



2021-2022
Year-End Report
CE-00D95519

30 October 2022

www.apnep.org

TABLE OF CONTENTS

Executive Summary.....	2
2021-2022 Key Accomplishments.....	3
Activities & Projects 2021-2022.....	9
Supplemental Projects (Non-320 Funded)	22
Administration and Program Implementation	25
Travel	26
Non-Federal Cost-Share (Match).....	28
Leverage Funds	29
Partnership Entities	30
APNEP Contracts and Grants Summary Table.....	32

EXECUTIVE SUMMARY

Purpose

The report presents information about APNEP’s completed and ongoing projects from October 2021 through September 2022 under cooperative agreement *CE-00D95519*. Descriptions of projects completed prior to May 2021 under *CE-00D95519* may be found in previous years’ reports that are available at APNEP.org

Cooperative Agreement

This report addresses actions under EPA/NC-DEQ Cooperative Agreement *CE-0D95519* to support implementation of the management strategies recommended in APNEP’s [Comprehensive Conservation and Management Plan \(CCMP\)](#) under the direction of the Leadership Council, as well as to support APNEP’s mission of identifying, protecting, and restoring the Albemarle-Pamlico region’s significant resources. The period of performance under this Cooperative Agreement is from October 1, 2019, through September 30, 2024.

Principal Contacts

Leadership Council Chair

Dr. Kirk Havens
V.A. Institute of Marine Sci.
P.O. Box 1346
Gloucester Pt, VA 23062
(804) 684-7380

APNEP Director

Dr. William L. Crowell, Jr.
Albemarle-Pamlico NEP
1601 Mail Service Center
Raleigh, NC 27699-1601
(919) 707-8633

APNEP Program Manager

Ms. Heather Jennings
Albemarle-Pamlico NEP
1601 Mail Service Center
Raleigh, NC 27699-1601
(919) 707-8632

EPA Project Officer

Ms. Rachel Hart
US EPA, Region IV
61 Forsyth Street
Atlanta, GA 30303
(404) 562-9279

EPA Region III Liaison

Ms. Megan Mackey
US EPA, Region III
1650 Arch Street
Philadelphia, PA 19103
(215) 814-5534

EPA HQ Lead

Mr. Vince Bacalan
US EPA, HQ
1301 Constitution Ave NW
Washington, DC 20460
(202)566-0930

2021-2022 Key Accomplishments

Key accomplishments from October 2021 through September 2022 are listed below. Additional details about these and other projects can be found in the [Activities and Projects 2021-2022 section](#) of this document.

Focus Areas and Activities

The Covid-19 pandemic created many challenges for APNEP since March 2020. However, the Partnership continued its attention on CCMP focus areas and activities as directed by the Leadership Council during the January 2020 strategic planning meeting. These actions led to activities primarily focused on submerged aquatic vegetation (SAV), water quality, coastal habitats, and resilience; all consistent with the CCMP and APNEP mission. During this time the staff worked with the Management Conference and our many partners to continue business as usual where possible. The result was many remote workdays and many virtual meetings for staff, Management Conference members, and our partners.

Additionally, the Partnership continues work on further development of its monitoring plan and amending the CCMP to reflect changes since 2012. Staff are currently working with partners to develop the updated water quality component of the monitoring plan. A priority for much of the remaining fiscal year is to complete the update/amendment to the CCMP by year's end.

Submerged Aquatic Vegetation (SAV)

SAV Map Data Collection - Monitoring

During 2021-2022 APNEP continued to coordinate with the North Carolina Department of Transportation and other partners on the APNEP SAV Team to gather SAV data via aerial imagery and boat-based surveys. In addition to this information supporting the creation of an updated map of high-salinity SAV for the Albemarle-Pamlico Estuarine System, this effort in 2021 marked the initial implementation of APNEP's Integrated Monitoring Plan by focusing on several indicator metrics reflecting the condition of the region's coastal SAV resource. The water quality component of this Integrated Monitoring Plan is discussed next. [Learn more.](#)

Water Quality

Research Study to Support Water Clarity Metrics for SAV Protection

Water clarity indicator research for SAV protection: To set SAV protection and restoration goals for the Albemarle-Pamlico Estuarine System and make the connection to needed nutrient and sediment load reductions, quantitative linkages between the concentrations of optical constituents and SAV light requirements are needed. Under a contract with APNEP, Dr. Nathan Hall of the UNC Institute of Marine Sciences has developed scientifically defensible chlorophyll-*a* and turbidity threshold concentrations that when considered together lead to water clarity that is protective of SAV in high-salinity zones. This information will help guide the decisions made through the NC Nutrient Criteria

Development Plan and the NC Coastal Habitat Protection Plan. With ongoing research needs established, this project is set to conclude December 2022. [Learn more.](#)

NC Nutrient Criteria Development Plan Support

APNEP staff and select STAC members are active in the NC Nutrient Criteria Development Plan (NCDP) process, now focused on the Albemarle Sound and Chowan River. Staff assisted the NC Division of Water Resources (NCDWR) with gaining a complete understanding of the system and recommended candidates for the NCDP's Scientific Advisory Council who are experts in high- and low-salinity SAV, and SAV impacts on fish productivity, as well as water quality issues. NCDWR has selected SAV as a biological indicator for the health of the Albemarle Sound and Chowan River. APNEP staff will continue to actively participate in nutrient criteria development for the Albemarle Sound and Chowan River until recommendations are accepted by NCDWR and approved the NC Environmental Management Commission and submitted to EPA.

Water Quality Testing and Communications Projects

Central to APNEP's mission as a program authorized by the Clean Water Act is protecting and restoring the Albemarle-Pamlico region's waters. The Partnership funded several projects in support of this mission. Through support for Sound River's Swim Guide program and NC Division of Marine Fisheries' Recreational Water Quality Monitoring Program, APNEP is expanding the collection of water quality data for our region that prioritizes public health. Both programs monitor water quality with the primary goal of alerting local communities to potentially hazardous conditions, and the Swim Guide program with Sound Rivers has the added educational benefit of operating through citizen scientists. [Learn more.](#)

Coastal Habitats

2021 NC Coastal Habitat Protection Plan Amendment

In late 2021, an amendment to the NC Coastal Habitat Protection Plan (CHPP) was adopted by the three NC regulatory bodies with water quality and fisheries oversight – Coastal Resources, Environmental Management and Marine Fisheries Commissions. The amendment focuses on and identifies five primary areas where improving water quality is critical.

To support CHPP implementation, the amendment includes a recommendation that a public-private partnership be formed with NC-DEQ and several non-governmental organizations. This partnership would be able to seek out additional funding sources that NC-DEQ and APNEP are currently unable to pursue as public entities, as well as explore and prioritize non-regulatory approaches towards implementing recommendations identified in the Amendment. [Learn more.](#)

Resilience

Tribal Coastal Resilience Connections

Using supplemental EPA 320 funds designated to work with underserved and under-represented communities on climate resilience, APNEP partnered with the NC Commission of Indian Affairs (NCCIA), NC State University (NC SU), and Virginia Coastal Policy Center to work with tribal communities in the Albemarle-Pamlico region. The goal of this initiative is to develop a strategy for incorporating resilience into tribal planning and community engagement processes. The Tribal Coastal Resilience Team has been successful in generating research on tribal engagement in climate and resilience planning efforts throughout the U.S., launching a social media campaign, conducting outreach at conferences and events, and creating partnerships and building the groundwork for a sustainable program. The second phase of the project was initiated in 2022. [Learn more.](#)

Using Natural and Nature-Based Features to Build Resilience to Storm-Driven Flooding

APNEP has participated on a Virginia Institute of Marine Sciences (VIMS)-led team on a NOAA-funded Coastal Resilience project which began in 2017. The project team developed a spatial analysis tool for Virginia local governments to identify opportunities and criteria for using Natural and Nature Based Features (NNBFs) that increase resilience to flooding and generate credits for local governments in water quality and hazard mitigation programs. The tool was released on ADAPTVA in 2021. APNEP has worked with the project team and other partners to evaluate the tool's applicability in NC coastal localities as a possible extension of the guidance to areas beyond coastal Virginia. APNEP developed a scope of work to assess NC locality needs, build a template tool comparison database, and develop outreach materials and resources that NC local government staff can use to compare tools and the types of NNBFs that can meet their needs. APNEP contracted with Wetlands Watch and anticipates completing this remaining phase of the project in 2022. [Learn more.](#)

NC Executive Order 80 Implementation

APNEP staff continue to participate in activities stemming from implementation of the 2020 NC Climate Risk and Resilience Plan, including the Natural and Working Lands Stakeholder Team, Coastal Habitats and Pocosin Wetlands Subcommittees, and the Coastal Resilience Community of Practice. APNEP's involvement in these efforts have led to identification needs for integrating resilience activities with existing programs and initiatives, including working closely with NC Division of Marine Fisheries staff to develop actions that complement the goals and objectives of both APNEP's CCMP and the NC CHPP. APNEP's facilitation of its SAV team and resulting mapping, monitoring, metric development, and economic valuation studies have all contributed significantly towards protection of SAV, which is included as a resilience strategy in the state plans. In addition, the Tribal Coastal Resilience Project (see above) stemmed from APNEP participation on various workgroups and committees. Staff continue to explore options to assist with implementation of the actions recommended in the NC Climate Risk and Resilience Plan. Staff are also working closely with other partners on resilience initiatives including the NNBF project for local governments described above, and other projects that will inform development of resilience strategies including Ecological

Flows and the Scuppernong Regional Water Management Study.

Water Level Monitoring Stations (non-320 funds)

APNEP supported placement of additional NC Flood Inundation Mapping and Alert Network (FIMAN) remote monitoring stations in Newport and Havelock through the NC Division of Emergency Management. Data from gauges located within the Albemarle-Pamlico watershed contribute to knowledge that can be used to address future water management actions in the watershed as well as increase real-time knowledge of water levels and flow conditions in the Albemarle-Pamlico region. [Learn more](#)

Engagement and Stewardship

Watershed Engagement Projects

In 2021, APNEP initiated a request for proposal (RFP) process that will be used to fund targeted outreach and engagement initiatives.

- **Engagement and Stewardship 2021 Request for Projects:** With input from its Engagement and Stewardship Action Team, APNEP released an RFP during summer 2021 and received 10 proposals. An independent review committee of environmental education and outreach professionals selected the following two projects through a competitive evaluation and ranking process:
 - ***Following the River: An Exploration of the Virginia Southern Watersheds/ Pasquotank River Basin:*** Lynhaven River Now (LRNow) will create a resource guide and lesson plans for educators in southeastern Virginia and northeastern North Carolina to increase knowledge about the unique history and natural resources of the region and connections of the shared waterways between the two states. The program will also consist of two unique, immersive teacher training experiences in the southern watersheds of Virginia Beach that flow into North Carolina's Pasquotank River Basin and the Albemarle Sound.
 - ***Shad in the Classroom:*** The Friends of North Carolina Museum of Natural Sciences was awarded funds to support the Museum in continuing their "Shad in the Classroom" program described above. The program engages students in hands-on learning about American Shad and North Carolina's River Basins. It is also designed to foster an appreciation and understanding of the natural world, as well as to inspire the next generation of biologists and conservationists. The program will train teachers to facilitate classroom learning about water quality, American Shad ecology, riverine and coastal ecosystems, and careers in science. The project will also consist of workshops for teachers and field experiences for students.

Partnership-Building and Regional Coordination

NC Aquatic Nuisance Species Management Plan Committee Coordination

APNEP staff continued working with the NC Aquatic Nuisance Species Management Plan Steering Committee to revise the Plan for federal approval, and afterwards identify next steps for Plan implementation. This state plan for coordinated management, research, and outreach of aquatic nuisance species, once finalized and federally approved, will make NC eligible for federal funding to support the plan's implementation. Improved coordination and collaboration across state agencies will leverage limited resources available for invasive species management in NC. [Learn more.](#)

North Carolina - Virginia Memorandum of Understanding (2020)

APNEP facilitated a renewed Memorandum of Understanding (MOU) between six environmental and natural resources agencies from North Carolina and Virginia. The MOU, released in September 2020, builds upon the MOU signed in 2017 and reaffirms the agencies' commitments to foster interstate collaboration within the shared waterways of the Albemarle-Pamlico region. The MOU required a report on coordination, data-sharing, and assessment of interstate initiatives by March 2021, which was circulated to the agency designees in summer 2021. The designees agreed upon climate resilience as an overarching theme for MOU implementation, with an initial focus on working together in the Chowan River Basin. A final recommendation regarding interstate joint-management strategies is pending coordination with the new Virginia administration. [Learn more.](#)

Currituck Sound Coalition

This initiative is being led by Audubon North Carolina and is a coalition of many of APNEP's partner organizations. The idea behind the formation of the coalition is to increase collaboration and coordination on nature-based strategies that provide multiple benefits – flood risk reduction, storm protection, improved water quality, habitat, recreational opportunities, cultural heritage, etc. – for communities and wildlife in and around the Currituck Sound watershed. Together the coalition can effectively inform planning, advance policy, and lead on-the-ground projects that demonstrate the capacity of nature-based solutions to address the most pressing coastal challenges in northeastern North Carolina. APNEP staff participate on the Coalition's Wetlands Working Group, which released a Marsh Conservation Plan in 2021. APNEP staff are working with Coalition members to develop strategies for outreach with Virginia partners and helped establish connections to Virginia partners for a meeting held August 2022. [Learn more.](#)

Scuppernon Regional Water Management Study

In partnership with Washington and Tyrell Counties, APNEP submitted a grant application to the NC Water Resources Development Grant fund on behalf of Washington County in Fall 2019 to conduct a hydrologic study of the headwaters of the Scuppernon River, Lake Phelps, Pocosin Lakes National Wildlife Refuge, and surrounding land. The grant was awarded to Washington County in Fall 2020, and a contract is currently being developed with the Albemarle Commission who will serve as the grant administrator. APNEP continues working with these local governments who have requested assistance with addressing flooding and

resilience planning. APNEP has been working to secure match commitments from project partners and identify potential technical partners that have the capacity to conduct the water budget and modeling work. The outcomes from the study will be utilized to build a more comprehensive, collaborative regional water management strategy for the northern Albemarle-Pamlico peninsula, which has been experiencing cycles of flooding and drought in an area that is highly vulnerable to sea level rise.

ACTIVITIES & PROJECTS 2021-2022

This year-end report provides an overview of the status of projects and activities under Cooperative Agreement CE-0D20614. Ongoing projects are those that began during or before the last fiscal year, and which APNEP expects to continue through the current fiscal year as well.

Diversity, Equity, and Inclusion

Objectives: Engage communities and stakeholders that are representative of the broader populations within our programmatic boundaries to implement the CCMP and the Partnership's mission.

Description: APNEP affirmed its diversity, equity, and inclusion statement in 2020, which included commitments to engage diverse communities and populations in the organization's decisions and diversify the perspectives represented within all of Partnership's management and citizen advisory groups. The commitment includes a requirement to report annually on actions taken to enact these commitments in our Annual Work Plan. [Learn more.](#)

Progress to Date:

- APNEP continues to partner with representatives from Tribal coastal plain communities, universities, and agencies through the Tribal Coastal Resilience Connections project described elsewhere. The project was initiated using supplemental funds from EPA designated for work with underserved communities on CCMP actions in NEP watersheds.
- STAC leadership in Spring 2021 formed an ad-hoc subcommittee to promote DEI opportunities within the science & technology community. A subcommittee representative briefed the greater STAC during their June 2021 meeting on a draft proposal outline to conduct an exploratory spatial analysis to investigate relations between indicators of human well-being and ecosystem health among disadvantaged communities within the APNEP Region.
- Staff continually seek opportunities to assist communities that lack the capacity and resources to deal with environmental issues, particularly in rural areas in eastern NC.
- Staff received numerous trainings on diversity and bias from NC-DEQ Human Resources.
- APNEP's Summer 2021 intern Abby McNaughton developed a document entitled *Recommendations for Incorporating Diversity, Equity, Inclusion, and Justice in APNEP Communications & Outreach*. She interviewed APNEP staff and partners including the NC Office of Environmental Education which assist with the NC-DEQ Diversity and Inclusion committee and conducted online research. Her recommendations included starting with social media and grants. She assisted with diversifying outreach and targeting new audiences for the 2021 Engagement & Stewardship RFP which was released during her tenure. APNEP staff have begun implementing other recommendations including updating website content and will be considering them during the 2022 CCMP revision. Staff will include the document in the next update to its Engagement Strategy.

Joint Graduate Fellowship in Estuarine Research

Objectives: To foster interest in research related to CCMP goals; obtain research that can be used to inform APNEP and regional partner efforts to protect and restore ecosystem processes.

Description: APNEP and the NC Sea Grant (NCSG) College Program have supported a Joint Graduate Fellowship since 2015 (first awarded project began in 2016). The fellowship provides funding for a graduate student based in NC to conduct applied research within the NC portion of the APNEP management boundary. Fellows must conduct research that addresses focus areas identified in the CCMP and the NCSG Strategic Plan. [Learn more.](#)

Progress to Date:

- **2019:** In January 2019, fellow Erin Voigt (NC State University) began studying how native and non-native invasive marsh species and wave exposure affect shoreline erosion and the availability of nursery habitat in Currituck, Albemarle, and Pamlico Sounds.
- **2020:** In January 2020, fellow Haley Plaas (UNC-Chapel Hill) began studying cyanobacteria toxins in the Chowan River and Albemarle Sound.
- **2021:** In January 2021, fellow Stacy Trackenberg (East Carolina University) began studying how restored seagrass beds in coastal North Carolina are functioning as habitat for faunal communities across varying depths.
- **2022:** In January 2022, fellow Joshua Himmelstein (UNC-Chapel Hill) began studying sediment delivery in North Carolina saltmarshes using low-cost, open-source sensors.

Coastal Plain Ecological Flows Evaluation: Pilot Project (Phase II)

Objectives: Complete data compilation, field studies, and analysis needed to address data gaps in the coastal plain to identify surface flows needed to protect the ecological integrity of biota in coastal streams. Develop recommendations for the NC Division of Water Resources to inform development of ecological flows for the coastal plain.

Description: APNEP has led an Ecological Flows Action Team since 2015 at the request of partners that participated in the NC Ecological Flows Science Advisory Board (EFSAB) to address data gaps and needs identified by members of EFSAB's Coastal Ecological Flows Working Group. The EFSAB was established in response to 2010 legislation directing the former NC Department of Environment and Natural Resources to develop hydrologic models for each river basin in North Carolina and determine the flows needed to maintain ecological integrity in surface waters. [Learn more.](#)

Progress to Date:

APNEP provided funds to team co-lead Dr. Mike O'Driscoll and colleagues at ECU to conduct the Phase I study, [Existing Data for Evaluating Coastal Plain Ecological Flows in the Albemarle-Pamlico Estuary Region](#), completed in 2018. The team met regularly throughout 2019-2020, focusing on addressing the recommendations in the Phase I report and developing a proposal for a Phase II Study to conduct pilot studies in selected watersheds and develop an evaluation process to inform development of ecological flows in the coastal plain. APNEP contracted with ECU to conduct work on the Phase II pilot study which began in spring 2021.

In 2021-2022, the ECU team conducted hydrological/water quality data collection along the Trent River, performed initial data analysis, and engaged with community stakeholders to help develop ecological

flow guidance for the Trent River system and evaluate approaches to facilitate applying this guidance to similar coastal watersheds in the Albemarle-Pamlico Estuary system. ECU met with the Ecological Flows Team to brief them on project progress and solicit input on sampling locations in July 2021 and April 2022. This project has been extended until March 2023.

Development of scientifically defensible chlorophyll-*a* standards for protection of SAV

Objectives:

- 1) Calibrate an empirical model relating Secchi disk depth to attenuation of photosynthetically active radiation (PAR);
- 2) Validate the Biber et al. (2008) bio-optical model for predicting PAR attenuation in both low and high salinity estuarine waters at locations throughout the estuarine system;
- 3) Use the validated bio-optical model or empirical relationships developed from Objective 2 to set thresholds for the maximum growing season average chlorophyll *a* that is protective of SAV habitats in low- and high-salinity zones; and
- 4) Combine diffuse attenuation coefficient and bathymetry data sets from sites throughout estuarine system to determine the potentially suitable habitat with respect to light under current chlorophyll-*a* levels and across a range of potential, future chlorophyll-*a* scenarios.

Description: To set SAV protection and restoration goals and make the connection to needed nutrient and sediment load reductions, quantitative linkages between chlorophyll-*a* concentrations and SAV light requirements are needed. This project will develop recommendations for scientifically defensible chlorophyll-*a* standards that are protective of SAV for high- and low-salinity zones of estuarine system through four objectives listed above.

Progress to Date:

The project was completed and the [final report](#) submitted March 2022. Information will help guide the decisions made through the NC Nutrient Criteria Development Plan and the NC Coastal Habitat Protection Plan.

Calibration of a bio-optical model for low-salinity SAV

Objectives:

1. In collaboration with NC-DWR and the University of North Carolina Institute of Marine Sciences (UNC IMS), collect necessary paired chlorophyll-*a*, colored dissolved organic matter (CDOM), and PAR data from select NC Ambient Monitoring System (AMS) stations in Chowan River, Albemarle Sound, Pamlico River, and Neuse River.
2. Calibrate a bio-optical model for low-salinity SAV in APES using the data from Objective 1.
3. Develop scientifically defensible chlorophyll-*a* standards for protection of low-salinity SAV.

Description: To set SAV protection and restoration goals for estuarine system and make the connection to needed nutrient and sediment load reductions, quantitative linkages between chlorophyll-*a* concentrations and SAV light requirements are needed. APNEP previously contracted with the UNC IMS to conduct this analysis for both high- and low-salinity SAV. While the bio-optical model performed well for APES high-salinity waters where it was originally developed, further calibration is needed to utilize the model for low-salinity SAV. Extensive compilation and review of available water quality data revealed limited measurements of the critical parameters CDOM and PAR in low-salinity waters that are necessary for further calibration of the bio-optical model. This project will collect these data, calibrate

the model, and develop recommendations for scientifically defensible chlorophyll-*a* standards that are protective of SAV for low-salinity zones. These findings, in association with the findings for high-salinity SAV, will help guide the development of water quality management strategies for the protection of SAV, particularly through the CHPP and NCDP.

Progress to Date:

APNEP met several times with NC-DWR and Dr. Nathan Hall of UNC IMS regarding collaboration on this project, developing a workplan, and formalizing the roles and responsibilities of APNEP, NC-DWR, and UNC IMS relative to specific tasks needed to complete the project. In May 2021, data collection began.

Fill Data Gaps on Optical Water Quality Constituents in Currituck Sound

Objectives:

1. Post-calibrate continuously monitored CDOM and chlorophyll *a* fluorescence dataset collected by the US Army Corps of Engineers Field Research Facility (USACE-FRF) and East Carolina University Coastal Studies Institute (ECU-CSI) to produce a high temporal resolution and spatially expansive dataset of the optically active constituents in the appropriate units necessary for modeling K_{dPAR} in Currituck Sound.
2. Measure the absorbance and scattering spectra of the dissolved and particulate fractions of Currituck Sound waters to contribute data for recalibration of the bio-optical model for low-salinity SAV habitats.
3. Integrate results into ongoing work to recalibrate a bio-optical model to establish chlorophyll-*a* and turbidity thresholds for the protection of low-salinity SAV habitats. Data products from accomplishment of objectives 1 and 2 will be utilized for the ongoing project funded by APNEP to recalibrate the bio-optical model and develop scientifically defensible thresholds for chlorophyll *a* and turbidity for low-salinity SAV habitats throughout APES.

Description: Currituck Sound historically hosted expansive low-salinity SAV that provided critical habitats for fish and forage for migratory waterfowl. Since the 1960's, reductions in water clarity deterioration due to non-point source nutrient and sediment pollution have caused significant declines in SAV coverage but the remaining SAV of Currituck Sound still constitute an important fraction of North Carolina's low-salinity SAV habitats. Understanding the causes of light attenuation for SAV in Currituck Sound is important for developing strategies to restore SAV coverage but this goal is hampered by a general lack of useable data on the optical water quality constituents that drive light attenuation. Additionally, the bio-optical model that is being used to develop water quality thresholds for protecting SAV within APES does not currently perform well in low-salinity SAV waters like Currituck Sound and requires recalibration for low-salinity estuarine waters (see previous project). The USACE-FRF in Duck, NC and the ECU-CSI deployed continuous monitoring instrumentation to produce an extensive dataset of these water quality parameters with turbidity as NTU but both CDOM and chlorophyll *a* were measured in arbitrary fluorescent units (AFU) and are currently unusable for quantifying light attenuation and defining thresholds for protecting SAV. USACE-FRF collected high temporal resolution (15-minute), turbidity (NTU), CDOM (AFU), chlorophyll *a* (AFU), and diffuse attenuation of photosynthetically active radiation (K_{dPAR}) datasets at five research platforms in Currituck Sound from 2016 to 2018. Additionally, from 2018 to 2019, ECU-CSI and USACE-FRF partnered to deploy two instrumented benthic landers that measured these parameters in the same units.

Progress to Date: This project began in May 2022. A final report in conjunction with the previous project is expected in December 2022.

NC Aquatic Nuisance Species Management Plan Development

Objectives: To update a strategic plan for coordinated management, research, and outreach on aquatic nuisance species in NC; to garner renewed commitment from lead state agencies for the plan's implementation; to submit the plan to the NC Governor's Office for consideration; to acquire approval from the federal Aquatic Nuisance Species Task Force.

Description: The NC Aquatic Nuisance Species Management Plan (NC-ANSMP) is a collaborative, multiagency plan to improve the state's ability to address aquatic invasive/nuisance species issues. Although the original plan was adopted in 2015 by the state's three lead regulatory agencies on invasive species, there has been no implementation to date. Furthermore, NC never submitted the plan for federal approval to become eligible for external funding under the Aquatic Nuisance Species Prevention and Control Act (1990). Given the state's limited resources directed towards invasive species management, federal funding is critical to successful implementation of the NC-ANSMP. In support of the CCMP, APNEP staff and NC-DWR staff are co-leading a revision process of the NC-ANSMP by the plan's Steering Committee with the end goals of renewing commitments for collaboration from state agencies and making NC eligible to receive federal funding for invasive species management.

Progress to Date:

APNEP staff provided feedback on the original NC-ANSMP adopted in 2015 and have been co-facilitating, along with NCDWR, an update of the Plan through the NC-ANSMP Steering Committee in 2018-2022.

NC Coastal Habitat Protection Plan Implementation Support

Objectives: To coordinate across NC state agencies to improve conservation and restoration of coastal habitats, and to raise awareness about the importance of these habitats for NC fisheries.

Description: The NC Coastal Habitat Protection Plan (CHPP), adopted by the Coastal Resources, Environmental Management, and Marine Fisheries Commissions, has seen routine development since its implementation began in 2004. The CHPP has assisted in creating an opportunity for agencies and commissions within NC-DEQ to work together on issues specific to fish habitat. While differences in scope, geography and mission exist, implementation of the CCMP and the CHPP are complimentary and APNEP staff ensure that both plans are implemented in a coordinated and integrated fashion. By statute, the CHPP must be reviewed and updated if needed every five years. The CHPP was last revised in 2016 and adopted by all three management commissions. An amendment to the 2016 CHPP began in 2020 and was adopted by the three commissions in November 2021.

Progress to Date:

- APNEP's projects and initiatives related to SAV monitoring and assessment are strongly tied to CHPP implementation. See SAV Monitoring and Assessment project description for more information.
- APNEP staff participate in efforts and initiatives to support CHPP implementation including the NC Oyster Blueprint and the Living Shorelines Action Team. Past APNEP efforts in support of CHPP implementation have included:
 - Funding economic studies that have assisted in generating financial support from the NC General Assembly

- Long-term efforts to facilitate the use and construction of living shorelines including education and outreach initiatives which have led to streamlined permitting processes and increased demand.
- APNEP staff were involved in the development of the 2021 CHPP Amendment, Issue Papers, and workshops throughout 2020-2021. The draft CHPP update was released for agency and public review in the summer of 2021 and was adopted by the three commissions in late November of 2021.
- APNEP staff were involved in a series of webinars to create public outreach for the CHPP Update and to receive public comment on the amendment in 2021. APNEP also assisted with social media outreach to raise awareness about the CHPP and solicit public comment.
- To support CHPP implementation, the amendment includes a recommendation that a public-private partnership be formed with NC-DEQ and several non-governmental organizations. This partnership would be able to seek out additional funding sources that NC-DEQ and APNEP are currently unable to pursue as public entities, as well as explore and prioritize non-regulatory approaches towards implementing recommendations identified in the Amendment.

APNEP Action and Monitoring/Assessment Teams Facilitation

Objectives: Facilitate interagency and inter-organization communication related to priority issues in the Albemarle-Pamlico region, improve cooperation and develop collaborative initiatives that accomplish shared goals and development of APNEP’s monitoring plans and assessment deliverables.

Description: APNEP’s initiatives are guided by input from a diverse group of regional partners and stakeholders. Action Teams have been created to address the management strategies elucidated in APNEP’s CCMP. Each Action Team works toward implementation of several closely aligned management actions in various environmental disciplines. Members include representatives from state, local, and federal government, nonprofits, and universities. In 2017, APNEP re-convened seven Monitoring and Assessment Teams (MATs) to assist in developing (1) integrated monitoring plans that collectively describe priorities among scientists, managers, policy makers, and citizens on how ecological monitoring should be targeted to best support APNEP indicator tracking of CCMP ecosystem outcomes, and (2) assessment deliverables in the form of metric reports, indicator reports, and ecosystem assessments; based on the higher-quality monitoring data available and targeted to technically-inclined stakeholders.

Building Climate Resilience Capacity in Tribal Communities

Objectives: Support tribal communities in the Albemarle-Pamlico region with considering climate risk and resilience into tribal planning and community engagement processes.

Description: APNEP utilized supplemental Section 320 funding from the EPA and worked with representatives from tribal communities in the Albemarle-Pamlico region and the coastal plain of Virginia and NC to develop a strategy for incorporating resilience into tribal planning and community engagement processes. The proposal seeks to build capacity for tribal communities to actively engage in federal, state, regional, and local planning efforts that impact Indigenous people, recognizing considerations and perspectives that are unique to tribal communities.

Progress to Date: Through extensive coordination with tribal representatives, community leaders, and organizations including the NC Office of Recovery and Resilience, APNEP developed a project proposal which was approved by the Leadership Council in fall 2019 and the NC Commission of Indian Affairs in

March 2020. APNEP contracted with the NCCIA and NCSU in spring 2020. Both partners were granted an extension in March 2021 through September 2021 due to COVID and lack of ability to conduct planned in-person engagement including workshops, Pow-wows, and community events.

Phase I included research on tribal climate adaptation plans, online experimentations with tribal engagement, field work, partnership and network development, and continued discussions on tribal engagement issues in Virginia and NC. The TCRC team continued its social media (#WaterStory) campaign launched 2020 on Indigenous People's Day to share information about climate science, and resilience and adaptation planning. This platform provided a way during Covid to engage virtually about climate issues of concern to Tribal communities, collect stories about Indigenous connections to the land and waterways of the coastal plain in Virginia and NC, and share resilience and adaptation work being conducted by Tribes. Team members conducted outreach through presentations and panels at around fifteen events. In addition to engaging with Tribal communities about climate resilience, the team is using success stories from coastal tribal communities in and adjacent to the Albemarle-Pamlico region as well as those throughout Turtle Island to build awareness around what is working well and could be. A final report is being finalized by the team.

Phase II will narrow the scope and focus on engagement with Tribal communities in the shared waterways of the Albemarle-Pamlico region between Virginia and North Carolina (also supporting implementation of APNEP's MOU), building upon a Climate Risk Analysis conducted by the Climate Service for the NCCIA in Phase I with the Nottoway Indian Tribe of Virginia and Meherrin Indian Nation. It will expand tools identified in Phase 1 (Terrastories, GIS Storymapping, and WAMPUM) and utilize geospatial mapping platforms to collect water stories and present climate threats and vulnerabilities identified by Tribal communities in this region. The team will utilize these efforts to build towards creating a Tribal Coastal Resilience toolbox, create interactive skill building workshops, and develop interactive maps to assist with future resilience planning. The information will also provide a platform that can be utilized to educate agency staff on considerations, perspectives, and traditional ecological knowledge unique to native communities.

APNEP participates as a team member and assists with the Facebook page, Tribal Coastal Resilience Connections, that was launched fall 2020. APNEP organized and facilitated a panel discussion highlighting the team's work at the May 2021 Carolinas Climate Resilience Conference. Staff are working to ensure tribes are included in regional resilience planning efforts and will ensure that recommendations from the project are incorporated into reports and workplans that result from the Virginia/NC MOU.

Event Participation and Sponsorships

Objectives: To support regional partners in reaching shared goals, to leverage resources and transfer knowledge/skills within the Albemarle-Pamlico region.

Description: APNEP supports regional outreach, networking, and knowledge/skill transfer events via sponsorship. Sponsorship funding generally falls between \$500-\$2500 and helps to leverage resources to reach shared goals and promote partnership opportunities. APNEP may participate in sponsored or non-sponsored events via tabling, environmental education activities, or logistical support.

Progress to Date:

- 2022 Celebrating Sound Waterways Event (hosted by the Chowan Edenton Environmental Group): APNEP was invited to participate in this event raising awareness about water quality and ecosystem health in the waterways that flow into Albemarle Sound. Staff gave a presentation and hosted a booth. The event was held during Estuaries Week.
- 2022 I Heart Estuaries (social media, February)
- 2022 National Estuary Week (social media, September)
- 2021 CHPP webinars
- APNEP served as a sponsor for the May 2021 Carolinas Climate Resilience Conference, and organized and facilitated a panel with the Tribal Coastal Resilience Team.
- Staff participated in the 2022 Envirothon
- APNEP staff served as a sponsor for the 2022 WRRRI conference and hosted a booth. Staff also assisted with judging the student poster competition. Several partners gave talks on APNEP sponsored initiatives including:
 - Sara Sutherland, Duke University, The Economic Value of SAV
 - Nathan Hall, UNC-Chapel Hill, Development of Water Quality Thresholds for Protection of SAV in APES
 - Robert Christian, East Carolina (Emeritus), Transdisciplinary Approach to Understanding Low Flows and Their Consequences in a Coastal Plain River
 - Jaclyn Best, East Carolina University, Engaging with Stakeholders to Determine Ecological Flow Guidelines in Eastern NC

Communications and Engagement

Objectives: Increase awareness of and access to APNEP and partner resources, increase knowledge and understanding of Albemarle-Pamlico region issues and promote environmental stewardship behaviors. Develop targeted communications strategies and materials for specific initiatives such as SAV and incorporating DEI in social media.

Description: APNEP produces a wide variety of communications materials to improve the Partnership's ability to reach different audiences, including its partner organizations, local government, the public, and scientists and researchers. APNEP accomplishes this through print and digital materials, including its website, social media platforms, blog, e-newsletter, and printed fact sheets and brochures.

Progress to Date:

In FY2018-2020 APNEP staff developed a new long-term Engagement Strategy for the Partnership, which presents a detailed vision for how APNEP plans to conduct its communications and outreach efforts going forward. Overall capacity for these efforts has been reduced with the return of the Communications and Outreach Specialist to graduate school in 2020 and lack of a full-time person in the position.

- In March 2019 APNEP launched a new website with an updated look, feel and content. The website was updated again in early 2021 to adjust to software changes. This new website is mobile-friendly and designed to meet accessibility standards.
- Print communications materials were updated in 2020; printing has been on hold due to restrictions on in-person events due to COVID.
- A targeted communications strategy for SAV was developed in 2020-2021.

- In August 2022, APNEP published an updated map of the extent and density of submerged aquatic vegetation (SAV) in North Carolina’s sounds during 2020. Mapping SAV in the Albemarle-Pamlico estuary was done through a combination of aerial flights and ground truthing with boat-based surveys.
- In February 2021, a high-salinity SAV extent metric report was released.
- In 2021, a GIS Storymap was published to help communicate the results of the metric report and mapping efforts to the public and decision makers.
- Summer intern Abby McNaughton created infographics (one for the public, one for local governments) and a webpage to assist with communications regarding the SAV economic valuation report released in 2021.
- APNEP has hosted a Science Communications and Outreach intern through the Department of Administration State of NC Internship since 2018. Past interns have developed storymaps, GIS-based project maps for our website, analysis of communication and outreach strategies for aquatic invasive and nuisance species, strategies for SAV, and recommendations for Diversity, Equity, Justice, and Inclusion into the Partnership’s outreach activities.

Continuation of Long-Term Watershed Engagement Projects

APNEP continued long-term support and funding for education and engagement projects “Shad in the Classroom” and the “Summer Teacher Institute” through summer 2021 and initiated a new open request for proposal (RFP) process to fund targeted outreach and engagement initiatives in 2022. These long-term projects are described below with closeout information noting that both projects demonstrating that funds will be discontinued and posted to the new RFP process. Since Shad in the Classroom was chosen again under the new process the detail is included in the 2021 section, along with specific plans for FY22-23 under the new RFP.

Engagement and Stewardship 2021 Request for Proposals

With input from its Engagement and Stewardship Action Team, APNEP released an RFP during summer 2021 and received 10 proposals. An independent review committee of environmental education and outreach professionals selected the following two projects through a competitive evaluation and ranking process: Following the River: An Exploration of the Virginia Southern Watersheds/Pasquotank River Basin and Shad in the Classroom. These projects were awarded and initiated in 2022.

Following the River: An Exploration of the Virginia Southern Watersheds/ Pasquotank River Basin (Year I)

Objectives: Engaging teachers in the Virginia Southern Watershed to incorporate APES- specific curriculum into annual student lesson plans.

Description: Lynhaven River Now (LRNow) will create a resource guide and lesson plans for educators in southeastern Virginia and northeastern NC to increase knowledge about the unique history and natural resources of the region and connections of the shared waterways between the two states. There is a lack of resources geared towards the “Southern Watersheds” in Virginia Beach and the Pasquotank River Basin in NC, and Virginia educators are often unaware that their waterways drain into Albemarle Sound and not the Chesapeake Bay. The project will increase knowledge of the connections to APES and the shared waterways between the two states. The

program will also consist of two unique, immersive teacher training experiences in the southern watersheds of Virginia Beach that flow into NC's Pasquotank River Basin and the Albemarle Sound.

The first training will take a cohort of five 9-12th grade teachers on a five- to six-day (dependent on weather and tides) sail throughout the entire watershed to learn all about the habitats, history, economics, land use, and problems that this watershed faces. As they follow the river, teachers will become more familiar with the rich resources that are in NC and form relationships that might lead to Zoom talks, internships, and data collection projects for the students.

The second training will be a two-day workshop for five more 9th-12th grade teachers to learn about the history and natural history of the North Landing River and Back Bay sub-watersheds. This group of teachers will be learning about the unique habitats found in this region—the North Landing River is considered to be the most biodiverse area in Virginia east of the Blue Ridge Mountains.

After the trainings, both groups will join at False Cape State Park and Back Bay NWR to create a resource guide and lesson plans for Virginia and NC educators on the Virginia Southern Watersheds/Pasquotank River Basin.

The goal is to create materials about the upper part of the watershed in Virginia that would be available online for both NC and Virginia Beach teachers. The team also hopes to expand the NC Pasquotank River Basin booklet to include maps and information about the Virginia portion of this river basin.

Progress to Date:

Lynhaven River Now has recruited teachers, scheduled trips, and developed itineraries for both training experiences. Working through APNEP staff and partners, they have established a network in NC and will be stopping to meet with experts and visit sites such as museums, nature areas, and historic sites along the way. A pre-sail workshop was held April 2022 for teachers to learn about the boat, basics of sailing and an overview of the watershed. APNEP staff and partners participated. Final report is pending.

Shad in the Classroom (Year I) 2022

Objectives: Engage students in hands-on learning about American Shad and Albemarle-Pamlico region river basins, foster environmental stewardship and understanding of watershed connections, contribute to the restoration of American Shad within the Neuse River Basin, and inspire a new generation of biologists and ecologists.

Description: The Shad in the Classroom project provides teachers with the training, resources, and support to raise American shad from eggs to fry in their classrooms, and then release fry into the Neuse basin waters. In doing this, students can learn about water quality issues, watershed connections, and aquatic ecosystems through hands-on activities and outdoor education. Teachers are also able to utilize extension activities facilitated by the Shad in the Classroom program, including fish dissections, gyotaku (fish printing), and other lesson plans. Raising and releasing shad contributes to the U.S. Fish and Wildlife Service's and NC Wildlife Resource Commission's goals for restoring American shad populations in these river basins. The

collaborative project provides students with an understanding of the scientific process, an inspiration for careers in science, and a desire to protect our waterways. Final report is pending.

Virginia-North Carolina Memorandum of Understanding Implementation

Objectives: Facilitate and strengthen partnerships between NC and Virginia state agencies and other partners; identify shared goals for Albemarle-Pamlico region watersheds and contribute to projects that work towards those goals.

Description: Facilitated by APNEP, six environmental and natural resources agencies from NC and Virginia signed a MOU in 2020 that re-affirmed their commitment to foster interstate collaboration within the shared waterways of the Albemarle-Pamlico region. The agreement builds upon the MOU signed in 2017 and will assist agencies in coordinating with APNEP to tackle regional issues such as climate resilience, nonpoint source pollution, restoring fish passage and spawning habitat, and controlling invasive species. Agencies included: NC-DEQ, North Carolina Department of Natural and Cultural Resources, North Carolina Department of Agriculture and Consumer Services, North Carolina Wildlife Resources Commission, Secretary of Natural Resources of the Commonwealth of Virginia, and the Secretary of Agriculture and Forestry of the Commonwealth of Virginia.

Progress to Date:

Designees from both states have been meeting regularly since the 2020 MOU was signed. Staff from APNEP and the Virginia Department of Conservation and Recreation, Natural Heritage Division were designated to lead coordination and facilitation of MOU implementation, with assistance from the Virginia Deputy Secretary of Natural Resources. The MOU requires a report on coordination, data-sharing, and assessment of interstate initiatives by March 2021, which was circulated to the agency designees in summer 2021. The designees agreed upon climate resilience as an overarching theme for MOU implementation, with an initial focus on working together in the Chowan River Basin.

Progress was made on a Governor-level agreement to elevate the status and recognition of the importance of the Albemarle-Pamlico ecosystem both regionally and nationally. A draft agreement was developed by the designees and sent for review by the Governor's offices in both states. The Governor's agreement will elevate the commitment between Virginia and North Carolina to collaborate in the shared waterways of the Albemarle-Pamlico estuarine system.

Progress on the Governor's agreement and MOU implementation has stalled pending changes in agency leadership with the incoming Virginia administration. Staff have developed a transition document to brief the new agency heads once they have all been appointed. A final recommendation regarding interstate joint-management strategies will be delivered to the signatories in 2022.

As part of this commitment, APNEP and partners have been working actively to revitalize our efforts in Virginia, with additional efforts in the following areas:

- Participation in the USCA Coastal Habitat Project, Currituck Sound Coalition, and VIMS NNBF Coastal Resilience project discussed elsewhere.
- **Coordination with Congresswoman Luria:** APNEP has been participating in an Albemarle-Pamlico Roundtable hosted by Virginia Representative Luria since March 2021 to foster federal

support and resources for the shared waterways. The Roundtable primarily includes members of Virginia based organizations including Back Bay Restoration Foundation, Wetlands Watch, the Virginia Chapter of The Nature Conservancy, and Lynhaven River Now but also includes other Congressional members and staff from the APNEP region including Representatives Murphy and McEachin. Other participating agencies and organizations include Back Bay and Dismal Swamp National Wildlife Refuges, Virginia Cooperative Extension, USACE. Staff have worked to connect other regional partners to the roundtable including NC Wildlife Refuge staff, Audubon, and others.

- **Grant Coordination:** APNEP was invited to collaborate on a NFWF proposal with VIMS and Virginia Dept of Wildlife Resources. Staff continue to seek opportunities to collaborate with regional partners to submit grants that further MOU implementation and write support letters when requested.

Integrated Monitoring Plan & Ecosystem Indicator Development

Objectives: Facilitate the development and implementation of an integrated monitoring network (ecosystem observatory) through the guidance of regional monitoring and assessment teams, assess the value of information for measuring ecosystem and CCMP implementation outcomes.

Description: APNEP continues to facilitate the establishment of an integrated monitoring plan to detect, measure, and track changes in the ecosystem. Much preparatory work has already been conducted by the APNEP Monitoring and Assessment teams (MATs), and these teams' contributions will be essential to complete the Plan. Upon completion, the Plan will provide resource managers and other partners with cost and information quality alternatives that will facilitate the selection of a set of monitoring protocols for monitoring plan implementation.

Progress to Date:

By the start of 2019, each MAT had identified a prioritized list of indicators and metrics. APNEP staff synthesized the priorities of each Team to create an overall list of "high priority/Tier 1" indicators and metrics to monitor in the region. With the input of APNEP's STAC, staff and SAV Team monitoring leaders developed a proof-of-concept Integrated Monitoring Plan whose initial scope focused on coastal SAV and estuarine water quality that impacts coastal SAV. The plan was accepted by the Leadership Council in March 2021. During the current evaluation period, other MATs are using the SAV monitoring plan as a model to develop monitoring plans for their ecosystem component, with the highest priority of staff in 2022 being a monitoring plan for estuarine waters.

Recreational Water Quality Monitoring

Objectives: Monitor and test bacterial concentrations in coastal recreational waters, inform the public about any dangers to public health.

Description: APNEP continues to provide bridge funding to the NC-DMF Recreational Water Quality Monitoring Program for the continuation of water quality monitoring near recreational areas. The program tests bacterial concentrations in coastal recreational waters to protect public health. The program is responsible for notifying the public when bacteriological standards for safe bodily contact have been exceeded. The program also has an educational component that accompanies the testing, which informs the public about how bacteria enter coastal waters and what actions can help prevent it.

Progress to Date:

This is a continuation of 26 APNEP swimming sites will be sampled 19 times throughout the year totaling 494 samples with bacteriological results posted immediately to the NC Recreational Water Quality website.

Three APNEP sites will be sampled 31 times throughout the year totaling 93 samples with bacteriological results posted immediately to the website.

To date a total of 3,579 samples have been analyzed in order to inform the citizens of North Carolina about the *Enterococci* levels throughout the Albemarle Pamlico Watershed.

Coastal Submerged Aquatic Vegetation Monitoring and Mapping

Objectives: Monitor and map the extent, spatial cover class, and percent cover of coastal SAV in the Albemarle-Pamlico region.

Description: In coastal waters of the APNEP region, SAV is widely recognized as serving many important ecological functions. Other than APNEP's efforts, there are no long-term SAV monitoring programs established in the region that can provide reliable quantitative data on the status and trends of this resource. Thus, APNEP continues to lead and support coastal SAV monitoring via various platforms, including remote sensing and boat-based protocols.

Progress to Date:

Since 2004, APNEP has participated in and often led the facilitation of a statewide SAV partnership that has collaborated to achieve the long-term goal of determining the location of the region's SAV and trends in overall extent and spatial cover classes. Monitoring coastal SAV is important because among other benefits it can serve as an indicator of estuarine habitat condition. The Partnership has taken steps towards assessing the extent of underwater grasses. APNEP's SAV Team published a baseline SAV map in 2011 using data from aerial surveys from 2006 through 2007, as well as a second map based on high-salinity SAV survey data in 2013 and published in 2019. APNEP plans to produce by spring 2022 a high-salinity SAV map based on 2019-2020 aerial surveys, a substantial decrease in process time between data acquisition and map publication.

To address challenges in tracking "hidden" SAV in turbid lower-salinity waters and to detect significant trends more quickly (including changes in species composition), APNEP began coordinating a SAV Sentinel Network in 2014. The sentinel network combines boat-based sonar and video technology with in-water observations to track SAV at stations dispersed throughout the sounds. The boat-based protocols were tested on Albemarle Sound in 2014 and the first installment of sentinel stations occurred there in 2015. Subsequent stations have been established throughout the Pamlico River and Neuse River Estuaries. A final report on low-salinity sentinel site monitoring in Albemarle Sound and Neuse River Estuary (associated with National Fish & Wildlife Federation funding) was submitted in March 2020.

A significant milestone was achieved in 2021 with the completion of an APNEP SAV monitoring plan, which supports beginning in Spring 2021 (1) the acquisition of four boat-based metrics to complement the traditional metric "extent by spatial cover class": maximum depth distribution, species presence, relative abundance, macroalgae presence and absence; (2) conducting annual surveys on a portion of

the region (sub-region) rather than surveying the entire region every five-to-seven years; (3) bi-seasonal (spring and fall) surveys for high-salinity SAV; (4) single-season (summer) surveys for low-salinity SAV.

Milestones:

- Update the spring 2021 APNEP high-salinity SAV metric report, incorporating the 2019-2020 SAV high-salinity extent by cover class map. APNEP and its partners will use this information to develop protection and restoration strategies for SAV and fish species in the region and support the CHPP update.
- Planned enhancement of the SAV monitoring plan based on knowledge gained during the 2021 and 2022 field seasons.
- Building on the SAV monitoring plan, establish an expanded survey effort in low-salinity waters.
- Building on the SAV monitoring plan and 2021 survey/mapping of Bogue and Back Sounds, bi-seasonal survey of Core Sound sub-region in 2022.

Supplemental Projects (Non-320 Funds)

Using Natural and Nature-Based Features to Build Resilience to Storm-Driven Flooding Project

Objectives: Work with the Virginia Institute of Marine Sciences (VIMS) project team and partners to evaluate the applicability of tools for assisting coastal local governments and planners in determining suitable areas for natural and NNBFs within NC.

Description: APNEP is a partner with VIMS, Wetlands Watch, and the Virginia Coastal Policy Center on this NOAA-funded Coastal Resilience project. The project team has developed a spatial analysis tool that will be shared with Virginia local governments to identify opportunities and criteria for using NNBFs that increase resilience to flooding and generate credits for local governments in resource management and hazard mitigation programs. APNEP is working with the project team and other partners to evaluate applicability of the tool in NC coastal localities to plan for possible extension of the guidance developed in this project to areas beyond coastal Virginia.

Progress to Date:

In 2021, the project team completed the analysis and map viewer which is available on [ADAPTVA](#). The project team conducted outreach with Virginia localities throughout 2021. APNEP staff conducted virtual meetings and other outreach opportunities to solicit feedback from NC agency personnel and other partners throughout 2020-21 and participated in outreach events led by the project team. APNEP contracted with Wetlands Watch in to compare the Virginia based tool with those that exist in North Carolina. They are also conducting a needs assessment and outlining resources that North Carolina local government staff can use to compare tools and the types of NNBFs that can meet their needs (which also helps further implementation of actions in the NC Risk and Resilience Plan and Natural and Working Lands Plan related to developing interstate toolboxes and resources for local government). Outreach with NC partners for this portion of the project began summer 2021 is expected to be completed late 2022. The scope of this effort is generally focused on our shared waterways with Virginia, and results will be included in future reporting done for the MOU and to NC-DEQ and NCORR regarding E080 implementation. APNEP is participating on a statewide Resilience Toolbox Committee and will be providing the results of the project to the group for consideration. Deliverables from the project also

include fact sheets on CHPP habitats. After lengthy contracting delays, Wetlands Watch was not able to proceed with the project until summer/fall 2022.

Water Level Monitoring Stations

Objectives: Placing additional water-level monitoring stations within APES.

Description: Each station is equipped with meteorological monitoring equipment and maintained by NC Emergency Management's Flood Inundation Mapping and Alert Network (FIMAN). The data derived from the project will be used to address future water management actions across the watershed and will inform local governments, citizens, and low-lying communities who are subject strong storm surges in how to plan for future events. Since sea-level rise will influence these impacts, as well as saltwater intrusion into freshwater streams, the gauges will allow for maximum safety of citizens and protection of natural resources.

Progress to Date:

In 2021, APNEP contracted with NC Department of Emergency Management to install additional water-level monitoring stations in the Albemarle-Pamlico region's coastal plain in Newport, Carteret County, Slocum Creek near Havelock, Craven County. Data from gauges located within the Albemarle-Pamlico watershed increases real-time knowledge of flood conditions in the Albemarle-Pamlico region, as well as contributing to knowledge that can be used to address future water management actions in the watershed. [Learn more.](#)

Staff anticipates that this program will be addressed in the upcoming APNEP monitoring plan for estuarine waters.

2022 SAV Aerial Images and Analysis

Objective: Map North Carolina's coastal SAV using aerial imagery.

Description: NC-DEQ provided APNEP with funds to support acquisition of new aerial images and conduct analysis of the data collected and to reassess previous data interpretations. APNEP under cooperative agreement with NC Department of Transportation acquired aerial imagery of submerged aquatic vegetation. The NC-DMF will provide the photo interpretation and ground truthing necessary to analyze the photographic data.

Progress to Date:

Unfortunately, the 2019 images were impacted by poor water clarity in several areas and thus images were acquired in spring 2020 using APNEP's existing SAV mapping efforts and funds. NC-DMF was able to analyze some data and has been working to address issues with earlier images and habitat mapping efforts. An additional \$80,000 in APNEP (320 Grant Funds) were added to the contract to capture spring and fall 2020 imagery.

2021 SAV Aerial Images and Analysis

Objective: Map North Carolina's coastal SAV using aerial imagery.

Description: In 2020, NC-DEQ provided APNEP with funds to support acquisition of new aerial images and conduct analysis of the data collected and to reassess previous data interpretations. APNEP under

cooperative agreement with NC Department of Transportation acquired aerial imagery submerged aquatic vegetation. APNEP and NC-DMF will provide the photo interpretation.

Progress to Date:

Images were acquired in spring and fall 2020 under APNEP’s existing SAV mapping efforts and funds. NC-DMF was able to analyze some data, but APNEP contracted additional expertise to finish the interpretation required. The 2020 SAV mapping layer is expected to be published in May 2022. Aerial photographs and interpretation continued through the 2022 field season, with photos taken in both spring and fall seasons.

Scuppernong Regional Water Management Study

Objectives: Develop a collaborative approach for conducting a hydrologic study of the headwaters of the Scuppernong River, Lake Phelps, and the surrounding land in Washington and Tyrell Counties. The outcomes from the study will be utilized to build a more comprehensive approach to regional water management to create a water budget for the northern Albemarle-Pamlico peninsula.

Description: The NC Division of State Parks requested assistance from APNEP (formally in April 2018 via the Leadership Council) to serve as a neutral, science-based partner and convene a steering committee to develop an approach for a regional hydrologic study. The study’s purpose is to determine a regional water budget that can serve as a decision support tool to guide future potential water management implementation actions in collaboration with stakeholders including conservation land managers, local governments, other state and federal agencies, and private landowners. The need for the study was prompted by cycles of flooding and drought, as well as concerns from local communities regarding NC Division of State Parks and USFWS water management and hydrologic restoration activities on lands they manage in the region. The study will also consider impacts from climate variability and sea level rise in an area that is extremely vulnerable to flooding. This study will provide for more water monitoring in the watershed, update existing water management plans, and inform future water management strategies, including improving regional drainage efficiency and building regional resilience.

Progress to Date

In partnership with Washington and Tyrell Counties, APNEP submitted a grant application to the NC Water Resources Development Fund on behalf of Washington County in Fall 2019 and received notification of a grant award in Fall 2020. A contract is currently being developed with the Albemarle Commission who will serve as the grant administrator. APNEP continues to work with these local governments who have requested assistance with technical and grant administrative capacity to address flooding and resilience planning. APNEP has developed a Memorandum of Agreement to outline its roles and responsibilities as a project partner and has been working to secure match commitments from project partners and identify potential technical that have the capacity to conduct the water budget and modeling work.

ADMINISTRATION & PROGRAM IMPLEMENTATION

Administrative Costs

Overall administration costs under the federal grant during FY2021-22 are estimated at approximately \$585,955 and include six staff FTE salaries, interns, benefits, longevity pay, equipment, supplies, office and office and storage space rent, IT services and phone, and training and development. APNEP maintain two boats. Operational costs and maintenance are covered under projects where the vessel is used. Maintenance costs are associated with supplies. Temporary employees added for contract or specific project support will be paid under the budgeted amount for the project.

Indirect Costs

Under the FY2021-22 *Negotiated Indirect Cost Agreement* between NC-DEQ and EPA, indirect rate is 10.2% of all salaries supported by this federal grant (May 2021). Estimated indirect costs will be \$41,045 based on the indirect rate for grant-supported salaries.

Personnel*

Presently, a majority of APNEP staff are housed at the APNEP office in Raleigh within the NC-DEQ Headquarters. This site houses the Director, Program Manager, Program Scientist, , Policy and Engagement Manager, and Quantitative Ecologist. The APNEP field office in Washington, NC houses the Coastal Habitats Coordinator. The Virginia Department of Environmental Quality has historically provided some support for CCMP implementation; however, a position is not assigned at present. Staff from the Virginia Department of Cultural Resources have been providing support for MOU implementation the past several years. These positions are not covered under program administration but support CCMP implementation and occur at no additional cost to the program.

Director

The Director administers and coordinates program activities and CCMP implementation, involving interaction with numerous federal and state resource management agencies, universities, interest groups, and the public. This position manages the post-CCMP grants and associated contracts, provides staff support to the APNEP Leadership Council and Advisory Committees, and represents APNEP at local, state, regional and national meetings. Dr. Bill Crowell has been the Director since June 2002.

Program Manager

The Program Manager assists in the administration of the 320 Grant and coordinates and manages APNEP contracting and associated activities within NCDEQ. The position also assists in the development and maintenance of broad support for the APNEP mission and CCMP implementation; develops tracking mechanisms for performance measures and CCMP implementation efforts; and provides staff support to the Leadership Council and Advisory Committees. Heather Jennings has been the Program Manager since June 2018.

Watershed Project Manager

The Watershed Project Manager will assist in the administration of the BIL Grant funds and coordinate and management of contracting and associated activities within NCDEQ. The position also assists in the development and maintenance of broad support for the APNEP mission and CCMP implementation; conducts GPRA reporting; and provides staff support to the Leadership Council and

Advisory Committees. Additionally, the position also works towards implementation of the CHPP with the APNEP Coastal Habitats Coordinator. The position is currently vacant. Ms. Stacey Feken will begin serving in this role since in October 2022.

Program Scientist

The Program Scientist assists the Director with CCMP administration. This position helps design and implement a comprehensive monitoring strategy and reporting process, guides the Scientific and Technical Advisory Committee (STAC), and reviews project proposals and reports for merit. This position provides staff support to the Leadership Council and Advisory Committees. Dr. Dean Carpenter has served in this role since November 2003.

Policy and Engagement Manager

The Policy and Engagement Manager assists the Director and Management Conference with engagement, educational and outreach activities. The position oversees communication strategies, pursues new partnership and funding opportunities, and works with program staff to engage in new CCMP implementation actions. It also provides staff support for the Management Conference and serves as a liaison on various external working groups. Stacey Feken has served in this role since March 2016, though will move to Watershed Project Manager position in October 2022.

Quantitative Ecologist

The Quantitative Ecologist coordinates with staff and contributing scientists and managers to assess the environmental health of the Albemarle-Pamlico estuarine system. Responsibilities include working with partner agencies and researchers to analyze and report upon indicators of watershed and estuarine health, including identification of monitoring gaps, facilitating, and supporting APNEP Action Teams and Monitoring & Assessment Teams, and managing SAV fieldwork and the program's GIS functions. Dr. Tim Ellis has served in this role since March 2017.

Coastal Habitats Coordinator

This position serves as an APNEP liaison to local governments and state agencies. The Coastal Habitats Coordinator provides coordination and support to local governments and state agencies to enhance CCMP implementation. The position also directs coordinated implementation of the NC Coastal Habitat Protection Plan (CHPP), working closely with the Coastal Resource Commission, the Marine Fisheries Commission, and the Environmental Management Commission. Jimmy Johnson has served in this role since January 2006.

Program Associate

The Program Associate supports APNEP education and public outreach activities as well as APNEP field work activities. This position will also provide valuable staff support to the Leadership Council and other advisory committees. This position is currently vacant.

**All positions are administered in compliance with NC Office of State Personnel rules and policies*

TRAVEL

National Estuary Programs may use U.S. EPA §320 funds and matching funds to cover the cost of travel by staff and/or stakeholders from other NEPs or watershed organizations who collaborate with the NEP on issues of common interest. Stakeholders may include members of the public and of environmental and public interest organizations, business or industry representatives, academics, scientists, and

technical experts.

- U.S. EPA §320 funds and matching funds may be used to cover costs associated with attending conferences, meetings, workshops, or events that advance CCMP implementation. Section 320 funds also may be used to cover the cost of projects described in the annual workplan and the cost of renting facilities.
- Note that when using U.S. EPA §320 funds for travel, NEPs should use the least expensive means of travel whenever possible.
- U.S. EPA §320 and matching funds may not be used to cover the travel costs of Federal employees.

APNEP, the Management Conference, and EPA consider personal, face-to-face contact essential for information sharing and technology transfer. As part of the federal grant requirements to attend EPA-NEP meetings, each NEP is required to allocate minimum of \$10,000 as travel funds for program activities, enhancement, education, and outreach support. APNEP intends to use budgeted travel funds to support:

- 1) Management Conference, Action Team, Monitoring and Assessment Teams, and Ad-Hoc committee meetings,
- 2) Participation in watershed stakeholder meetings, workshops, and conferences relevant to CCMP implementation
- 3) Participation in national or regional NEP and EPA meetings
- 4) Participation in international, nation, regional, and local workshops, or conferences
- 5) Travel to other NEPs or communities to provide peer-to-peer technical assistance
- 6) Travel to other NEPs or watersheds for assistance
- 7) Travel by NEP staff or stakeholders from other NEPs or watershed programs to provide NEP with assistance

Travelers may include Management Conference members, Action Team members and Monitoring and Assessment Team members, citizens, and members of environmental or public interest organizations, business or industry representatives, academicians, scientists, or technical experts as determined appropriate by the APNEP Director.

As a requirement of this grant agreement, a member of APNEP's core staff are required to participate in all meetings called on behalf of the NEPs by U.S. EPA.

Food

While most travel funds are associated with staff, management conference members, and action team participants, travel funds and funds associated with specific workplan projects, APNEP funds awarded as grants or contracts may be used for light refreshments and/or meals served at meetings, conferences, training workshops and outreach activities (events), consistent with 41 CFR 301-74.7 and NC-DEQ travel policies, and as approved by the APNEP Director.

2021-22 Travel

APNEP staff attended a few meetings and conferences using the allotted travel funds and specific project funds or administration costs. COVID-19 restrictions impacted in-person staff and partner interactions greatly in 2020-21. As a result, the Partnership incurred less costs than normal associated with travel during the year. Some travel costs may be associated with specific projects and travel costs are

budgeted/reported for those projects not listed specifically as travel. Rates are listed in the table below. Below is a summary of these activities that have occurred or are currently planned for the year:

Personnel	Date	Purpose	Location	Cost
APNEP Staff/ Management Conference	10/1/21 to 9/30/22	Routine Program Activities/ meetings/ projects/ workshops/ conferences/ fieldwork/ MC meetings	APNEP area	4,000
			Total*	\$ 4,000

NON-FEDERAL COST-SHARE (MATCH)

Summary of Match Requirements

As Partnership host (grant applicant), NC-DEQ provides \$662,500 for the required 1:1 non-federal matching funds from October 1, 2021, to September 30, 2022. This match is provided through:

1) In-kind Positions (salaries and benefits)	\$ 202,386
2) Water Quality Improvement Project(s) Expenditures:	<u>\$ 497,614</u>
TOTAL:	\$ 700,000

- In-kind Services:** NC-DEQ intends to provide **\$ 202,386** as part of the required 1:1 non-federal match for federal fiscal year October 1, 2021, to September 30, 2022. This match will be provided for staff support (salaries and benefits) by the Coastal Habitats Coordinator and Watershed Manager positions (see “Personnel” above). The match positions are responsible for program administration, support, community involvement and guiding implementation of the CCMP and CHPP, as well as other Albemarle-Pamlico watershed issues.
- In-kind Project Expenditures Non-federal Match:** The NC-DEQ intends to provide \$497,614 as part of the 1:1 non-federal match for federal fiscal year October 1, 2021, to September 30, 2022. The expenditure of these non-federal funds will be provided through water quality improvement projects in one or more of the river basin areas within APNEP’s programmatic jurisdiction. The projects will be administered by the N.C. Division of Water Infrastructure.

Division of Water Infrastructure

The N.C. Division of Water Infrastructure provides financial assistance for projects that improve water quality. Programs within this agency fund many types of projects, including sewer collection and treatment systems, drinking water distribution systems, water treatment plants, storm water management systems, and stream restoration. The Division supports the State Water Infrastructure Authority (SWI), which was created in 2013, under North Carolina General Statute 159G-70. The SWI Authority is an independent body with primary responsibility for awarding both federal and state funding for water and wastewater infrastructure projects.

LEVERAGE FUNDS

APNEP actively seeks alternative funding sources for Partnership activities and projects to support CCMP goals. In addition, APNEP pursues additional avenues for collaborating with partners to assist in targeting program funds towards CCMP and basin-wide goals. Where possible, APNEP works to cost-share projects to increase the effectiveness or the magnitude of projects, even though in several cases APNEP has not been the primary catalyst for a project or activity.

APNEP has been successful in its ability to promote the needs, as well as the successes, associated with natural resource management, protection, and enhancement efforts in the Albemarle-Pamlico region. Several state conservation-funding sources were developed in response to research funded by the Albemarle-Pamlico Estuarine Study. Examples of these programs include the N.C. Clean Water Management Trust Fund, the N.C. Clean Water State Revolving Fund Program, and the N.C. Conservation Reserve and Enhancement Program.

2021-22

During the 2021 federal fiscal year (October 1, 2021 - September 30, 2022), APNEP continued to seek partners and additional opportunities for partners in targeting actions and funds towards CCMP implementation. APNEP submitted its leverage results in September 2021 to the EPA *NEPORT* database: total leverage was \$1,454 for every dollar provided by the EPA §320 grant, with \$ 1,017,780,131 of that tied to APNEP efforts with partners (primary and significant, based on data from *NEPORT accessed* on May 12, 2022).

PARTNERSHIP ENTITIES

Host

The main APNEP office is located within the NC-DEQ Office of Secretary in Raleigh, N.C., with additional personnel in Washington and Beaufort, N.C. In the past, the Virginia Department of Environmental Quality provided support through a position to working with APNEP, but the position is currently vacant. Staff from the Virginia Department of Conservation and Recreation Natural Heritage Program have been assisting with support for the VA-NC Memorandum of Understanding.

Management Conference

Leadership Council

The Leadership Council is the main advisory body for APNEP and the Management Conference. It was established by a N.C. Governor's Executive Order to advise, guide, evaluate and support the CCMP implementation process, advance the CCMP and its management actions, and to ensure the highest level of collaboration, coordination and cooperation among state and federal agencies, local governments, the public, and various interest groups. The Leadership Council consults with the advisory committees and the APNEP Office for recommendations pertaining to implementation of CCMP actions at the regional and local levels, and the coordination and development of research and monitoring priorities. A major duty of the Leadership Council is to maintain the relevance of the CCMP and to make recommendations to address emerging issues that may affect the significant natural resources of the Albemarle-Pamlico estuarine system. The Leadership Council, in cooperation with the APNEP Office, develops an annual report, budget, and work plan.

Science and Technical Advisory Committee

The Science and Technical Advisory Committee (STAC) was established in 2004 to provide independent advice to the Leadership Council and the Implementation Committee on scientific and technical issues, including ecosystem assessment and monitoring, in support of CCMP implementation.

Implementation Advisory Committee

As recommended by the Leadership Council during their January 2020 Strategic Planning Meeting, the function of the Implementation Advisory Committee will be carried out by the Executive Committees of both Leadership Council and the STAC. The Executive Committees thus will evaluate those CCMP implementation projects whose funding exceeds the \$5,000 threshold for funding project decisions by staff only. The future of an independent Implementation Advisory Committee lies in a new Executive Order regarding the structure of the Management Conference.

Action Teams

APNEP has established several Action Teams focused on implementing CCMP objectives and actions. Action Teams are responsible for developing the outputs associated with each action deemed necessary to achieve desired ecosystem outcomes. Action Team membership is open to any interested party. For 2021-22, the active Action Teams receiving staff facilitation priority will be those who most closely align with the focus areas as directed by the Leadership Council.

Monitoring and Assessment Teams

Two of the four phases of APNEP's adaptive management cycle, "Monitoring" and "Assessment", help ensure that stakeholders have regular, reliable decision support as to whether CCMP outcomes and actions are being achieved. To leverage program capacity and promote partner collaboration when implementing these two crucial phases, APNEP established in 2008-2009 six resource monitoring and assessment teams (MATs) whose missions each addressed a major sub-system of the Albemarle-Pamlico regional ecosystem. For 2021-22 the MATs receiving staff facilitation priority will be those who most closely align with the further development of the monitor plan and the focus areas (SAV, Water Quality, Coastal Habitats, & Resilience) as directed by the Leadership Council.

Other Partnerships

In general, APNEP is considered a boundary organization, or an organization that facilitates collaboration and information flow between diverse research disciplines and between the research and public policy community. As such, APNEP engages its partnering organizations and the public to improve awareness and understanding of environmental issues facing the Albemarle-Pamlico region. The various methods of APNEP engagement are discussed in greater detail in the [APNEP Engagement Strategy](#).

Much of this coordination occurs through relationships built via our partner network, independent of whether partners are participating on an APNEP team. APNEP is tracking issues of interest to the Partnership and providing support where feasible, such as Chowan algal blooms, offshore oil drilling, impacts to communities due to flooding and sea level rise, and fisheries issues. Engagement associated with these issues has led to letters of support for partners applying for grants, formal comments through the Leadership Council, technical advice and support to agency management, funding and logistical assistance, and hosting workshops to convene technical experts.

APNEP staff also regularly participate in external workgroups and committees to expand our reach, facilitate regional collaboration, and reciprocate volunteer involvement. Where possible, APNEP seeks to prioritize projects that align with the complimentary missions of these external workgroups. Staff also actively seek opportunities to integrate external workgroup projects with APNEP Action Team projects.

APNEP Contracts and Grants Summary Table

Completed Projects

Activity Category	CCMP Actions Addressed	Program Title	320 Funds	Match Funds	Total
Outreach	A2.1, B2.6, D1.3	Aquatic Invasive Species Communication & Outreach Strategy Development	\$2,000	N/A	\$2,000
Monitor	D1.1, D2.1, D2.3, D3.1, E1.3	Swim Guide	\$9,500	\$14,304	\$23,804

Ongoing Projects

Activity Category	CCMP Actions Addressed	Program Title	CWA 320 Funds	Match Funds	Total
Identify	A1.1, B2.2, C1.1, C1.2, C3.3, E1.1	Development of scientifically defensible chlorophyll- <i>a</i> standards for protection of SAV in the Albemarle-Pamlico Estuarine System	\$24,751	N/A	\$24,751
Identify	A3.3, D3.2, E2.2	Coastal Plain Ecological Flows Evaluation: Phase II	\$50,000	TBA	\$50,000
Identify	A2.1, B2.6, C3.1, D1.3, D2.1	APNEP-NC Sea Grant Joint Graduate Fellowship in Estuarine Research	\$5,000	\$5,000	\$10,000
Protect & Restore	A2.1, B2.6, C3.1, D1.3	NC Aquatic Nuisance Species Management Plan Coordination	\$0	\$6,103	\$6,103
Protect and Restore	A1.1, A2.3, A2.4, B1.3, B1.4, B1.5, B2.2, B3.2, B3.3, C1.3, C1.4, C1.5, C2.2, C3.2,	NC Coastal Habitat Protection Plan Implementation Support	\$0	\$24,000	24,000

	C4.2, C5.1, C5.2, C5.3, D1.2, D1.4, E1.2				
Protect & Restore	A2.2, B3.1, D3.3	Using Natural and Nature-Based Features to Build Resilience to Storm Driven Flooding Project	\$0	\$27,000	\$27,000
Engage	All	APNEP Action Team Facilitation	\$0	\$12,000	\$12,000
Engage	All	Event Participation & Sponsorship	\$2,000	\$30,000	\$38,500
Engage	All	Public Outreach & Print Media	\$0	\$300	\$300
Engage	D1.1, D2.1, D2.2	Following the River: An Exploration of the Virginia Southern Watersheds/Pasquotank River Basin	\$20,000	\$27,970	\$47,970
Engage	1a, 1b, 1d, 2a, 2c, 3b	Shad in the Classroom	\$20,000	\$11,000	\$31,000
Monitor	E1.1, E1.2, E1.3, E2.1, E2.2	Integrated Monitoring Plan & Ecosystem Indicator Development	\$0	\$2,441	\$2,441
Monitor	D2.3, E1.1, E2.1, E2.2	Recreational Water Quality Monitoring	\$12,007	\$283,000	\$301,594
Monitor	A1.1, E1.1, E2.1	SAV Mapping & Monitoring	\$0	\$74,717	\$74,717
Protect & Restore	All	Undesignated CCMP Implementation Projects	\$7,442	\$7,442	\$14,884

APNEP Leverage Projects

Activity Category	CCMP Actions Addressed	Program Title	CWA 320 Funds	Match Funds	Total
-------------------	------------------------	---------------	---------------	-------------	-------

Monitor	E1.1, E1.2, E2.1, E2.2	Sentinel Network Monitoring of SAV in Roanoke and Neuse River Watershed	\$0	\$75,000	\$75,000
Monitor	B2.2, C3.3, E1.1	APNEP Estuarine Workboat	\$0	\$43,118	\$43,118
Monitor	B2.2, C3.3	2019 SAV Aerial Images and Analysis	\$0	\$180,000	\$180,000
Monitor	A3.1, B2.3, C2.3	Scuppernong Study	\$0	\$624,547	\$624,547
Monitor	B2.3, C2.3	Water-Level Monitoring Gauges	\$0	\$120,000	\$120,000