change Using a Surface Elevation Table, Digital Level, and Total Station. James C. Lynch, Neil Winn, Katya Kovalenko, Glenn Guntenspergen. 2023. *Estuaries and Coasts*. <https://doi.org/10.1007/s12237-023-01263-1>

Seagrass Vulnerability Related to Changing Temperature Regimes being Studied Through NRPP Funded Collaboration. In 2019-2021, the NCBN in collaboration with USGS scientists received NRPP funding to use NCBN seagrass monitoring data collected as part of our estuarine nutrient enrichment monitoring program, to look at seagrass vulnerability related to changing temperature regimes. The project incorporated the Network's long-term datasets from Cape Cod, Fire Island, and Assateague Island National Seashores. Final products are currently being completed. A manuscript was submitted for peer-review to the *Journal of Geophysical Research – Biogeosciences*. **Manuscript title is: *Modeling Potential Changes in Seagrass Coverage, Biomass and Vulnerability Under Increased Temperature*.**

Holly Plaisted, Northeast Coastal and Barrier Network, Biologist attended the Consulting with Tribal Nations Training in January 2023. This interactive course provided participants with an overview of Consulting with Tribal Nations through instructor-led lectures, discussions, and case studies. The culminating activity was a mock consultation where participants play the various roles. The training was designed to enable participants to acquire the basic knowledge of the tribal consultation process, cultural awareness and the importance of engaging with Tribal nations on matters that affect them. David Goldstein, the NER Tribal and Cultural Affairs Lead and Eric D. Chiasson, Regional Tribal Liaison Officer, ONAA-IR1 provided funding support for Holly to take the course.

NCBN Monitoring Activity (FY2023)

Monitoring Protocol	ASIS	FIIS	GATE	GEWA	SAHI	COLO	CACO	THST
Coastal Shoreline	X	X	X	X	X			
Coastal Topography	X		X					
Marsh Elevations (SET)	X	X	X			X	X	
Marsh Veg/Nekton	*	*	*	*	*	*		
Estuarine Water Quality		X		X			X	
Seagrass	X	X					X	
Forest Health	X			X	X	X		X

Weather and Climate	X	X	X	X	X	X	X	X
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*Marsh Vegetation and Nekton Monitoring, on hold. Unable to afford a protocol lead or conduct the extensive surveys that we once did that required a 2-3 person crew. A trend report and power analysis was completed in 2022. The report can be found here:

<https://irma.nps.gov/DataStore/Reference/Profile/2287704>

Inventories

- The Following Inventories are being conducted in NCBN parks:
 - FIIS-SAHI-GATE-Nesting Diamondback Terrapin inventory
 - CACO E-Meso-Mammals with a focus on Coyotes (eDNA inventory)
 - ASIS-Rare Plant Inventory
- Data and Data Reports for past Herp Inventories at COLO, GATE, SAHI, and FIIS have been created and uploaded at the following links:
 - COLO:** Data: <https://irma.nps.gov/DataStore/Reference/Profile/2296963> Data Report: <https://irma.nps.gov/DataStore/DownloadFile/690734>
 - GATE:** Data: <https://irma.nps.gov/DataStore/Reference/Profile/2296969> Data Report: <https://irma.nps.gov/DataStore/Reference/Profile/2296968>
 - FIIS:** Data: <https://irma.nps.gov/DataStore/Reference/Profile/2296966>, Data Report: <https://irma.nps.gov/DataStore/Reference/Profile/2296965>
 - SAHI:** Data: <https://irma.nps.gov/DataStore/Reference/Profile/2296972>, Data Report: <https://irma.nps.gov/DataStore/Reference/Profile/2296971>

Vital Signs Monitoring

Tidal Wetland Elevation monitoring (SET)

- 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 once 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.
- Data Collection:** Sampling trips consist of Surface Elevation Table (SET) and marker horizon measurements, and water level data loggers are typically serviced during these trips. Sample sites at NCBN and NETN parks were visited twice in FY23 with 81 of the 87 SETs sampled. SET and marker horizon data was collected, and water level loggers downloaded. Successfully updated 3 older SETs that were buried at GATE. Installed 3 new SETs at CACO in support of work in the Herring River. Installed 12 new SETs at GWMP (NCRN) in support of continuing data collection at the Dyke Marsh site.

New methods for scanning marsh elevation were tested at CACO with scientist from Rochester Institute of Technology, using the newest Trimble laser scanner, as well as testing the use of Lidar now available on iPads and iPhones. Scans taken on the marshes are being evaluated by the RIT to determine the viability and accuracy of using the various scanners for monitoring elevation.

3. **Data Management:**

- All SET and marker horizon data collected through 2022 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. Datasets containing SET and Marker horizon data up through 2022 are available here: [NPS Data](#) – all NPS SET/MH data.
 - Staff from several networks implementing Sediment Elevation Table (SET) monitoring – including NCBN, NETN, NCRN, SECN, and SFAN – met weekly to define and automate the production of a common dataset standard to allow for multi-park annual reporting. The group also worked together closely to develop a suite of quality-control and visualization tools in R for use by SET Project Leads for QA/QC.
 - A system for updating older SETs that are buried was successfully tested at GATE. Approximately half of the SETs in the NCBN network have been sinking and some are buried and will need to be updated in FY24.
4. **Analyses:** Western Ecosystems Technology Inc. completed a multi-park trend analysis of SET and marker horizon data for NCBN, NETN and NCRN Networks that was completed 2022. No additional analyses have been done.
 5. **Reporting and Publications:** Trend report for years 2002-2019 can be found here : <https://irma.nps.gov/DataStore/Reference/Profile/2296580>.
 6. **Protocol Changes:** No protocol changes were made in FY23, but the protocol is currently being revised and updated in 2024.
 7. **Protocol Reviews:** No Operational Review/Technical Steering Committee Meetings were held in 2023.

Salt Marsh Vegetation and Nekton Monitoring

1. **Description:** 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:** The Network has put both the Nekton and Vegetation monitoring protocols on hold due to staffing and funding, as well as the results of the latest trend report and power analysis, that will be evaluated as part of the NCBN Network Review in 2024.
3. **Data management:** All data for the previous field seasons have been entered/verified/validated/accepted and posted to IRMA.
4. **Analyses:** In 2021 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. The

final report was completed and posted to IRMA in 2022 and the results indicate that further evaluation of the use of these two protocols is necessary. This includes an analysis of the financial sustainability of the use of these two protocols. Currently, power analyses indicate a need for increasing the sampling area and frequency for all parks in order to address the current monitoring questions. We unfortunately do not have the funding to continue monitoring vegetation and nekton, especially at a higher resolution and frequency.

5. **Reporting/presentations/brief:** The trend report and power analyses can be found here: Peck, C., P. Duffy, and K. Broms. 2021. Application of multimetric index, and trend & power analysis for salt marsh monitoring: Northeast Coastal and Barrier Network. Natural Resource Report NPS/NCBN/NRR-2021/2316. National Park Service, Fort Collins, Colorado.
<https://doi.org/10.36967/nrr-2287704>
6. **Protocol changes/deviations:** No changes were made to either protocol. The NCBN Program Manager and Data Manager researched multiple options for revising and enhancing the network's Salt Marsh Monitoring program using remote sensing data. Currently the Southeast Coast Network has been working on a monitoring protocol to monitor their marshes using Planet Data, we hope to collaborate with the Network on implementing this method in NCBN parks. During the summer of 2024 NCBN will be hosting a DHA SIP Intern who will be working on cross walking the SECN protocol to one of the NCBN parks to test the SECN method.
7. **Protocol reviews:** No Reviews occurred in FY23

Shoreline Change and Coastal Topography Monitoring

1. **Description:** Ocean Shoreline Position and Coastal Topography. An essential question in all coastal parks is the magnitude and rate of shoreline change. The Ocean Shoreline Position Protocol is implemented at GATE, FIIS, ASIS, SAHI, and GEWA. Monitoring at CACO has been on hold since the Mark Adams, the part GIS Manger retired. Prior to his retirement the Network along with Rutgers U staff, reviewed the issues related to implementing the protocol at CACO along the park bluffs, and whether the protocol as it is, is appropriate to use in those areas.

Dune, cliff, and bluff erosion and migration often involve direct threats to resources, infrastructure, and human safety and are major management issues in many parks. Our Coastal Topography monitoring protocol is currently implemented at GATE and ASIS and is used to describe the beach-dune-bluff system. These data provide information about the temporal and spatial changes in beach-dune-bluff morphologies in the parks. We began plans to implement this protocol at FIIS, but the pandemic interrupted the plans, and most recently our coastal geomorphology monitoring tech, left the network for a position at CACO.

2. **Data Collection:** Shoreline Position was monitored in the fall of 2022 and spring 2023 at FIIS, GATE, ASIS, SAHI, and GEWA. Park staff continued to collect these data for the Network at ASIS, while NCBN collected the data at the remaining park units. Coastal topography

monitoring occurred at both ASIS (collected by park staff) and GATE (collected by NCBN, both fall 2022 and spring 2023).

3. **Data management:** The fall 2022 and spring 2023 survey data for all monitored park units has been received, entered, and certified. Guides for 1D and 2D SQL server databases were created and published to IRMA:
1D User Guide: <https://irma.nps.gov/DataStore/Reference/Profile/2293356>
2D User Guide: <https://irma.nps.gov/DataStore/Reference/Profile/2299966>
4. **Analysis:** No analyses were performed in FY23.
5. **Reporting/presentations/brief:** Trend Reports were completed through a Task Agreement with Rutgers University for GATE and FIIS. Peer-review for both parks was completed, and publications completed. Reports can be found here:
FIIS Trend Report: <https://irma.nps.gov/DataStore/Reference/Profile/2299483>
GATE Trend Report: <https://irma.nps.gov/DataStore/Reference/Profile/2299536>
GATE Annual Rpt 2019-2020: <https://irma.nps.gov/DataStore/Reference/Profile/2297044>

For each protocol, data visualizers have been developed for each park where monitoring occurs:

Coastal Topography AGOL Dashboard Visualizers:

ASIS: <https://www.arcgis.com/apps/dashboards/4f508c9fccde47dfb3e6c647fe4388aa>

GATE-SHU:

<https://www.arcgis.com/apps/dashboards/f1daaebad5f44e95b348a72cc51ce66d>

GATE-JBU: <https://www.arcgis.com/apps/dashboards/41a9eff9bfd049a889876943f1fe6b3b>

GATE-SIU: <https://www.arcgis.com/apps/dashboards/57c5196fab64cb09424af6081631462>

Ocean Shoreline Position AGOL Dashboard Visualizers:

ASIS: <https://www.arcgis.com/apps/dashboards/e2675272123342ce988af5236ca4f07e>

FIIS: <https://www.arcgis.com/apps/dashboards/0b1a919c6d2c405c95de9cb17c836ed0>

GATE-SHU:

<https://www.arcgis.com/apps/dashboards/810e016fcbdb4fd69d406684b29042f3>

GATE-JBU:

<https://www.arcgis.com/apps/dashboards/bebb4159c8064010b18e02ad4472e753>

GATE-SIU:

<https://www.arcgis.com/apps/dashboards/c24f1fe51b0546d1b1209c6bbb9965e1>

SAHI: <https://www.arcgis.com/apps/dashboards/4a5c06bedba24f89be159e5acf24ce69>

6. **Protocol changes/deviations: Quality Assurance Plans were developed for each protocol in FY23.** Shoreline QAP: <https://irma.nps.gov/DataStore/Reference/Profile/2300298>
Topography QAP: <https://irma.nps.gov/DataStore/Reference/Profile/2300299>
7. **Protocol reviews:** The annual operational review for both the Ocean Shoreline Position and Coastal Topography Protocols was completed in February 2023. Annual surveys and post-season questionnaires used in preparation for the annual operational review were posted to IRMA: <https://irma.nps.gov/DataStore/Reference/Profile/2300300>

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) (ENE water quality component) Water quality data was collected on schedule in 2023 at three parks: CACO, FIIS, and COLO. CACO data was collected by NCBN protocol lead, Holly Plaisted, with assistance from park staff and our summer NCBN SIP intern, Maeve Noone-Price. FIIS data was collected through our cooperative agreement with Dr. Brad Peterson from SUNY Stony Brook, and at COLO through an agreement with Betty Niekirk, Virginia Institute of Marine Science (VIMS).

Seagrass condition data was collected at ASIS, CACO and FIIS. CACO by Holly Plaisted and Maeve Noone-Price with additional assistance from Dr. Agnes Mittermayr through a services contract with the Center for Coastal Studies, FIIS by Holly and Stony Brook University and ASIS by VIMS. Both were funded through cooperative agreements with NCBN.

3. **Data management:** All 2022 monitoring data has been certified and published.
4. **Analyses:** Trend analysis of all years (2006-2020) and components (water quality and seagrass condition) of the ENE protocol were completed in early 2023 by Neptune and Company. An update of this analysis to incorporate data through 2022 is underway with assistance from Dr. Jessica Nagel through a services contract.
5. **Reporting/presentations/brief:** A trend report developed by Neptune and Company as well as park-specific summaries were produced and completed in FY2023. NCBN SIP intern, Michaela Compo, drafted annual resource briefs of water quality trends, as well as an interactive AGOL dashboard application for spatial water quality visualizations. Michaela also created a Storymap displaying CACO's ENE Water Quality Report.

6. **Protocol changes/deviations:** Program sustainability planning and results of statistical power analyses conducted by Neptune has led us to review the results of our water quality monitoring for each park and evaluate the results in relation to their relevance to park management. To document changes and justification, targeted protocol review was completed by the protocol lead and program manager in FY23. Additionally, with assistance from VIMS staff through our cooperative agreement, we began a comprehensive revision of the protocol and supporting SOPs. We planned to complete the revision in FY23 but have pushed the target completion date to 2024-2025.
7. **Protocol reviews:** The annual operational review for the NCBN ENE protocol was conducted in March 2023.

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

1. **Description:** Monitoring trends in forest condition and health among five network parks. Schoodic Institute interns are hired to serve on the forest crew.
2. **Data collection:** Data collection occurred at COLO, THST, GEWA, SAHI, and ASIS in 2023. (Note: ASIS funds the implementation of this protocol in their park).
3. **Data management:** All previous data has been verified and certified. All final datasets associated with this protocol are posted to Data Store and are publicly accessible. The team started to work on documentation to publish forest data into IMD's new data package format. All final datasets associated with this protocol will be posted to [DataStore](#) as publicly accessible once quality checked (~January 2024).
4. **Analyses:** finalized and published regional regeneration trend analysis: <https://irma.nps.gov/DataStore/Reference/Profile/2299183>. A variety of scripts were updated in the forest NETN and forest MIDN R packages to improve data summary and quality checks. Built an R Markdown plot viewer by park that summarizes data collected in a given year by plot and module and provides an overall summary table to aid in field season planning.
5. **Reporting and outreach:** Map-based summary reports for NCBN parks are in progress and will be completed in January 2024. Preliminary figures and table have been sent to parks for review. Worked with IPMTs and interested parks to complete Strategic Invasive Management Plans. Co-organized [resilient forests initiative](#) to communicate trends in forest condition to park managers and partners in person at NCTC and through a variety of [web articles](#). A storymap, presenting case studied in deer management can be found [here](#). The team contributed to regional planning and helped write multiple BIL/IRA funding requests for invasive and deer management in NER parks.
6. **Protocol changes/deviations:** Revised and updated SOPs as needed.
7. **Protocol Reviews:** Annual operational review for MIDN/NCBN/NETN was completed 3/2023.

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 previous year's data for the area each NCBN park resides in will be downloaded yearly in January, and made available to NCBN parks and the public through resource briefs (available on NCBN website and IRMA) and nps.gov shared articles. The NCBN Data Manager developed new guidance and consolidated existing guidance on the production of Weather Monitoring Resource Briefs for NCBN parks.
4. **Analyses:** Weather data summaries were created for each park.
5. **Reporting and Publications:** Unfortunately, although we have developed Resource Briefs for each park for 2022, they have not been published due to the loss of NCBN staff this year.
6. **Protocol Changes:** No changes were made to the protocol.
7. **Protocol Reviews:** no reviews were necessary

Additional Data Management Activities

- Data Managers from several networks implementing Sediment Elevation Table (SET) monitoring - including NCBN, NETN, NCRN, SECN, and SFAN - published the protocol's first official cumulative Data Package that met all current IMD guidelines. Served as metadata lead and co-authored a Data Management SOP outlining data export, QA/QC, documentation, and publication (Wright, W., D. Skidds, E. Cheng, and A. Kozlowski. 2023. Monitoring Coastal Wetland Elevation Data QA/QC and Data Publication-Version 1.0. Southeast Coast Network Standard Operating Procedure NPS/SECN/SOP-2.3.05. National Park Service Inventory and Monitoring Division. Fort Collins, Colorado.)
- Completed metadata for and published Data Package for legacy NCBN Secretive Marsh Bird Monitoring program (2013-2017).
- The NCBN Data Manager worked with NPS and IR1 IT to move NCBN file share from Reston Data Center to Azure cloud; provided testing for developers.
- The NCBN Data Manager and Program Manager collaborated on updating a number of Information Management Plan SOPs. SOPs included Metadata Creation, File Share Administration (Mapping Network Drives, Directory Structure, Naming Conventions, Backup and Restore), and Data Lifecycle Workflow / Annual Close-out Procedures.

Science Integration into Management

1. **Direct support of park planning:**

- In 2019-2021, the NCBN in collaboration with USGS scientists received NRPP funding to use NCBN seagrass monitoring data collected as part of our estuarine nutrient enrichment monitoring program, to look at seagrass vulnerability related to changing temperature regimes. The project incorporated the Network's long-term datasets from Cape Cod, Fire Island, and Assateague Island National Seashores. Final products are currently being completed. A manuscript was submitted for peer-review to the Journal of Geophysical Research - Biogeosciences. Manuscript title is: *Modeling Potential Changes in Seagrass Coverage, Biomass and Vulnerability Under Increased Temperature*.
- For each park, Michaela Compo, NCBN SIP intern, developed our new Estuarine Water Quality Data Dashboard: Water Quality Monitoring, that includes data from all NCBN parks where we monitor WQ: ASIS, CACO, FIIS, GATE, GEWA and COLO.
- Sara continues to be a member of the FIMP Data Management team, which is a multi-agency team brought together to discuss data management of the tremendous amount of data that is and will be collected as part of the FIMP.
- Both Sara Stevens and Jim Lynch have been part of the Northeast Region Salt Marsh SDM Workgroup, and participated in the three-day workshop that took place, spring 2023 at the University of Rhode Island. The Network's SET data is being used as part of the USGS UVVA modeling and tool for evaluating the resilience of park marsh units.

Partnerships and Collaboration

1. **Other activities that support parks, regions, and I&M (multi-network or national)**
 - The Cape Cod Pleasant Bay Alliance, the Center for Coastal Studies, Boston University and the NCBN worked together on the Massachusetts Municipal Vulnerability Preparedness: Community Climate Adaptation Plan for Pleasant Bay Ecosystem and Infrastructure project. This work was based on the results of the NRPP project.
 - The Northeast Coastal and Barrier Network, the Center for Coastal Studies, Boston University, and Mass Bays Program, also developed a detailed implementation plan for SCC funded project: Identifying factors preventing recovery of eelgrass from large declines to inform management actions at Cape Cod National Seashore. This will be a three-year project beginning in FY24.
 - NCBN SET Protocol lead is a member and co-leader of the NPS I&M SET database group. This collaborative effort includes five I&M Networks working together on the development of a SET monitoring database as well as the procedures for processing SET and Marker Horizon data. Work continued on this shared database project throughout FY2023.
2. **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, presented an overview of the NCBN seagrass and water quality monitoring program to the East Coast SAV (submerged aquatic vegetation) Cooperative. She also presented a summary of eelgrass patterns in Pleasant Bay, MA at the annual meeting of the non-profit "Friends of Pleasant Bay".
- NCBN Staff stationed at the University of Rhode Island continue to provide teaching support and mentoring opportunities to students.

3. Workgroups and Task Force Engagement

- Chesapeake Bay Sentinel Site Cooperative (Jim Lynch and Holly Plaisted, NCBN)
- Cartography & Web Mapping Subcommittee and sub workgroup, Cartography Working Group (Scott Rasmussen, NCBN)
- GIS Council Subcommittee, GNSS Position and Navigation (Dennis Skidds, NCBN)
- IR-1 GIS Steering Committee (Dennis Skidds, NCBN)
- NPS National Safety Leadership Council (Robin Baranowski, NCBN)
- NPS Women's Employee Resource Group, Working Mothers Subcommittee (Sara Stevens, NCBN)
- Northeast Region Salt Marsh SDM Workgroup. (Sara Stevens and Jim Lynch NCBN)
- Massachusetts Seagrass Workgroup (Holly Plaisted, NCBN)
- New England Estuarine Research Society (NEERS) Meeting Program Committee Co-chair - Fall 2022 and Spring 2023. (Holly Plaisted, NCBN)
- Pleasant Bay Climate Adaptation Action Plan (work group w/Pleasant Bay Alliance). (Holly Plaisted, NCBN)
- SAVvy Braintrust (National Estuarine Research Reserve Science Collaborative). (Holly Plaisted, NCBN).
- East Coast SAV Collaborative. (Holly Plaisted, NCBN).

Communication

- **Reports and Publications**

Peer Reviewed Publications

- **Lynch, J.C.**, Winn, N., Kovalenko, K. et al. *Comparing Wetland Elevation Change Using a Surface Elevation Table, Digital Level, and Total Station. Estuaries and Coasts* (2023). <https://doi.org/10.1007/s12237-023-01263-1>
- **Plaisted HK**, Shields EC, Novak AB, Peck CP, Schenck F, Carr J, Duffy PA, Evans NT, Fox SE, Heck SM, Hudson R, Mattera T, Moore KA, Neikirk B, Parrish DB, Peterson BJ, Short FT and Tinoco AI (2022) Influence of Rising Water Temperature on the Temperate Seagrass Species Eelgrass (*Zostera marina* L.) in the Northeast USA. *Front. Mar. Sci.* 9:920699. <https://doi.org/10.3389/fmars.2022.920699>
- Laura C. Feher, Michael J. Osland, Karen L. McKee, Kevin R. T. Whelan, Carlos Coronado-Molina, Fred H. Sklar, Ken W. Krauss, Rebecca J. Howard, Donald R. Cahoon, **James C. Lynch**, Lukas Lamb-Wotton, Tiffany G. Troxler, Jeremy R. Conrad, Gordon H. Anderson, William C. Vervaeke, Thomas J. Smith III, Nicole Cormier, Andrew S. From & Larry Allain. *Soil Elevation Change in Mangrove Forests and Marshes of the Greater Everglades: A Regional Synthesis of Surface Elevation Table-Marker Horizon (SET-MH) Data. Estuaries and Coasts* (2022). <https://doi.org/10.1007/s12237-022-01141-2>

NCBN Inventory and Monitoring Reports:

- Peck CP and Duffy P. 2023. Estuarine Nutrient Enrichment Monitoring: Data Summary and Trend Analysis for Cape Cod National Seashore. Neptune and Company, Inc.. Lakewood, CO
<https://irma.nps.gov/DataStore/Reference/Profile/2296760>
- Peck CP and Duffy P. 2023. Estuarine Nutrient Enrichment Monitoring: Data Summary and Trend Analysis for Colonial National Historical Park. Neptune and Company, Inc.. Lakewood, CO
<https://irma.nps.gov/DataStore/Reference/Profile/2296761>
- Peck CP and Duffy P. 2023. Estuarine Nutrient Enrichment Monitoring: Data Summary and Trend Analysis for Fire Island National Seashore. Neptune and Company, Inc.. Lakewood, CO
<https://irma.nps.gov/DataStore/Reference/Profile/2296762>
- Peck CP and Duffy P. 2023. Estuarine Nutrient Enrichment Monitoring: Data Summary and Trend Analysis for George Washington Birthplace National Monument. Neptune and Company, Inc.. Lakewood, CO
<https://irma.nps.gov/DataStore/Reference/Profile/2296764>
- Peck CP and Duffy P. 2023. Estuarine Nutrient Enrichment Monitoring: Data Summary and Trend Analysis for Gateway National Recreation Area. Neptune and Company, Inc.. Lakewood, CO
<https://irma.nps.gov/DataStore/Reference/Profile/2296763>
- Northeast Coastal and Barrier Network. 2023. Northeast Coastal and Barrier Network Coastal Geomorphological Monitoring Program Safety Plan. Northeast

Coastal and Barrier Network, National Park Service, Kingston, RI. Self-published:
<https://irma.nps.gov/DataStore/DownloadFile/681709>

- Peck C. 2023. Herpetological Inventory at Colonial National Historic Park. Neptune and Company. Report: <https://irma.nps.gov/DataStore/Reference/Profile/2296962>
- Data: <https://irma.nps.gov/DataStore/Reference/Profile/2296963>
- Peck C. 2023. Herpetological Inventory at Gateway National Recreation Area. Neptune and Company. Report: <https://irma.nps.gov/DataStore/Reference/Profile/2296968>
- Data: <https://irma.nps.gov/DataStore/Reference/Profile/2296969>
- Peck C. 2023. Herpetological Inventory at Fire Island National Seashore. Neptune and Company. Report: <https://irma.nps.gov/DataStore/Reference/Profile/2296965> Data: <https://irma.nps.gov/DataStore/Reference/Profile/2296966>
- Peck C. 2023. Herpetological Inventory at Sagamore Hill NHS. Neptune and Company. Report: <https://irma.nps.gov/DataStore/Reference/Profile/2296971> Data: <https://irma.nps.gov/DataStore/Reference/Profile/2296972>
- Psuty NP and Others. 2023. Shoreline position monitoring at Fire Island National Seashore: 2017–2022 and 2007–2022 trend report. Natural Resource Report. NPS/NCBN/NRR—2023/2531. National Park Service. Fort Collins, Colorado. <https://doi.org/10.36967/2299483>
- Psuty NP and Others. 2023. Shoreline position and coastal topographical change monitoring at Gateway National Recreation Area: 2017–2022 and 2007–2022 trend report. Natural Resource Report. NPS/NCBN/NRR—2023/2553. National Park Service. Fort Collins, Colorado. <https://doi.org/10.36967/2299536>
- Psuty NP and Others. 2023. Northeast Coastal and Barrier Network monitoring of shoreline position (1D) and coastal topographic (2D) change: 2019–2020 annual summary report for Gateway National Recreation Area. Natural Resource Report. NPS/NCBN/NRR—2023/2496. National Park Service. Fort Collins, Colorado. <https://doi.org/10.36967/2297044>

Outreach products

- Estuarine Water Quality Report, CACO Storymap: [Estuarine Nutrient Report \(arcgis.com\)](#)
- Estuarine Water Quality Data Dashboard: [Water Quality Monitoring - All Parks Aug 2023 \(arcgis.com\)](#)
- iNaturalist Storymap for parks: [YOU are a scientist. \(arcgis.com\)](#)
- NCBN Infographic: [NPS-NCBN-Staff - NCBN INFOGRAPHIC D1 MC.pdf - All Documents \(sharepoint.com\)](#)
- SET Location and Access Point Maps/StoryMap: [SET Viewer \(arcgis.com\)](#)
- NCBN Stewardship Saavy Podcast, draft episode. CACO Retired Wildlife Ecologist, Bob Cook.

Organizational Excellence

1. Safety

Annually, NCBN Biotech, Robin Baranowski updates and manages the Network's safety plans, safety site and related documents. Robin updates all five safety plans for the Network monitoring protocols. She has also created sharepoint site to house all of the NCBN safety plans and documents and updates the site as annually and as needed throughout the year. Robin also holds the annual NCBN safety training for NCBN staff to go over all updates and review safety procedures for the Network. The following are the links to the safety site and safety plans for each protocol:

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

2. Staffing

Current Staff as of November 2023:

- NCBN Program Manager, Sara Stevens (Nerone)
- Biologist/Tidal Wetland Elevation Monitoring Lead, Jim Lynch
- Biologist/Estuarine Monitoring Lead, Holly Plaisted

Staffing Changes 2023: (3 staff members left NCBN for higher graded NPS positions)

- NCBN Data Manager, Dennis Skidds (Dennis' position has been vacant since August 2023, when the NER Regional Director put a "pause" on all hiring in the region. Dennis accepted the NER GIS Coordinator Position, vice Nigel Shaw)
- Assistant Data Manager/Geomorphological Monitoring Biotech, Scott Rasmussen (Scott's position has been vacant since August 2023 as well. Scott accepted the CACO GIS position, vice Mark Adams)
- Biotech, Science Communication/Botanist, Robin Baranowski (Robin's position has been vacant since Feb 2023. Robin accepted the Regional Biologist position, vice Seth Lehrman)

2023 SIP Interns:

- Interns- SIP Science Interns, Maeve Noone-Price, summer 2023 (12 weeks) and Michaela Compo, 38 week SIP Science Communication intern, Nov 2022-Aug 2023.

NCBN board members and technical/steering committees:

Park Name	Board Member
Cape Cod NS	Brian Carlstrom-Jennifer Flynn (new Sept 2023)
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 Cobern
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	NPS Deputy GNSS PosNav Coord.
Staff	Southeast Coast Network
Jeffrey Bracewell	Gulf Coast Network GIS
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
William Vervaeke (Ches)	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	

Budget

In FY23 the Network received funding to cover almost all COLA costs for our staff. This is the first time in the history of the Network that we have received COLA allocations. In addition, the Network received a one-time funding allocation of \$109,000 from the central office's, base increase funds for additional project funding or to meet other Network needs. In FY2024, each Network is due to receive a much needed base increase of 7% to our Vital Signs Monitoring funding, which would be approximately \$64,000 for NCBN.

Category	Amount
INCOME	
Vital Signs Monitoring (base)	\$886,100 + \$30,780 (COLA) = \$916,880
WRD	\$82,300
TOTAL INCOME	\$999,180
Central Office Base Increase Funding*	\$109,000
TOTAL INCOME	\$1,108,180
EXPENDITURES	

Personnel (BOC 11 & 12)	\$728,476
Travel (BOC 21)	\$28,615
Transportation (BOC 22)	\$3468
Rent, communication, utilities (BOC 23)	\$0
Services and contracts (BOC 25)	\$20,340
Supplies and materials (BOC 26)	\$27,865
Equipment (BOC 31)	\$31,721
Agreements (BOC 411c) NCBN Monitoring	\$167,662
Other: IRA Funding TA-UNCW-Seagrass Genomics (CACO, FIIS, ASIS)	\$100,033
TOTAL EXPENDITURES	\$1,108,180.00
TOTAL FIXED COSTS*	\$728,476
TOTAL WATER MONITORING EXPENDITURES**	\$282,731.
% BUDGET FIXED (total fixed/total income)	81%

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

**Annual WRD Funding (\$82,300), covers approximately 29% of total NCBN WQ monitoring costs.