

NORTHEAST COASTAL AND BARRIER NETWORK (NCBN)

FY2020 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)

NCBN FY2020 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 due to COVID. Although fall SET and Shoreline field sampling occurred, spring surveys were mostly put on hold. Many of us traveling out of Rhode Island, needing tests before entering other states, staying in hotels, etc....was and continues to be a safety issue for us all, and this is most likely going to be a problem for our program for a while. We have been trying to figure out ways around as many hurdles as we can, and still ensure staff safety. Because our cooperators from Stony Brook University and Virginia Institute of Marine Science were under different COVID and travel related guidelines, they were able to collect data at ASIS, COLO, and GATE during the summer.

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.

- **Inventory and Monitoring Division's Conservation Initiative** – NCBN Staff participated in IMD's Conservation Initiative, a year- long process to set an audacious goal that will set the path for IMD to be relevant, sustainable, and impactful over the next 20-years. The Network Program Manager, Data Manager, and Science Communication Biotech attended week-long brainstorming meetings held by WASO IMD created to develop future I&M program goals for the next twenty years. The final overarching goal is to: *By 2040 Together I&M, partners, and parks generate 2,040 science-based solutions to promote resilient ecosystems.*
- Through a cooperative agreement with Colorado State University, this year we developed **shoreline change visualizers for SAHI, GATE, FIIS and ASIS**. The link below connects to interactive web maps that help visualize shoreline change rates for NCBN parks during five-year monitoring periods. The maps show annual shoreline positions and color-coded transects perpendicular to the shorelines that indicate erosion rates. For those who want to dive deeper than the initial data visualization, the maps allow you to explore the statistics and protocols involved in calculating shoreline change rates, and to access the five-year shoreline position trend reports. Link to the visualizers: <https://www.nps.gov/im/ncbn/ocean-shoreline-position.htm> In addition to the visualizers, we created a standard operating procedure (SOP) for how to develop and update the visualizers annually so that NCBN staff (and others) will be able to keep them up-to-date for each park. NCBN Staff have been planning the development of a 2D web app/visualizer for the coastal topography program, like the shoreline change visualizers.
- **Seventeen-year water temperature dataset at CACO**. The 2020 field season wasn't a complete bust for NCBN. Following COVID-19 safety protocols, and with help from CACO field technician Kaitlyn Button, we were able to complete some critical fieldwork. NCBN and CACO have been monitoring water temperature at sites in the park for over 17 years and the data have proven critical for understanding patterns in seagrass abundance and distribution. Making day trips from Rhode Island to CACO, the NCBN Estuarine Monitoring Lead retrieved and deployed water temperature loggers at CACO's seagrass monitoring sites. However, full-scale annual seagrass monitoring was cancelled, due to the pandemic at all parks. ENE water quality monitoring continued to be successfully implemented, on schedule, at GATE, ASIS and COLO thanks to cooperators at Stony Brook University and Virginia Institute of Marine Science.

- **University/NPS Partnership.** The University of Rhode Island provides office space for several NPS employees from multiple programs, including our network. In return, we provide support to the University through providing student research experiences, mentoring students, and instructing courses. To learn the details of what we do, read the National Park Service Contributions to the University of Rhode Island: 2020 Summary found [here](#).
- **NCBN, ASIS, and COLO Staff Collaborate to Increase Real-time GPS/GNSS Coverage.** Staff from NCBN, ASIS, and COLO are partnering to bring Region 1's second NTRIP (Networked Transport of RTCM via Internet Protocol) receiver online at Jamestown Island, joining the first that was deployed at ASIS in 2018. NTRIP receivers, like the Trimble NetR9 installed at COLO, continuously collect and feed correction data to the NPS' NTRIP server or "caster" in Denver. The caster then serves the corrections over the internet, allowing for an unlimited number of GPS/GNSS field receivers or "rovers" using cellphone connections to achieve sub-meter to centimeter-level accuracies, even up to 50 – 100km from the receiver. The receivers at ASIS and COLO are two of 24 recently acquired from the US Coast Guard by the NPS, with the NCBN contributing to the purchase of an antenna and necessary cabling and lightning suppression equipment for COLO. COLO GIS specialist Dave Frederick assisted with siting and park logistics before his recent retirement, and Neil Winn (ASIS) and Jim Lynch (NCBN) are looking forward to completing the installation in the near future. As noted by Frederick, "This is a wonderful opportunity for COLO. There is quite a bit of focus on Jamestown Island with so much change affecting the natural and cultural resources on the Island." Nearby park units, such as GEWA and THST, will likewise be able to take advantage of this free correction service.
- **Vertical Land Motion Workshop.** Staff from NCBN and ASIS (Jim Lynch, Neil Winn) attended a workshop in Hampton, Virginia in February on Vertical Land Motion in the Chesapeake Bay. Organized by the Chesapeake Bay Sentinel Site Cooperative and Maryland Sea Grant, the workshop had sessions on the latest science on vertical land motion, current monitoring efforts, and anticipated impacts on coastal ecosystems. Subsidence is an important contributor to local rates of sea level rise in the mid-Atlantic region, especially in Virginia (COLO). This was an opportunity for coastal scientists, managers, planners, and communicators to engage with vertical land motion's geologic, hydrologic, and geodetic community. The workshop also included a field trip to a USGS extensometer, which measures land subsidence.

Field Activity Summary Table for FY2020

Vital Sign(s)	Park(s)	Actual Months of Sampling (or cancellations)
Forest Health Monitoring	COLO, THST, GEWA, SAHI, ASIS	All forest health monitoring was cancelled during the summer 2020. Biotechs who had been hired worked remotely and analyzed existing data and created data summaries for four parks (COLO, SAHI, GEWA, THST). NETN, NCBN and MIDN collaborate through a shared cooperative agreement with the

		Schoodic Institute for field data collection.
Estuarine Nutrient Enrichment Monitoring (Water Quality)	CACO, ASIS, GATE, FIIS COLO, GEWA	Sampling occurred at GATE through our Task Agreement with Stony Brook University, and ASIS and COLO through our Task Agreement with the Virginia Institute of Marine Science.
Estuarine Nutrient Enrichment Monitoring (Seagrass)	CACO, FIIS, ASIS	All Seagrass monitoring was cancelled due to COVID-19.
SET Monitoring	CACO, FIIS, GATE, ASIS, COLO BOHA, ACAD NCRN parks	Sampling occurred during the fall 2019, but all spring 2020 sampling was cancelled due to COVID-19
Shoreline Change Monitoring	CACO, FIIS, GATE, ASIS, GEWA, SAHI	Sampling occurred fall 2019, but spring sampling was not completed at any parks due to COVID-19, however, Rutgers completed some surveys for GATE prior to the March shutdown.
Coastal Topography Monitoring	ASIS, GATE	Sampling occurred fall 2019 at both parks, but spring sampling was not completed except for some work at GATE by Rutgers prior to the March shutdown.
Salt Marsh Vegetation and Nekton Monitoring	FIIS, ASIS, SAHI	No data collection occurred during the summer of 2020.

Inventories

- a) All species data associated with the Hurricane Sandy submerged mapping projects for CACO, SAHI, FIIS and ASIS was entered into NPSpecies.
- b) All herp inventory data collected as part of the studies completed by cooperators from the University of Rhode Island, is being re-entered by a two biotechs that NCBN shares with the Eastern Rivers and Mountains Networks.

Vital Signs Monitoring

- a. Salt marsh surface elevation monitoring
 - i. *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.
 - ii. *Data Collection:* Data collection normally occurs twice during the fiscal year, in the fall and spring. Fall 2019 trips occurred on schedule with 6 parks in the NCBN and NCRN being sampled. These trips included measurements at the sampling stations (SET and Marker horizons), vegetation sampling, water level gauge servicing and GNSS surveys (CACO, NACE). COVID-19 issues in 2020 did not allow for the spring sampling to occur.
 - iii. *Data management accomplishments and status:* All SET and marker horizon data collected through 2019 was entered into the NPS SET database and checked for errors (QA/QC). Water level data was checked, loaded into Aquarius and approved. Updated trends and

graphics for all data collected through 2019. Secured contract with Western Ecosystems Technology Inc for trend analysis of SET and marker horizon data from the NCBN, NETN and NCRN. Data was provided to the contractor in July 2020.

- iv. *Reporting/presentations/brief*: Trend analyses are underway for SET and marker horizon data from all SET sites in the northeast region through a contract with Western Ecosystems.
 - v. *Protocol changes/deviations*: Work began in FY20 on an update to the SET protocol.
 - vi. *Protocol reviews*: No operational review was conducted in FY20 due to no data collection. The next review is scheduled to be held in FY21.
- b. Salt Marsh Vegetation and Nekton Monitoring
- i. *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.
 - ii. *Data Collection*: Due to restrictions on travel and field work presented by the COVID-19 pandemic, field crews were not hired for the summer, FY2020 field season.
 - iii. *Data management accomplishments and status*: All data for the previous (FY19) field season were entered/verified/validated/accepted and posted to the NPS DataStore in early FY20. No FY20 data were collected.
 - iv. *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.
 - v. *Reporting/presentations/brief*: A final report from Neptune, Inc. is expected in December 2020.
 - vi. *Protocol changes/deviations*: No changes were made to either protocols in FY20.
 - vii. *Protocol reviews*: NCBN plans to conduct protocol reviews in the Spring of 2021.
- c. Shoreline Change and Coastal Topography Monitoring
- i. *Description*: A primary goal of the NCBN Coastal Geomorphological monitoring program is to provide information to our park managers and improve the understanding of the dynamic nature of park coastlines, including both the temporal and spatial patterns of coastline change in NCBN parks. 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.

- ii. *Data Collection:* Shoreline Position was monitored in the fall at CACO, FIIS, SAHI, GEWA, 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, collect the data for us at GATE. NCBN staff collect the data for GEWA and SAHI. Due to the COVID-19 Pandemic, data collection did not occur in spring 2020. GATE was partially collected and included all shorelines except for Plumb Beach and all coastal topography profiles at Breezy Point and Sandy Hook.
 - iii. *Data management accomplishments and status:* All fall 2019 data have been entered, verified, validated, certified and posted to the NPS Data Store. Data collected at GATE during the spring 2020 are still undergoing processing due to the limited ability for staff to enter office spaces that house the survey equipment and computers used for data storage and processing.
 - iv. *Reporting/presentations/brief:* Rutgers University collaborators completed an annual report for GATE, but no trend reports were completed.
 - v. *Protocol changes/deviations:* This year, NCBN staff developed a sampling design for FIIS in order to implement the Coastal Topography monitoring protocol. Both Coastal Geomorphological Protocols went through a review in 2016 and were rewritten to reflect changes and comments identified from the review board. Both protocols are awaiting final approval and formatting before they are released. New digital Field Data Forms were created to include dropdown selections and auto-populating fields. These forms are used by all members of our coastal geomorphology monitoring. Finally, spring fieldwork was largely canceled due to the COVID Pandemic.
 - vi. *Protocol reviews:* The annual operational review for both the Ocean Shoreline Position and Coastal Topography Protocols was completed in March 2020.
- d. Estuarine Nutrient Enrichment Monitoring
 - i. *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.
 - ii. *Data Collection:* (ENE water quality component) Data were collected on schedule at three parks: GATE, ASIS, and COLO. GATE data were collected through our cooperative agreement with Dr. Brad Peterson from SUNY Stony Brook, and at ASIS and COLO through an agreement with Dr. Ken Moore, Virginia Institute of Marine Science (VIMS). To adhere to IMD water quality laboratory accreditation requirements, NCBN procured a contract for chlorophyll-a samples to be analyzed by an NELAP accredited lab. The Virginia Institute of Marine Science Analytical Service Center was selected through the competitive bid process. They successfully analyzed 222 samples in FY2020. The sediment organic carbon monitoring component of the ENE protocol was implemented at GATE, ASIS and COLO. Laboratory analysis will be conducted by the Virginia Institute of Marine Science Analytical Service Center. The VIMS Analytical Service Center completed TOC analysis of samples collected in 2019 from CACO, FIIS, and GEWA.

- iii. *Data Collection:* (Seagrass condition component (CACO, FIIS, ASIS) Seagrass plant metric data were not collected at CACO and ASIS in calendar year 2020 due to the COVID-19 pandemic. Seagrass data was collected at FIIS by Stony Brook University and at ASIS in October 2019 by VIMS. Both were funded through cooperative agreements with NCBN. Continuous temperature data were collected throughout FY2020 as directed by the protocol at each of the monitoring sites and was not affected by travel restrictions. Erin Shields at VIMS and the VIMS Analytical Service Center completed sediment grain size and organic matter content analysis of samples collected from monitoring sites in 2016 through 2019.
 - iv. *Data management accomplishments and status:* Completed QC and certification of 2019 spatial water data and made available on Data Store and STORET. Completed data entry into Aquarius, QC and certification/approval of continuous logging station (2005-2019) and seagrass monitoring site temperature data (2003-2019). Secured contract for comprehensive trend analysis of water and seagrass data and began working with contractor, Neptune and Co. Inc. Data was provide to contractor in September 2020.
 - v. *Reporting/presentations/brief:* Trend analysis of 2006-2019 data are underway. A compressive trend report and park-specific summaries are planned to be produced in FY2021 and early FY2022.
 - vi. *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.
 - vii. *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
- e. Forest Health Monitoring (GEWA, THST, COLO, SAHI) This monitoring is in collaboration with NETN and MIDN.
 - i. *Description:* NCBN collaborates with two networks in the region to collect forest health monitoring data at four of our parks. This year NCBN was part of a cooperative agreement with the Schoodic Institute along with the other networks to help implement the protocol in all three network's parks. This year Schoodic Institute interns were hired to serve on the forest monitoring crew. Due to COVID-19, all monitoring was cancelled, and the intern's seasons were shortened to 12 weeks. In lieu of sampling, NETN forest health monitoring leads, provided R and GIS training to the interns who were able to work remotely, so they could build forest summaries for both the MIDN and NCBN parks. Materials for the R training are available upon request.
 - ii. *Data collection:* No data was collected due to COVID-19.
 - iii. *Data management:* 2019 MIDN/NCBN data were entered, verified and validated. Historic (2009-2011) MIDN and NCBN data were 100% checked (verification process hadn't been completed those years), transcription errors were corrected, and final data were validated. Testing of the new SQL forest database continued weekly through FY20.
 - iv. *Reporting and outreach:* (a) The first multi-network invasive plant trend analysis, which included 12 years of invasive plant data from 39 parks, was accepted and is currently in press. Network and park level summaries of the results from this paper were sent to park resource management staff and are available upon request. (b) Drafted a report of regeneration data for VAFO and HOFU study to validate the sampling design, assess whether deer management targets were low enough to support sufficient regeneration in VAFO and

- determine whether deer management was needed in HOFU. (c) Developed forest summary reports for MIDN and NCBN parks, similar to the reports generated for NETN in FY19. Completed summaries are located available upon request. (d) Presented monitoring results at four in-person or remote-based meetings.
- v. *Protocol changes/deviations*: No major changes were made to the protocol content, however, the protocol was reformatted as follows: Standard Operating Procedures (SOP) document was split into multiple documents by each SOP, Safety SOP migrated to a Safety Plan and we added a Summary of Major Protocol Changes document. These changes were made to conform to newly proposed changes in protocol formatting.
 - vi. *Protocol Reviews*: Annual operational review for MIDN/NCBN/NETN was completed in winter 2020.

Data Management

- a. All NCBN databases were updated with an added functionality to produce export queries that rendered 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. This effort also involved creating FGDC-CSDGM compliant metadata templates for each of those export products, often necessitating the documentation of dozens of individual fields. To date, datasets and metadata templates have been created for all NCBN monitoring protocols, and several other Networks have consulted NCBN for advice on how to best implement the metadata component.
- b. This year, NCBN data manager Dennis Skids, completed a detail as the National Inventory and Monitoring Program Data Manager, a position in Fort Collins which remains vacant. In this position, Dennis served as a liaison between the IMD Central Office and the Network Data Manager community, participated as a functional analyst on network database projects, and serving on various working groups to advance the goals of the Long Term Data Management (LTDM) Governing Board, and lead monthly Data Manager “Fireside Chat” calls.
- c. This year the NCBN, GULN, and SECN Networks developed an IMD Network Project Request proposal for the development of a shared SQL Server database solution for the Network’s shoreline position change monitoring programs, based on the NCBN Shoreline Change protocol.
- d. All NCBN seagrass data collected in CACO, FIIS, and ASIS, has been updated to prepare for transitioning to a SQL database.

Science Integration into Management

- a. Direct support of park planning
 - i. This year FIIS and CACO began developing their RSS plans. Both the NCBN Program Manager and the Estuarine Monitoring Lead, took part in the start-up meetings for CACO and then split their time between FIIS and CACO as the parks went through the process of developing their RSSs.
 - ii. The NCBN Program Manager participated in the Atlantic Research Learning Center two-day Workshop, July 2020. The goal of the workshop was to bring a select group of participants together to work on creating a vision for the future of the learning center.
 - iii. NCBN staff continue to coordinate the installation of the NetR9 NTRIP GNSS receiver at COLO.
- b. Support for park management actions/issues
 - i. Through a cooperative agreement with Colorado State University, this year we developed shoreline change visualizers for SAHI, GATE, FIIS and ASIS. The link below connects to

- interactive web maps that help visualize shoreline change rates for NCBN parks during five-year monitoring periods. The maps show annual shoreline positions and color-coded transects perpendicular to the shorelines that indicate erosion rates. For those who want to dive deeper than the initial data visualization, the maps allow you to explore the statistics and protocols involved in calculating shoreline change rates, and to access the five-year shoreline position trend reports. Link to visualizers: <https://www.nps.gov/im/ncbn/ocean-shoreline-position.htm>
- ii. In addition to the visualizers, we created a standard operating procedure (SOP) for how to develop and update the visualizers annually so that NCBN staff (and others) will be able to keep them up-to-date for each park. NCBN Staff have been planning the development of a 2D web app/visualizer for the coastal topography program, similar to the shoreline change visualizers.
 - iii. NCBN staff have acquired COLO shoreline monitoring and rates of change data from the Virginia Institute of Marine Science (VIMS). Data were acquired to develop a shoreline change visualizer for the park in 2021 following the SOP developed by Colorado State.
 - iv. Three separate SOWs were developed and contracted out using the IMD IDIQ contract for data analysis support this year. Analyses are being completed for NCBN salt marsh nekton and vegetation, estuarine water quality, and SET data for NCBN parks.
 - v. Direct park support included a specific project for FIIS related to the comparison of the Fire Island Wilderness Area boundary at establishment in the 1960's versus what the boundary looks like today, post Hurricane Sandy and the inclusion of the breach within the boundary.
 - vi. NCBN SET monitoring coordinator, is collaborating with other IMD Networks on a visualizer for quality control reviews of SET data and trend reporting.
 - vii. Weather and Climate brief templates were developed for the network parks based on those created by the Mid-Atlantic Network. 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. Starting in 2021, NCBN staff will be developing annual weather and climate resource briefs for each park. These will provide a summary of both historic and current (2020) weather and water level data.
 - viii. NCBN Staff created an ArcGIS Online Story Map that maps all the different types of monitoring data collection in each of the networks' parks. Sources of data include not only NCBN data, but national and park level monitoring data as well.
 - ix. This year the NCBN Estuarine Monitoring Lead responded to CACO ENE fieldwork and data management needs and worked closely with staff to ensure ENE data were entered and verified. She trained field staff on PAR sensor data download and intercalibration and deployed and retrieved data loggers (Duck Harbor and Pleasant Bay). In addition, she assisted park staff and interns with data entry.
 - x. The NCBN Estuarine Monitoring Lead began working with the CACO aquatic ecologist in developing a plan to assist with Kettle Pond Water Quality monitoring program data management and analysis and came up with a 2-year plan for the park to complete the work.
 - xi. NCBN staff support COLO by handling the data management tasks for their park landbird monitoring program.
- c. Regional support
- i. The NCBN Biological Science Technician, volunteered to participate on a technical review panel for the Service-wide Comprehensive Call (SCC) project proposals for the third year in a row.

- ii. The NCBN Program Manager, presented NCBN monitoring and available data at the Northeast Climate Change Refugia Workshops, March 16 and 19, 2020, and for coastal refugia specifically, Oct 2020.
- iii. The NCBN Data Manager completed the organization and posting of data products associated with four Hurricane Sandy-related submerged resource mapping projects at ASIS, CACO, FIIS, and GATE. Together, these projects generated hundreds of data products comprising terabytes of data. Products included bathymetric and side-scan sonar data files and mosaics, sediment and biological data associated with grab samples, habitat classification maps, and other ancillary datasets. The NCBN Data Manager worked with Marsha Leavitt at IMD to ensure that these data would meet specifications for inclusion in Data.gov.
- iv. The NCBN Data Manager served as an early-adopter and representative for NPS Region 1 natural resource staff during the DOI migration from Google to Microsoft Office 365. He attended pre-migration training and assisted with initial testing and attended weekly (and eventually daily) team meetings as migration day approached in early February. He acted as a resource for other R1 NR staff with questions regarding the new platform, prepared weekly email updates, and worked as a liaison between colleagues and the regional IT implementation staff.
- v. NCBN staff are members of the NER GIS council and continue to serve as a resource to parks and networks regarding the NPS mapping-grade GNSS receiver replacement plan.

Partnerships and Collaboration

- a. Other activities that support parks, regions, and I&M (multi-network or national)
 - i. 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.
 - ii. The NCBN Estuarine Monitoring Lead, continued to work closely with other Network water colleagues (SECN and ERMN) to standardize QA/QC, data management, correction and certification procedures across networks, and discussed plans with other network aquatic staff for inter-network review of Aquarius data.
 - iii. The NCBN Estuarine Monitoring Lead, 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.
 - iv. NCBN Staff continue to provide publication formatting and support on Interior Region 1 NRCAs, RSS, and Vulnerability Assessment documents.
 - v. NCBN Staff planned to host the IMD Science Communicator's Annual training this year at the University of Rhode Island, but unfortunately due to COVID19 it had to be canceled. NCBN staff continue to be on the planning team to develop a remote-live training that may take place in 2021.

- vi. 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. He also was a member of the 2020 Data Manager Training Planning Committee
 - vii. Region 1 Planning: NCBN staff 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.
- b. Other NPS, federal, and external partnership activities (with state agencies, universities, etc.)
- i. The NCBN SET monitoring lead 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. He 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.
 - ii. The NCBN SET monitoring lead is also 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.
 - iii. The NCBN Estuarine Monitoring Lead maintained and established the following partnerships:
 - USGS: actively maintain close working relationship with coastal ecosystem scientists
 - SeagrassNet global program: participating in long-term program sustainability
 - Mass. Division of Marine Fisheries - actively maintain close working relationships with seagrass scientists.
 - Boston University - actively maintain close working relationship with Coastal ecosystem research professor and students
 - Center for Coastal Studies - actively maintain close working relationship with marine scientist
 - Piscataqua Region Estuaries Partnership (PREP) – new collaboration this year
 - EPA - actively maintain close working relationship with REGION 1 - New England marine scientist
 - Massachusetts Seagrass Workgroup: Shared CACO and FIIS monitoring results with MA Seagrass Workgroup in response to large-scale losses observed throughout MA.
 - iv. 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 five 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.

Science Communication

a. Reports and Publications (Peer Reviewed Journals)

Cahoon, D.R., Reed, D.J., Day, J.W., **Lynch, J.C.**, Swales, A. and Lane, R.R. 2020. Applications and utility of the surface elevation table–marker horizon method for measuring wetland elevation and shallow soil subsidence-expansion. *Geo-Marine Letters*. 39:265-278.
<https://doi.org/10.1007/s00367-020-00656-6>.

Yeates, A.G., Grace, J.B., Olker, J.H. **et al.** Hurricane Sandy Effects on Coastal Marsh Elevation Change. *Estuaries and Coasts* 43, 1640-1657 (2020). <https://doi.org/10.1007/s12237-020-00758-5>

Morris, J.T., **Lynch, J.**, Renken, K.A., **Stevens S.**, Tyrrell, M., Plaisted, H. 2020. Tidal and Hurricane Impacts on Saltmarshes in the Northeastern Coastal and Barrier Network: Theory and Empirical Results. *Estuaries and Coasts*. 43, 1658-1671. <https://doi.org/10.1007/s12237-020-00790-5>

Breithaupt, J. L., Smoak, J. M., Bianchi, T. S., Vaughn, D., Sanders, C. J., Radabaugh, K. R., Osland, M.J., Feher, L.C., **Lynch, J.C.**, Cahoon, D.R., Anderson, G.H., Whelan, K.R.T., Rosenheim, B.E., Moyer, R.P., Chambers, L.G. 2020. Increasing rates of carbon burial in southwest Florida coastal wetlands. *Journal of Geophysical Research: Biogeosciences*, 125, e2019JG005349.
<https://doi.org/10.1029/2019JG005349>

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Babson, A.L., Bennett, R.O., Adamowicz, **S.**, **Stevens**. Coastal Impacts, Recovery, and Resilience Post-Hurricane Sandy in the Northeastern US. *Estuaries and Coasts* 43, 1603–1609 (2020).
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Plaisted, H.K., Novak, A.B., Weigel, S. et al. Eelgrass Genetic Diversity Influences Resilience to Stresses Associated with Eutrophication. *Estuaries and Coasts* 43, 1425–1438 (2020).
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b. Reports and Publications (NPS Technical Reports)

Handel, S. N., M. S. Meixler, M. F. J. Aronson, C. M. K. Kaunzinger, J. N. Epiphan, and J. Gurevitch. 2020. Restoration of Jamaica Bay fringing habitats: Post-Sandy status and new approaches for a resilient future. Natural Resource Report NPS/NCBN/NRR—2020/2113. National Park Service, Fort Collins, Colorado.
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Hychka, K., J. Remillard, and C. Gottschalk Druschke. 2020. Minding the gap: Analysis of arguments made in the media for and against closing the breach at Fire Island National

Seashore. Natural Resource Report NPS/NCBN/NRR— 2020/2147. National Park Service, Fort Collins, Colorado. <https://irma.nps.gov/DataStore/Reference/Profile/2275611>

LaFrance Bartley, M., T. Curdts, and S. Stevens. 2019. Procedures and criteria for evaluating benthic mapping data: A Northeast Coastal and Barrier Network methods document. Natural Resource Report NPS/NCBN/NRR—2019/2050. National Park Service, Fort Collins, Colorado. <https://irma.nps.gov/DataStore/Reference/Profile/2267818>

Morris, J. T., and K. A. Renken. 2019. The impact of sea-level rise on saltmarsh condition and resiliency: Assateague Island National Seashore, Cape Cod National Seashore, Fire Island National Seashore, and Gateway National Recreation Area. Natural Resource Report NPS/NCBN/NRR—2019/1974. National Park Service, Fort Collins, Colorado. <https://irma.nps.gov/DataStore/Reference/Profile/2265896>

c. Outreach products

i. Resource Briefs that NCBN Staff re-created as shared content web articles

- [After Sandy, National Parks Get Storm-Ready: Park scientists muster elevation data and enhance information systems to prepare for future storms](#)
- [An aspiring geologist gains a well-grounded skill set from the Geoscientists-in-the-Parks \(GIP\) internship program](#)
- [Atlantic Horseshoe Crabs of Gateway National Recreation Area](#)
- [Atlantic Sturgeon of Colonial National Historical Park](#)
- [Bald Eagles of Colonial National Historical Park](#)
- [Discovering the Secrets of Resilience: Through long-term monitoring, National Park Service scientists learn how coastal places rebound from storms and adapt to sea level rise](#)
- [Documenting the Toll of Coastal Storms — with Smartphones](#)
- [Eastern Mud Turtles of Fire Island National Seashore](#)
- [Eelgrass of Cape Cod National Seashore](#)
- [Exploring the Woods Under the Water: Dr. Bradley Peterson examines the resilience of Great South Bay ecologies after Hurricane Sandy](#)
- [Films to Promote Unity and Healing: Filmmaker Sarah Gulick engages people in the science behind resilience](#)
- [Geoscientists-in-the-Parks \(GIP\) internship program broadens one student's career horizon](#)
- [Keys to Tomorrow: Chris Gobler studies storm impacts, resilience, and restoration opportunities in coastal parks](#)
- [More Impact for More People: Geoscientists-in-the-Parks \(GIP\) internship program advances park science, promotes stewardship, and launches careers](#)
- [Peregrine Falcons of Assateague National Seashore](#)
- [Sounding Seafloor Habitats: Researchers use sonar to map the underwater resources of four National Parks](#)
- [This Park's Personality: Interpretive Ranger Sonia Taiani brings shoreline dynamics and post-Sandy resilience research at Fire Island National Seashore to life for visitors](#)
- [This Park's Personality: Jordan Raphael and the quest to preserve the Sunken Forest](#)

- [True to Her Roots: One woman's passion for conservation becomes a reality in her native Rhode Island](#)

ii. Resource Briefs

- [2019 Weather in Review: Fire Island National Seashore](#)
- [An aspiring geologist gains a well-grounded skill set from the Geoscientists-in-the-Parks \(GIP\) internship program](#)
- [Atlantic Sturgeon of Colonial National Historical Park](#)
- [Documenting the Toll of Coastal Storms — with Smartphones](#)
- [Geoscientists-in-the-Parks \(GIP\) internship program broadens one student's career horizon](#)

iii. Data Visualizers

- Shoreline Change Map: Assateague Island National Seashore
[ASIS 2010-2019](#)
- Shoreline Change Map: Fire Island National Seashore
[FIIS 2007-2012](#)
[FIIS 2012-2017](#)
- Shoreline Change Map: Gateway National Recreation Area
[Breezy Point \(ocean side\) 2008-2012](#)
[Breezy Point \(bay & ocean\) 2012-2017](#)
[Fort Wadsworth 2008-2012](#)
[Fort Wadsworth 2012-2017](#)
[Great Kills \(bay & ocean\) 2008-2012](#)
[Great Kills \(bay & ocean\) 2012-2017](#)
[Miller Field 2008-2012](#)
[Miller Field 2012-2017](#)
[Plumb Beach 2008-2012](#)
[Plumb Beach 2012-2017](#)
[Sandy Hook 2007-2012](#)
[Sandy Hook 2012-2017](#)
- Shoreline Change Map: Sagamore Hill National Historic Site
[SAHI 2012-2017](#)

iv. Newsletters: NCBN Network Update: January 2020

Organizational Excellence

a. Safety

- NCBN stood down field work in March due to the COVID-19 pandemic. All NCBN field work requires inter-state travel in and out of six states (MA, RI, NY, NJ, MD, VA). This made it impossible during the spring months to collect our SET and Coastal Geomorphology data, especially with these states under stay-at-home orders. During the summer months, our Cooperators from Stony Brook and Virginia Institute of Marine Science were able to travel to FIIS/GATE and ASIS/COLO respectively, and collect most of our estuarine water quality data. Due to the inability to safely mitigate the risks of COVID-19 and/or state pandemic directives that prohibited inter-state travel, especially from Rhode Island where most of us are stationed, we had to cancel all field work for September and into the fall.

b. Staffing

Current Staff:

NCBN Program Manager, Sara Stevens

NCBN Data Manager, Dennis Skidds (currently on detail with WASO IMD until March 2021)

Biologist/SET Monitoring Lead, Jim Lynch

Biologist/Estuarine Monitoring Lead, Holly Plaisted

Perm Biotech/Coastal Geomorphology Monitoring Lead, Scott Rasmussen

Perm Biotech (STF), Science Communication/Botanist, Robin Baranowski

c. 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	Kym Hall

Technical Steering Committees	
Coastal Geomorphology (Scott Rasmussen/Dennis Skidds Leads)	
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 Lead)	
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 Lead)	
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 Lead/NCBN Staff)	
TBD	

d. 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 \$13,874 this year. In addition, the central IMD office had an excess of funding and forwarded an additional \$50,000 to all 32 networks. The majority of the remaining travel funds (\$16,126) and the additional \$50,000 from the central office, was put into two contracts that we developed under the central office's IDIQ contract for data analysis support. The two contracts include (1) the analysis of our estuarine water quality data for all parks 2003-2018, including seagrass for ASIS, CACO and FIIS, and (2) all SET data for parks collected between 1998-2019. Total for these contracts is \$87,713.

Category	Amount
INCOME	
Vital Signs Monitoring (base)	\$826,100
WRD	\$82,300
IMD Collaboration	\$30,000
IMD-One-time funding provided to each network	\$50,000
TOTAL INCOME	\$988,400
EXPENDITURES	
Personnel (BOC 11 & 12)	\$692,838
Travel (BOC 21)	\$13,874
Transportation (BOC 22)	
Rent, communication, utilities (BOC 23)	
Services and contracts (BOC 25)	\$112,008
Supplies and materials (BOC 26)	\$11,858
Equipment (BOC 31)	\$17,137
Agreements (BOC 41)	\$138,567
Other (BOC 24, 99, or not included in above BOCs)	
TOTAL EXPENDITURES	\$986,282
TOTAL FIXED COSTS*	\$717,838
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.