Albemarle-Pamlico
National Estuary Partnership

Progress Report
and
2020-21 Work Plan Proposal

Approved by the
APNEP Leadership Council
on May 20, 2020

www.apnep.org

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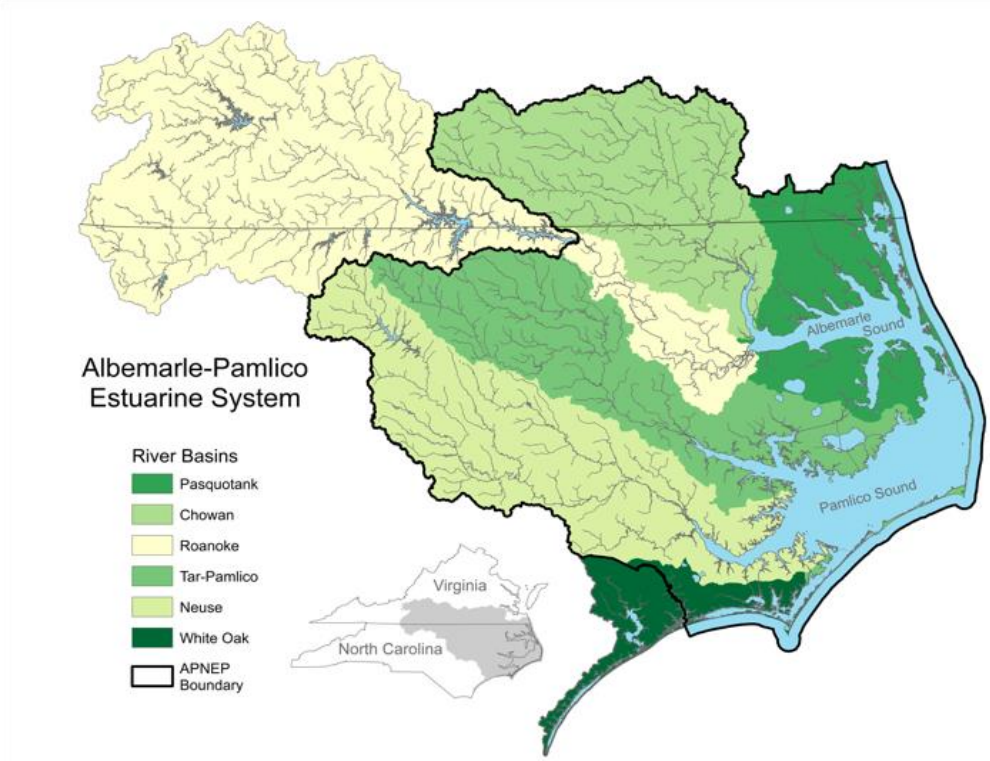
INTRODUCTION

The Albemarle and Pamlico Sounds comprise the nation's largest semi-lagoonal estuarine system. The system is composed of eight sounds and five major river basins draining over 30,000 square miles of watershed in North Carolina and Virginia. The sounds, rivers, creeks, wetlands and terrestrial areas provide habitat for an abundance of animal and plant species. People depend on the system for residential and resort development, food, recreation, mining, forestry, agriculture, business, and industry.



The Albemarle-Pamlico National Estuary Partnership (APNEP) is a component of the U.S. Environmental Protection Agency's (EPA) National Estuary Program. It was one of the first programs established under amendments to the Clean Water Act in 1987. APNEP's mission is to identify, protect, and restore the significant natural resources of the Albemarle-Pamlico region. The Partnership is a cooperative effort currently hosted by the N.C. Department of Environmental Quality (NC-DEQ) under a cooperative agreement with the EPA and works closely with the Commonwealth of Virginia. The Partnership also works closely with both EPA Regions III and IV.

APNEP's initial Comprehensive Conservation and Management Plan (CCMP) was ratified by the Governor of North Carolina and approved by the EPA in November 1994. The APNEP Policy Board approved a revised CCMP and submitted to the EPA in March 2012. The 2012-2022 CCMP was created in a stakeholder-driven process with an ecosystem-based management approach. APNEP staff are advised by a Management Conference as authorized under N.C. Governor's Executive Order #26 (2017).

EXECUTIVE SUMMARY

Purpose

This document addresses the following items:

2019-20 Progress Report

The report presents information about the Albemarle-Pamlico National Estuary Partnership's completed projects from May 2019 to October 2020, as well as ongoing projects under cooperative agreements *CE-0D20614* and *CE-00D95519.*

2020-21 Work Plan and Budget Proposal

This report also presents the 2020-2021 Annual Work Plan, associated budget, and proposed projects for the fiscal year beginning on October 1, 2020. This Work Plan and the associated grant application represent a funding increase request of $662,500 for year two (10/1/20 to 9/30/21) under cooperative agreement *CE-00D95519* between the US Environmental Protection Agency (EPA) and the North Carolina Department of Environmental Quality (NCDEQ).

Cooperative Agreements

This report addresses the following EPA-N.C.DEQ Cooperative Agreements to support implementation of the management strategies recommended in APNEP's 2012-2022 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 natural resources.

Cooperative Agreement *CE-0D20614*

The period of performance under this Cooperative Agreement is from October 1, 2019 through September 30, 2024.

Cooperative Agreement *CE-00D95519*

This Work Plan contains the conclusion of projects funded under Cooperative Agreement *CE-00D95519*. The overall period of performance under this Cooperative Agreement is from October 1, 2014 through September 30, 2020.

Principal Contacts

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

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

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

2019-2020 Key Accomplishments

Key accomplishments from May 2019 to April 2020 are listed below. Details about individual projects can be found in the Ongoing and Completed Projects sections of this document.

Scientific and Technical Initiatives

Submerged Aquatic Vegetation Monitoring and Coordination

- **SAV Team Releases 2013-14 Mapping Data:** APNEP has been a leader in recognizing the value of North Carolina's submerged aquatic vegetation (SAV) resource since the early 2000's and continues to facilitate an SAV Team to coordinate monitoring, mapping, and outreach efforts. In fall 2019, the Team finalized and published a map of high-salinity SAV extent and density from 2013 aerial images. This data represents the second map of North Carolina's SAV habitat and will be utilized alongside the previous map to develop a better understanding of the status and trends of SAV in the state. Learn more.

- **Third SAV Map Data Collection Begins:** In 2019, APNEP coordinated with the N.C. Department of Transportation and the N.C. Division of Marine Fisheries to gather data via aerial imagery and boat-based ground truthing respectively for a third SAV map. Efforts to collect aerial imagery needed for a complete map of SAV in the high-salinity areas of the Albemarle-Pamlico region will continue in spring 2020. Learn more.

- **APNEP Coordinates SAV-Water Quality Workshop:** In March 2020, APNEP led a coordinated effort to host a full-day workshop called "Clean Waters and SAV: Making the Connection" that brought together regional experts in both water quality and SAV to discuss linkages between the two resources. The recommendations and priorities developed during the workshop are being used to inform revision of the N.C. Coastal Habitat Protection Plan and will be synthesized in a summary report. The workshop discussion was also used to identify short-term actions for APNEP and partners to focus on in regard to SAV protection within the Albemarle-Pamlico region. Learn more.

Development of Ecosystem Indicators and Metrics

With the input of the Parntership's Science and Technical Advisory Committee (STAC), APNEP completed an initial list of high-priority ecosystem indicators and metrics for a Monitoring Plan in 2020. Learn more.

Communications and Outreach

Submerged Aquatic Vegetation Communications

- **SAV Economic Valuation:** APNEP has contracted with the N.C. State University Center for Environmental and Resources Economics Policy (CEnREP) to fund an analysis of the economic value of SAV in the Albemarle-Pamlico region. The study's findings will be incorporated into future outreach and communication campaigns about the resource.

- **SAV Press and Outreach:** Alongside release of the 2013 SAV map and the 2019 mapping effort, APNEP worked to highlight the organization's focus on SAV protection and the importance of SAV to the Albemarle-Pamlico region through various communications, including a blog post, a recurring SAV Spotlight section in APNEP's monthly e-newsletter, a 2013 map press release, and a focus on SAV on APNEP social media platforms. The press release led to external press for APNEP's efforts in the *Coastal Review Online* and on Public Radio East.

Water Quality Testing and Communications Projects

- Core to APNEP's mission as a program authorized by the Clean Water Act is protecting and restoring the Albemarle-Pamlico region's waters, and in 2019-2020 the Partnership funded a number of projects in support of this goal. Through support for Sound River's Swim Guide program and N.C. Division of Marine Fisheries' Recreational Water Quality Monitoring program, APNEP is expanding the collection of water quality data for our region and prioritizing public health. Both programs monitor water quality with the primary goal of alerting local communities to potentially hazardous conditions, and the Swim Guide program has the added educational benefit of operating through citizen scientists. Learn more.

Development of Updated Outreach Materials

In 2019, APNEP redeveloped the organization's outreach activities and materials. While direct outreach and environmental education is not a core focus for the Partnership, APNEP participates in tabling events and environmental education initiatives throughout the year and updated its materials to make sure that its participation in these events is effective and informative. Updates included the purchase of supplies that will allow for more hands-on and exploratory learning, as well as the development of a new "Water Detectives" activity that deepens elementary students' interest in the process of scientific research while learning about components of water quality.

Development of Updated Printed Materials

APNEP redesigned its set of printed materials to target priority audiences and communicate the Partnership's value to the region. Separate brochures for partner organizations, educators, and the general public were developed, as well as a rack card for general use. These new materials have a consistent look and feel that will be utilized across the board in APNEP communications. Learn more.

Long-Term Watershed Outreach Projects

APNEP's long-term support for the Summer Teacher Institute, a multi-day environmental and outdoor education professional development opportunity for the region's educators, has reached approximately 25 teachers each year since its inception in 2004. Learn more. Long-term APNEP support for the N.C. Museum of Natural Science's Shad in the Classroom program has reached approximately 30 educators each year since 2011, and through those educators over 1000 students each year. From 2010 (pre-APNEP funding) to 2018, the program has been able to grow from 13 classrooms to 30 classrooms across the region. In 2019, the NC-DEQ Secretary Regan attended one of the shad release day events, resulting in a local news story highlighting the program. Learn more.

Support for the Teacher Institute and Shad in the Classroom has enabled them to become collaborative initiatives that involve many regional, state, and local partner organizations, refine and continually improve on their outreach strategies, and gather relatively long-term data on program efficacy and impact.

Installation of Albemarle-Pamlico Estuary Highway Signs

APNEP worked with the N.C. Department of Transportation to design and install highway signs at major roadways into the Albemarle-Pamlico watershed. These signs will raise awareness of the extent of the region and of the connectivity from headwaters to the coast. Learn more.

Coastal Resiliency Initiatives

N.C. Coastal Resiliency Workshops

APNEP staff participated in a working group led by the N.C. Division of Coastal Management and assisted with planning and hosting a series of workshops for local governments to share knowledge and resources related to coastal resilience issues. These workshops were held during May 2019 and a Coastal Resilience Summit was held in June 2019. Additionally, APNEP staff co-chaired the Coastal Habitats subcommittee and participated in the Pocosin Wetlands subcommittee of the Natural and Working Lands (NWL) Stakeholder Group in preparation for the NWL Report to the N.C. Governor's office.

N.C. Executive Order 80 Implementation

APNEP staff participated in the N.C. Risk and Resiliency Plan development process led by NC-DEQ, designed to assist North Carolina cabinet agencies in assessing risks and vulnerabilities associated with climate change on agency programs and services. Staff participated in workgroups that conducted these assessments and wrote the Ecosystems and Coastal Structures chapters of the N.C. Climate Risk Assessment and Resilience Plan.

Coastal Resilience Community of Practice

APNEP staff have joined the N.C. Division of Coastal Management and N.C. Coastal Reserve in co-leading a Coastal Resilience Community of Practice. The workgroup consists of diverse coastal stakeholders, including agency representatives, local governments, and non-profit organizations who have agreed to focus on how ecosystem resiliency can help build local community resilience.

Water Level Monitoring Stations (non 320 funds)

APNEP has funded the placement of three N.C. Flood Inundation Mapping and Alert Network (FIMAN) remote monitoring stations through the N.C. Division of Emergency Management. Data from these gauges will increase real-time knowledge of flood conditions in the Albemarle-Pamlico region, as well as contribute to the knowledge used to address future water management actions in the watershed. Learn more.

Partnership-Building and Regional Coordination

N.C. Aquatic Nuisance Species Management Plan Committee Coordination

APNEP staff continued working with the N.C. Aquatic Nuisance Species Management Plan Committee in 2019-2020 to finalize and submit 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 North Carolina 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 North Carolina. Learn more.

Southern Watersheds Workshop

APNEP staff worked with Lynnhaven River NOW and other Virginia-based organizations to organize a workshop for teachers in Virginia's "Southern Watersheds" during summer 2019. This workshop raised awareness of the connection between the waterways of southeast Virginia and the wider Albemarle-Pamlico region, as well as APNEP resources available to Virginia teachers. Learn more.

Living Shorelines Tech Transfer Workshop

APNEP staff worked with Restore America's Estuaries and the N.C. Coastal Federation to organize a workshop in Beaufort, N.C. in October 2019. Staff participated on the steering committee that developed the agenda and coordinated field trips for all attendees. There were approximately 250 professionals from the U.S. and Canada who attended. All aspects of living shoreline work in the state, including the APNEP region were discussed with the participants. Learn more.

NC Marine Debris Action Plan Development

APNEP staff participated on the N.C. Marine Debris Advisory and Implementation Team that help guide the final stages of plan development. This committee advises on and participates in implementing the Action Plan. This plan provides a strategic framework for prevention and removal of marine debris along the North Carolina coast and inspires coordination, focus, and direction for the organizations and communities in addressing marine debris over the next five years and into future generations. Learn more.

Management Conference Activities

- **Leadership Council Strategic Planning Meeting:** In January 2020, the APNEP Leadership Council met for a multi-day strategic planning meeting facilitated by Coastwise Partners. APNEP has been working in spring 2020 to implement the resulting programmatic and administrative recommendations, including the development of program focus areas, revitalization of Management Conference purpose and focus, and increased North Carolina-Virginia collaboration. Learn more.

- **Science and Technical Advisory Committee:** The APNEP STAC has been focused primarily on the development of a Monitoring Plan for the Albemarle-Pamlico region. With STAC guidance, APNEP is finalizing its initial list of high-priority ecosystem indicators and metrics for its Monitoring Plan in early 2020.

2020-2021 CCMP Focus Areas and Activities

In 2020-2021, APNEP staff will focus on the following CCMP focus areas and activities. Details about individual projects can be found in the Ongoing and Proposed Projects sections of the work plan. These goals are in line with program priorities of water quality, SAV and coastal habitats, and climate resiliency.

Submerged Aquatic Vegetation

SAV Mapping

To continue high-salinity SAV data collection from 2019, aerial image acquisition and interpretation will take place in spring/summer 2020. This will result in the creation of a third map of SAV extent and density in the Albemarle-Pamlico region.

SAV Economic Analysis

APNEP is funding an analysis of the economic value of SAV in the region and will incorporate the study's findings into future outreach and communication campaigns about the resource.

SAV Communication Campaign

To highlight the value of SAV to the state as well as APNEP's role in monitoring the resource, the Partnership plans to continue focusing outreach and communication efforts on this topic in 2020-2021.

Research Study to Develop Chlorophyll-*a* Standards for SAV Protection

In order 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 chlorophyll-*a* concentrations and SAV light requirements are needed. This project through the UNC Institute for Marine Sciences will develop recommendations for scientifically defensible chlorophyll-*a* standards that are protective of SAV in high- and low-salinity zones of the Albemarle-Pamlico Sound Estuarine System.

Water Quality and Quantity Protection and Restoration

Ecological Flows Action Team

A working group brought together by APNEP has been developing a pilot project to address issues related to lack of ecological flow data in the coastal plain. Team members from East Carolina University are working on a proposal to develop research questions and criteria for establishing flow-ecology relationships in the coastal plain based on input and recommendations from team members at recent meetings. This work builds on a Phase I study, supported by APNEP, which focused research on the status of available ecological flow-related data for the Albemarle Pamlico Drainage Basin.

Living Shorelines

Living Shorelines Action Team

This team is co-lead by APNEP and the North Carolina Coastal Federation and is also called the NC Living Shorelines Steering Committee. Work by these members in 2019 includes research and monitoring of natural marshes and living shorelines, wave attenuation and transformation, and the use of alternative living shoreline construction materials. Education and outreach efforts by members have increased the awareness and shown the benefits of living shoreline techniques to the public as well as to real estate agents, contractors, and engineers. In addition, nearly 2,400 feet of living shorelines were constructed in 2019 throughout the state.

Monitoring

Development of Monitoring Strategy and Ecosystem Indicators

With the input of the Partnership's Science and Technical Advisory Committee (STAC), APNEP plans to complete development of its initial Monitoring Plan in 2020, as well as identification of high-priority ecosystem indicators and reports on their status in the Albemarle-Pamlico region.

Education/Outreach

Continuation of Long-Term Outreach Projects

APNEP plans to continue funding for Shad in the Classroom and the Teacher Institute from 2019-2021, at which time continued funding for both programs will be reevaluated alongside other submitted project proposals through an open RFP process. With input from its Engagement and Stewardship Action Team, APNEP is currently creating an RFP that will be used to fund targeted outreach and engagement initiatives starting in Fall 2021. This RFP process will enhance the program's transparency, accessibility, and the evaluation of outputs/outcomes from funded projects.

Development of Updated Printed Outreach Materials and Activities

APNEP is continuing the development of updated printed brochures for target audiences in 2020. These will include printed materials highlighting APNEP's SAV mapping, monitoring, and economic valuation, as well as brochures for other audiences such as researchers. APNEP also plans to develop a SAV-focused educational activity that can complement water quality-focused activities developed in 2019 for use at future outreach and tabling events.

Improved Climate Resiliency

Building Capacity for Climate Resilience in Tribal Communities

Using supplemental 320 funds, APNEP is contracting with the North Carolina Commission of Indian Affairs to work with tribal communities in the Albemarle-Pamlico region to develop a strategy for incorporating resilience into tribal planning and community engagement processes. The project will also involve an analysis of tribal engagement in climate and resilience planning efforts around the U.S. as well as assistance from the Virginia Coastal Policy Center with coordination with state agencies and tribal communities in Virginia.

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

APNEP is collaborating as a project partner on a NOAA Coastal Resilience Grant with the Virginia Institute of Marine Science (VIMS). The project is focused on increasing the use of natural and natured-based features (NNBFs) to increase resilience of coastal communities to flooding caused by storms and extreme weather events and is designed with local government officials as the target audience for project generated data and guidance. The project includes development of tools that allow local planners in coastal counties in Virginia to determine suitable areas to implement natural infrastructure. APNEP will continue its role in assisting the project team in assessing transferability of the tool to coastal localities in North Carolina.

Prioritizing Coastal Habitats and Carbon Resilience

APNEP was invited to collaborate on a United States Climate Alliance (USCA) project to expand work led by Duke University for the NC-DEQ Natural and Working Lands sub-teams that were established to support N.C. Governor's Executive Order #80. The USCA grant was awarded in winter 2019 and is a multi-state effort that includes APNEP partners in Virginia. The project involves a spatial analysis to map and prioritize coastal habitats that store carbon, enhance natural and human community resilience to coastal hazards, and support a variety of species. It is designed to support Atlantic coast states that are engaged in resilience planning and working to incorporate blue carbon into their climate mitigation plans. APNEP will continue its role in assisting the project team in making connections to scientists, restoration practitioners, resource managers, and communities working in coastal resilience and climate mitigation in North Carolina and Virginia to ensure products reflect their feedback and priorities.

PROPOSED BUDGET 2020-2021

For the time frame of October 1, 2020 to September 30, 2021, APNEP anticipates receiving a grant award up to $662,500 from the EPA to support activities geared towards implementing the Partnership's CCMP and its mission.

The proposed uses for this funding are highlighted below. Detailed information about each funding category is described within the work plan.

Activity or Project	2020-21 Budget	2019-20 Budget
New Undesignated Projects	$20,000	$34,942
Ecological Flows Pilot Project	$50,000	-
Shad in Classroom	$20,000	$20,000
Teacher Institute	$20,000	$20,000
Events & Sponsorships	$6,000	-
Supplemental Funding: Resiliency Project	-	$25,000
Administration	$476,551	$460,123
Travel	$12,000	$12,000
Subtotal	$604,551	$572,065
Indirect Cost (15.7%)*	$57,949	$52,935
Total Grant Funds	**$ 662,500**	**$ 625,000**

**Includes: N.C. 2019-20 Benefits are based on Social Security (7.65 %), Retirement (19.7 %) of position's annual salary and Medical Insurance Plan rate of $6,306 per year per person. Indirect Costs are based on a negotiated rate of 15.7 % of federal salaries under "Water Resources".*

COMPLETED PROJECTS 2019-2020

The following list provides an overview of APNEP's completed projects since the last annual work plan report was approved by the Leadership Council on May 14, 2019.

Engage: Education and Public Outreach

Albemarle-Pamlico Estuary Highway Signs

Objectives: Educate the public in North Carolina about the location of the Albemarle-Pamlico watershed in relation to where they work, play, go to school, and vacation.
Description: As part of APNEP's commitment to increase public awareness of the Albemarle-Pamlico watershed and its biological and natural significance to the region, APNEP contracted with the N.C. Department of Transportation for the manufacturing and installation of six signs to inform drivers entering the Albemarle-Pamlico watershed.

Year(s):	2012-2019
Partners:	North Carolina Department of Transportation
Outputs/Deliverables:	Six signs installed at the intersections of major N.C. highways and the Albemarle-Pamlico watershed boundary.
Outcomes:	Increased public awareness of the Albemarle-Pamlico watershed.
320 Funds:	Up to $35,000
Estimated Leverage:	N.C.DOT maintenance to address normal wear and tear of the six signs in their respective locations.
CCMP Actions:	Objectives D1 and D2.
CCMP Outcomes:	All (indirect)
CWA Core Programs Addressed:	(6) protecting coastal waters through the National Estuary Program
EPA Element(s):	Healthy Communities

Accomplishments and Deliverables:

N.C. Department of Transportation (NC-DOT) installed the six signs in winter 2019. Signage was installed at locations along the watershed boundary: Orange County, Wake County, Johnston County, Sampson County and Onslow County. NC-DOT has a maintenance agreement to perform updates, repairs, and relocation on all signs. APNEP will be working with the Commonwealth of Virginia to get similar signs installed in that portion of the watershed.

Aquatic Invasive Species Communication & Outreach Strategy Development

Objectives: Contribute to the implementation of the N.C. Aquatic Nuisance Species Management Plan via assessment of existing outreach efforts.

Description: APNEP worked with a summer intern and with the members of the N.C. Aquatic Nuisance Species Management Plan Committee to conduct an assessment of current outreach and communications efforts targeting aquatic nuisance species in North Carolina.

Year(s):	2019
Partners:	NC- DNCR, NC-DEQ, NC-DA&CS, The Nature Conservancy, U.S. Fish and Wildlife Service
Outputs/Deliverables:	Assessment of outreach and communications efforts, citizen science strategy
Outcomes:	Implementation of the N.C. Aquatic Nuisance Species Management Plan, increased data about aquatic invasives in the Albemarle-Pamlico region
320 Funds:	$2,000
Estimated Leverage:	TBD
CCMP Actions:	A2.1, B2.6, D1.3
CCMP Outcomes:	2b, 2c, 3a
CWA Core Programs Addressed:	(5) protecting wetlands, (6) protecting coastal waters through the National Estuary Program
EPA Element(s):	Living Resources, Habitats, Direct Assistance

Accomplishments and Deliverables:

The APNEP summer intern created an inventory of current and recent aquatic nuisance and invasive species communication efforts, both in North Carolina and elsewhere in the U.S. This inventory will be utilized by the APNEP and the N.C. Aquatic Nuisance Species Management Plan (ANSMP) Implementation Team to assess communication and outreach needs and guide implementation efforts.

Initial Assessment of Climate Change Impacts to CCMP Implementation

Objectives: Assess the risks and potential impacts from relevant climate stressors to implementation of the CCMP.

Description: During fall 2019, APNEP staff conducted a climate change vulnerability assessment to determine the risks from relevant climate stressors to implementation of CCMP actions. Identifying risks associated with climate change and managing them to reduce their impacts is essential for implementation of the CCMP actions. The CCMP was developed with the potential impacts of a changing climate in mind, thus the reassessment was a way to confirm and update APNEP's perception of risks to implementation of the CCMP actions.

Year(s):	2019
Partners:	Various partners
Outputs/Deliverables:	Initial assessment document
Outcomes:	Preparation for climate assessment and CCMP update
320 Funds:	Staff Time
Estimated Leverage:	$ 2,000
CCMP Actions:	All

CCMP Outcomes:	All
CWA Core Programs Addressed:	(6) protecting coastal waters through the National Estuary Program
EPA Element(s):	All

Accomplishments and Deliverables:

In consultation with various partners, APNEP staff developed an initial assessment of climate change impacts that is available on the APNEP website.

Regional Coastal Resiliency Workshops and Summit

Objectives: Learn from local governments about their greatest resiliency challenges and support the development of the State Climate Risk Assessment and Resiliency Plan under N.C. Executive Order 80. Share the latest information about climate science, impacts, and what other communities are doing in the region to adapt to changing conditions before and after disasters occur. Develop peer-to-peer networking opportunities to facilitate interdisciplinary understanding and collaboration on resilience issues at local and regional scales.

Description: APNEP participated in a working group led by the N.C. Division of Coastal Management, North Carolina Coastal Federation, and partners. The team conducted two Regional Resilience Workshops for local elected officials, local planners and local emergency managers in coastal North Carolina and held a Coastal Resilience Summit in June 2019.

Year(s):	2019
Partners:	N.C. Division of Coastal Management, North Carolina Coastal Federation, N.C. Sea Grant, N.C. Division of Emergency Management, various regional Councils of Government
Outputs/Deliverables:	Assist partners with workshop and summit summaries for inclusion in the Climate Risk and Resiliency Plan; information to inform APNEP focus and resources and utilization of EPA funding
Outcomes:	Share resources and perspectives about how the state can and should support reducing risks to natural hazards and climate change impacts and build long-term resilience for communities in coastal areas of North Carolina.
320 Funds:	Staff Time
Estimated Leverage:	$ 27,000
CCMP Actions:	D3.3
CCMP Outcomes:	1a, 1b, 1c, 1d, 1e, 2a, 2b, 2c, 3a, 3b, 3c, 3d
CWA Core Programs Addressed:	(4) addressing diffuse, nonpoint sources of pollution, (5) protecting wetlands, (6) protecting coastal waters through the National Estuary Program
EPA Element(s):	Healthy Communities, Trainings

Accomplishments and Deliverables:

- APNEP organized technical sessions and a panel discussion at the 2019 WRRI Conference that brought together NC and VA-based resiliency experts and practitioners to help inform opportunities to build regional coastal across state lines and inform focus areas for our involvement with resiliency efforts moving forward. Partners included the VA&NC Sea Grant, NCCF, Division of Coastal Management, and City of VA Beach.
- Staff provided logistical support for the Northeast Regional workshop and assisted in organizing and facilitating a panel discussion titled, "Below the Surface: Striving to Maintain Climate Ready and Productive Estuaries" at the Summit in May through June 2019.
- Through March 2020, staff assisted with completion of the N.C. DEQ Climate Risk and Resiliency Plan.
- Information and feedback from the WRRI panel, communities participating in the workshops, summit, and participation in the overall E.O. 80 process informed utilization of the EPA supplemental funding to engage tribal communities with resilience planning.

Stewards of the Southern Watersheds Teacher Workshop

Objectives: Increase educator understanding of the connection between southeastern Virginia and the Albemarle-Pamlico estuary and to connect educators with resources that will allow them to highlight the estuary in their classrooms.

Description: APNEP staff worked with Virginia-based partners, including Lynnhaven River NOW and the Virginia Department of Cultural Resources, to organize a workshop for educators in southeast Virginia in July 2019. Teachers working in Virginia Beach's "Southern Watersheds," which stretch south of Virginia Beach towards the N.C.-Virginia state line, often don't know that their waterways drain into Albemarle Sound and not the Chesapeake Bay. The workshop increased knowledge of the unique history and natural resources of this region, as well as its connection to the Albemarle-Pamlico estuarine system. APNEP also created a map of the entire bi-state Albemarle Watershed, which includes Virginia's Southern Watershed and North Carolina's Pasquotank River Basin, for use at and after the workshop.

Year(s):	2019
Partners:	Lynnhaven River *NOW*, Virginia Department of Cultural Resources, Back Bay National Wildlife Refuge
Outputs/Deliverables:	Increased teacher understanding of their connections to the Albemarle-Pamlico estuary and increased access to estuary-specific resources
Outcomes:	Increased awareness of how upstream behaviors in Virginia impact the Albemarle-Pamlico estuary
320 Funds:	Staff Time
Estimated Leverage:	$4,068
CCMP Actions:	D2.1, D2.2, D2.3
CCMP Outcomes:	1a, 1b, 1c, 1d, 1e, 2a, 2b, 2c, 3b
CWA Core Programs Addressed:	(4) addressing diffuse, nonpoint sources of pollution, (5) protecting wetlands, (6) protecting coastal waters through the National Estuary Program
EPA Element(s):	Trainings, Healthy Communities

Accomplishments and Deliverables:

In July 2019, the "Stewards of the Southern Watersheds" workshop was held at Back Bay National Wildlife Refuge and approximately 15 teachers attended the all-day workshop. Aside from the knowledge and resources gained by the attendees, preparing for and presenting at the workshop helped APNEP staff to strengthen new partnerships with Virginia-based organizations. A map of the Albemarle watershed, which stretches across both Virginia and N.C. but which is almost never shown in its entirety, was created by APNEP for the workshop and is now available to educators on our website. A toolbox of resources for educators was created by APNEP and other event facilitators; this is also available online.

Living Shoreline Tech Transfer Workshop

Objectives: Bring together experts and practitioners from across the country, to earned about emerging techniques, regulation, and community engagement regarding the use of living shorelines.
Description: APNEP staff worked with N.C. Coastal Federation to organize a workshop in Beaufort, N.C. in October 2019. Staff participated on the steering committee that developed the agenda and coordinated field trips for all attendees. There were approximately 250 professionals from the U.S. and Canada who attended. All aspects of living shoreline work in the state, including the APNEP region were discussed with the participants.

Year(s):	2019
Partners:	Restore America's Estuaries, N.C. Coastal Federation
Outputs/Deliverables:	Workshop, Field trips/demonstration sites
Outcomes:	Increased awareness, improved implementation, water quality protection
320 Funds:	Staff Time
Estimated Leverage:	TBD
CCMP Actions:	B3.1, C1.3
CCMP Outcomes:	2a, 2b, 2d
CWA Core Programs Addressed:	(4) addressing diffuse, nonpoint sources of pollution, (5) protecting wetlands, (6) protecting coastal waters through the National Estuary Program
EPA Element(s):	Trainings, Healthy Communities

Accomplishments and Deliverables:

APNEP staff worked with N.C. Coastal Federation to organize a workshop in Beaufort, N.C. in October 2019. Staff participated on the steering committee that developed the agenda and coordinated field trips for all attendees. There were approximately 250 professionals from the U.S. and Canada who attended. All aspects of living shoreline work in the state, including the APNEP region were discussed with the participants. Learn more.

North Carolina Marine Debris Action Plan Development

Objectives: To evaluate of past and current attempts to reduce marine debris on North Carolina's coast and engage stakeholders through workshops, professional meetings and online surveys were to develop the plan.
Description: The North Carolina Marine Debris Action Plan provides a strategic framework for prevention and removal of marine debris along the North Carolina coast and is based upon a recent evaluation of past and current attempts to address the problem.

Year(s):	2020
Partners:	N.C. Coastal Federation, N.C. Coastal Reserve, NC Division of Coastal Management, N.C. Sea Grant, N.C Wildlife Resources Commission, Coastal Carolina Riverwatch, and the N.C. Marine Debris Symposium
Outputs/Deliverables:	Draft Marine Debris Action Plan
Outcomes:	Plan for coordinated approach to address marine debris
320 Funds:	Staff Time
Estimated Leverage:	TBD
CCMP Actions:	D2.1
CCMP Outcomes:	2a
CWA Core Programs Addressed:	(4) addressing diffuse, nonpoint sources of pollution, (5) protecting wetlands, (6) protecting coastal waters through the National Estuary Program
EPA Element(s):	Healthy Communities

Accomplishments and Deliverables:

APNEP staff participated on the N.C. Marine Debris Advisory and Implementation Team that help guide the final stages of plan development. This committee advises on and participates in implementing the Action Plan. This plan provides a strategic framework for prevention and removal of marine debris along the North Carolina coast and inspires coordination, focus, and direction for the organizations and communities in addressing marine debris over the next five years and into future generations. Learn more.

ONGOING PROJECTS 2019-2021

The following provides an overview of APNEP's ongoing projects since the last annual work plan was approved on May 14, 2019. Ongoing projects are those that began during or before the last fiscal year, and which APNEP expects to continue through the 2020-2021 fiscal year. Projects proposed for additional funding in 2020-21 are noted.

Identify: Research and Technical Assistance

APNEP-N.C. Sea Grant Joint Graduate Fellowship in Estuarine Research

Objectives: 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 North Carolina Sea Grant (NCSG) College Program have supported a Joint Graduate Fellowship since 2015. The fellowship provides funding for a graduate student based in North Carolina or Virginia to conduct applied research within the North Carolina portion of the APNEP management boundary. Fellows must conduct research that addresses focus areas identified in the NCSG Strategic Plan and APNEP CCMP.

Year(s):	2015 - present
Partners:	N.C. Sea Grant (Lead)
Outputs/Deliverables:	Final report, maps, data.
Outcomes:	Increased capacity to address CCMP implementation actions
FY2019-20 Cost:	$5,750
Estimated Leverage:	$5,000
CCMP Actions:	A2.1, B2.6, C3.1, D1.3, D2.1
CCMP Outcomes:	2a, 2b, 2c, 3d
CWA Core Programs Addressed:	(4) addressing diffuse, nonpoint sources of pollution, (6) protecting coastal waters through the National Estuary Program
EPA Element(s):	Direct Assistance

Progress to Date:

- **2015-2018:** Fellows Liz-Brown Pickren, Stacey Zhang, Mollie Yacano, and Erin Voigt were funded through this Fellowship program. Learn more.
- **2019:** Fellow Haley Plaas began studying multiple issues related to cyanobacteria toxins in the Chowan River and Albemarle Sound in September 2019.

FY2020-2021 Plans:

Estimated Cost: $5,000
Milestones:

- July 2020: 2021 Fellowship applications due
- After September 2020: 2021 Fellowship begins
- Before December 31, 2020: 2020 Fellowship work completed
- Before December 31, 2021: 2021 Fellowship work completed

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.

Description: APNEP has led an Ecological Flows Action Team since 2015 at the request of partners that participated in the N.C. Ecological Flows Science Advisory Board (EFSAB) to address data gaps and needs identified by members of the Board's Coastal Ecological Flows Working Group. EFSAB was established in response to 2010 legislation directing the former N.C. 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.

Year(s):	2015 – present
Partners:	East Carolina University, APNEP Ecological Flows Team members (multiple partners), N.C. Land of Water (N.C.LOW)
Outputs/Deliverables:	Phase II Pilot Study & Summary Report.
Outcomes:	Refinement of data needed to develop recommendations for the N.C. Division of Water Resources for ecological flows in the N.C. coastal plain. Development of an evaluation process, decision tree, or matrix that can be replicated in other waterbodies.
Cost:	$ Staff time (2019-20)
Estimated Leverage:	$ TBD
CCMP Actions:	A3.3, D3.2, E2.2
CCMP Outcomes:	2a, 2b, 3a, 2b
CWA Core Programs Addressed:	(5) protecting wetlands, (6) protecting coastal waters through the National Estuary Program
EPA Element(s):	Habitats, Water Quality

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 organized and moderated a technical session entitled "Ecological Flows and Water Availability in the Coastal Plain" at the 2019 N.C. Sea Grant Coastal Conference, featuring work completed in Phase I and work from other team members including ECU and USGS. APNEP organized an expanded version of this session at the March 2020 WRRI conference. Since WRRI was cancelled due to meeting and travel restrictions due to COVID-19 virus, the session will be rescheduled as a webinar late spring or early summer 2020.

FY2020-2021 Plans:

- Completion of a scope of work for the Pilot Study Phase II described above and contract development late spring/early summer 2020.
  Estimated Cost: $50,000 (2020-21)
  Milestones: Identification of pilot study location, workshops, analysis, report.

Development of scientifically defensible chlorophyll-*a* standards for protection of SAV in the Albemarle-Pamlico Estuarine System

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 attenuation of PAR in both low and high salinity estuarine waters at locations throughout the Albemarle-Pamlico Estuarine System;
3) Use the validated bio-optical model or empirical relationships developed from Objective2 to set thresholds for the maximum growing season average chlorophyll *a* that is protective of SAV habitats in low- and high-salinity zones;
4) Combine diffuse attenuation coefficient and bathymetry data sets from sites throughout the Albemarle-Pamlico 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: In order 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 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 the Albemarle-Pamlico Sound Estuarine System through four objectives listed above.

Year(s)	2020
Partners:	UNC Institute of Marine Sciences, SAV Team
Outputs/Deliverables:	A final report that provides 1) a description of chlorophyll-a thresholds protective of high- and low-salinity SAV habitats including quantification of uncertainty in those thresholds; 2) documentation of the data sets and data analyses to validate the bio-optical model or similarly functioning empirical models for determining thresholds; and 3) identification of data gaps

	that could improve threshold estimates. An oral presentation of project findings to the APNEP management conference, the N.C. Nutrient Criteria Development Plan Scientific Advisory Committee, and other groups decided by APNEP. A publication submission to a journal oriented toward environmental management.
Outcomes:	Scientifically defensible chlorophyll-a standards that are protective of SAV for high- and low-salinity zones of the Albemarle-Pamlico Estuarine System. Interpolated maps of the depth to which sufficient light penetrates to support SAV (i.e., photic depth maps) will be created and overlaid with bathymetry to define the potential SAV habitat area under different chlorophyll-a scenarios.
Cost:	$ 24,751
Estimated Leverage:	$ TBD
CCMP Actions:	A1.1, B2.2., C1.1., C1.2, C3.3, E1.1
CCMP Outcomes:	2b, 3b
CWA Core Programs Addressed:	(6) protecting coastal waters through the National Estuary Program
EPA Element(s):	Habitats, Water Quality

Progress to Date:

- Project contracted and work began in April 2020.

FY2020-2021 Plans:

- Completion of project.
  Estimated Cost: $24,751
  Milestones: See objectives above.

Ecosystem Protection and Restoration

N.C. Aquatic Nuisance Species Management Plan Coordination

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

Description: The N.C. 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, N.C. 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 support is critical to successful implementation of the N.C. ANSMP. In support of the CCMP, APNEP staff is 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 N.C. eligible to receive federal funding for invasive species management.

Year(s):	2015-2016, 2018 - Present (years of APNEP involvement)
Partners:	N.C. Dept. of Environmental Quality, N.C. Wildlife Resources Commission, N.C. Dept. of Agriculture and Consumer Services, N.C. Dept. of Natural and Cultural Resources, US Fish and Wildlife Services, N.C. State University, The Nature Conservancy, N.C. Sea Grant
Outputs/Deliverables:	State plan for coordinated management, research, and outreach on aquatic nuisance species.
Outcomes:	Federal approval of this plan will make N.C. eligible to receive federal funding (~$40K/year) to support the plan's implementation. Improved coordination and collaboration across state agencies will leverage limited resources available for invasive species management in N.C.. The NC - ANSMP will also compliment Virginia's equivalent plan, thereby better enabling coordinated management actions between the two states under the 2017 MOU.
FY2019-20 Cost:	Staff Time
Estimated Leverage:	$6,103
CCMP Actions:	A2.1, B2.6, C3.1, D1.3
CCMP Outcomes:	2c
CWA Core Programs Addressed:	(5) protecting wetlands (6) protecting coastal waters through the National Estuary Program

EPA Element(s): Direct Assistance, Habitats, Living Resources

Progress to Date:

APNEP staff provided feedback on the original NC – ANSMP that was adopted in 2015 and have been facilitating an update of the Plan through the N.C. ANSMP Steering Committee in 2018-2020.

FY2020-2021 Plans:

Estimated Cost: Staff Time

Milestones:

- Fall 2020: Re-adoption of a revised N.C. ANSMP by NC-DEQ, NC-WRC, and NC-DA&CS, and first adoption by NC-DNCR. Submission of updated N.C. ANSMP to the federal Aquatic Nuisance Species Task Force for approval.

APNEP staff will continue to facilitate the coordination of revisions to the NC – ANSMP in 2020, with the goal of having the N.C. Governor's Office submit the revised Plan to the federal Aquatic Nuisance Species Task Force in late 2020 or early 2021. From there, APNEP staff will continue to work with the Plan's Steering Committee towards implementing the N.C. ANSMP in support of shared CCMP priorities.

N.C. Coastal Habitat Protection Plan Implementation Support

Objectives: To coordinate across N.C. state agencies in order to improve coastal habitats and to raise awareness about the importance of these habitats for N.C. fisheries.

Description: The N.C. 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 CCMP and the CHPP are complimentary and APNEP staff ensure that both plans are implemented in a coordinated and integrated fashion. The CHPP was revised in 2016 and adopted by all three management commissions. A 2018-2020 CHPP Implementation Plan was also adopted by the three commissions.

Year(s):	2004 - Present
Partners:	N.C. Department of Environmental Quality, N.C. Coastal Resources Commission, N.C. Environmental Management Commission, N.C. Marine Fisheries Commission, Sedimentation Control Commission
Outputs/Deliverables:	CHPP Annual Report
Outcomes:	Coordinated activities and regulation across N.C. state agencies to improve estuarine habitats.
FY2019-20 Cost:	Staff Time
Estimated Leverage:	$24,000

CCMP Actions:	A1.1, A2.3, A2.4, B1.2, B1.3, B1.4, B1.5, B2.2, B3.2, B3.3, C1.3, C1.4, C1.5, C2.2, C3.2, C3.3, C4.2, C4.3, C5.1, C5.2, C5.3, D1.2, D1.4, E1.2
CCMP Outcomes:	1a, 1b, 1c, 1d, 2a, 2b, 2c, 3b, 3c, 3d
CWA Core Programs Addressed:	(6) protecting coastal waters through the National Estuary Program
EPA Element(s):	Direct Assistance, Habitats, Living Resources

Progress to Date:

- A baseline has now been established for the extent and coverage of high-salinity SAV within the Albemarle-Pamlico region. Aerial images to maximize SAV detection have now been acquired during 2007-2008, 2013-2014, and 2019. Another set of images will be acquired in 2020 with an emphasis on those areas where the photography was not conducive to interpretation. The information generated from the images will be used to help determine the trends regarding high-salinity SAV coverage in the state's estuarine waters. *APNEP's projects and initiatives related to SAV mapping and monitoring are strongly tied to CHPP implementation. See SAV Mapping and Monitoring project description for more information.*
- A significant attempt to help restore oyster populations in N.C. has generated support from the N.C. General Assembly. Over $1 million dollars has been appropriated over several budget cycles to help with the construction of new oyster sanctuaries, as well as increased cultch plantings to help with commercial harvests. The N.C. Division of Marine Fisheries and Marine Fisheries Commission have also responded with a new Oyster Fishery Management Plan, which implements new safeguards when oyster populations drop below certain thresholds during the commercial harvest season. APNEP's oyster study and action team played major roles in this process.
- For a number of years, NC-Division of Coastal Management and NC-Division of Marine Fisheries have been working with the U.S. Army Corps of Engineers to develop a General Permit for Living Shorelines. That General Permit was issued in 2019, and the result has been an uptick in permits for living shorelines. As anticipated, this has made living shorelines a more viable option verses bulkheads and hardened structures. This activity was supported by long-term APNEP efforts to facilitate the construction of living shorelines.
- The CHPP was central to the EO80 Natural and Working Lands Coastal Habitats Subcommittee. NC-DMF and APNEP staff facilitated meeting of the NWL Coastal Habitats Subcommittee and later developed an action plan for this subcommittee, to be forwarded to the NWL Stakeholder Committee for inclusion in the Climate Risk Assessment and Resiliency Plan.

FY2020-2021 Plans:

Estimated Cost: Staff Time

Milestones:

- Spring 2020: Begin CHPP Revision
- Ongoing: CHPP Revision Process. Effectiveness of implementation of the 2018-2020 CHPP Implementation Plan is being assessed and the results will help in the 2021 revision of the document. The next Implementation Plan will be written from the newly revised CHPP document in late 2020 or early 2021.

Submerged Aquatic Vegetation Economic Analysis

Objectives: Estimate historic and current economic values directly related to SAV within the coastal zone area of the Albemarle Pamlico Estuary. The estimate will include the values of goods and services provided by SAV and SAV habitat.

Description: Building upon a 2016 EPA-sponsored effort to value the ecosystem services provided by SAV. The refined valuation of SAV will be used by those who reside or have influence in the APNEP region, such as government agencies, local governments, economists, educators, legislators, researchers, key decision makers and the general public. The contract will fund an economic study of SAV in the Albemarle Pamlico watershed. The research will estimate historic and current economic value of coastal SAV.

Year(s):	2019-Present
Partners:	N.C. State University
Outputs/Deliverables:	Economic analysis report
Outcomes:	Increased awareness and appreciation for the value of North Carolina's coastal SAV
FY2019-20 Cost:	$68,193
Estimated Leverage:	$ TBD
CCMP Actions:	B2.2, C3.3
CCMP Outcomes:	2a, 2b
CWA Core Programs Addressed:	(6) protecting coastal waters through the National Estuary Program
EPA Element(s):	Living Resources, Habitats

Progress to Date:

The RFP has been completed and the N.C. State Center for Environmental and Resource Economics Policy (CEnREP) was chosen to lead the project. APNEP formed a steering committee of SAV and resource economics expertise to guide CEnREP researchers through the project as necessary.

FY2020-21 Plans:

Estimated Cost: $0

Milestones:

- Quarterly: CEnREP researchers provide updates to APNEP and the steering committee
- September 31, 2020: Economic Analysis complete.

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

Objectives: To 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 North Carolina.

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 N.C. coastal localities to plan for possible extension of the guidance developed in this project to areas beyond coastal Virginia.

Year(s):	2018 - present
Partners:	Virginia Institute of Marine Science, Virginia Coastal Policy Center, Wetlands Watch
Outputs/Deliverables:	Inventory and comparison of N.C./Virginia. data sources; workshops and meetings with partners in N.C.
Outcomes:	Increase in incentives and tools for local governments and communities to utilize natural and nature-based features including living shorelines. Increase in the number of communities in the APNEP region that incorporate resilience and consideration of impacts from sea level rise and climate change into local planning processes.
FY2019-20 Cost:	Staff Time
Estimated Leverage:	$25,000
CCMP Actions:	A2.2, B3.1, D3.3
CCMP Outcomes:	2a, 2b, 2c, 3a, 3b, 3d
CWA Core Programs Addressed:	(4) addressing diffuse, nonpoint sources of pollution, (6) protecting coastal waters through the National Estuary Program
EPA Element(s):	Direct Assistance, Healthy Communities

Progress to Date:

APNEP staff have been conducting meetings and other outreach opportunities to solicit feedback from N.C. agency personnel and other partners throughout 2019. Staff will be participating in planned outreach with Virginia local governments during the spring-summer 2020. This information will be used to develop an evaluation of opportunities and limitations to extend the project outputs beyond Virginia in summer 2020.

FY2020-21 Plans:

Estimated Cost: Staff Time

Milestones:

- Spring/Summer 2020: Complete follow up discussions and targeted outreach with partners.
- July 2020: Develop a report for the project team that includes 1) an assessment of similar tools, projects, and programs that already exist in N.C.; 2) an assessment of information gaps and needs; 3) an assessment of the transferability of the tool to North Carolina; and 4) an analysis of how the tool could be modified for North Carolina that could be used as the basis for future NOAA proposals.

- October 2020: Submit abstracts for sessions at technical conferences including the 2020 North Carolina Planning Association Conference and Carolinas Integrated Sciences and Assessment Climate Conference.

Engage: Education and Public Outreach

APNEP Action Team Facilitation

Objectives: Facilitate interagency and inter-organization communication related to priority issues in the Albemarle-Pamlico region, to improve cooperation and develop collaborative initiatives that accomplish shared goals.

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.

Year(s):	Ongoing
Partners:	Varies; see Action Team webpages for partner organizations
Outputs/Deliverables:	Decisions about CCMP implementation priorities; improved communication between Albemarle-Pamlico region environmental organizations
Outcomes:	CCMP implementation
FY2019-20 Cost:	Staff Time
Estimated Leverage:	$12,000
CCMP Actions:	All
CCMP Outcomes:	All
CWA Core Programs Addressed:	(4) addressing diffuse, nonpoint sources of pollution, (5) protecting wetlands, (6) protecting coastal waters through the National Estuary Program
EPA Element(s):	Healthy Communities

Progress to Date:

See previous year's Work Plan for information about Action Team activities.

FY2020-2021 Plans:

Estimated Cost: Staff Time

Milestones:

- **Summer 2020:** Based on feedback from January 2020 Leadership Council meeting, APNEP staff will determine which Action Teams will continue to be active and/or if any consolidation or changes to Team goals are needed.

Building Climate Resilience Capacity in Albemarle-Pamlico Region Tribal Communities Project

Objectives: Support tribal communities in the Albemarle-Pamlico region with considering climate risk and resiliency into tribal planning and community engagement processes.
Description: APNEP is utilizing 2019-2020 supplemental Section 320 funding from the EPA and working with representatives from tribal communities in the Albemarle-Pamlico region and the coastal plain of Virginia and North Carolina to develop a strategy for incorporating resilience into tribal planning and community engagement processes. This 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.

Status:	In progress
Partners:	N.C. Sea Grant, N.C. Division of Coastal Management, TBD
Outputs/Deliverables:	Comparative analysis of engagement approaches, focus group discussions, workshops, project summaries, asset mapping, risk & vulnerability assessments, recommendations for inclusion in risk and resiliency plans.
Outcomes:	Increase in the number of communities in the APNEP region that incorporate resilience into local planning processes.
FY2019-20 Cost:	$27,500 ($25,000 EPA Region IV Supplemental 320 Funding, $2,500 APNEP 320 funding)
Estimated Leverage:	At least $27, 500
CCMP Actions:	D3.3
CCMP Outcomes:	1a, 1b, 1d, 1e, 2a, 2b, 2c, 3a, 3b, 3c, 3d
CWA Core Programs Addressed:	(5) protecting wetlands, (6) protecting coastal waters through the National Estuary Program
EPA Element(s):	Healthy Communities, Direct Assistance

Progress to Date:

Through extensive coordination with tribal representatives, community leaders, and organizations including the N.C. Office of Recovery and Resiliency, APNEP developed a proposal which was approved by the Leadership Council in fall 2019 and the N.C. Commission of Indian Affairs in March 2020. A contract has been submitted to NC-CIA staff and Department of Administration, and a project coordinator has been interviewed in April 2020. Coordination is ongoing with subcontractors, including North Carolina State University (NCSU) and the Virginia Coastal Policy Center.

A workshop entitled “Listening to People of Land and Water: Native Nations and Coastal Resilience” was planned by project partner Dr. Ryan Emmanuel of NCSU and included APNEP staff

as a panelist at the March 2020 N.C. Indian Unity Conference, was but cancelled due to the COVID-19 outbreak. APNEP staff did continue with sponsorship and an exhibitor table at the conference.

FY2020-2021 Plans:

Estimated Cost: $0

Milestones: Once the contract has been approved, work can begin on the subcontracted activities listed below:

1) Spring-Summer 2020: Project coordinator hired by the N.C. Commission of Indian Affairs to oversee project coordination and management, including developing and scheduling a resilience workshop with tribal community representatives. Project coordinator will also convene the steering committee to refine the project proposal as needed;
2) Spring 2020: Researcher from NCSU to conduct an analysis of tribal engagement in climate and resilience planning efforts around the U.S.;
3) Assistance from the Virginia Coastal Policy Center with coordination with state agencies and tribal communities in Virginia;
4) Late Spring 2020: Plan resilience workshop with input from steering committee; and
5) Summer 2020: Host resilience workshop with tribal representatives.

These activities could be impacted due to travel restrictions associated with the COVID-19 virus. APNEP staff have contacted EPA about potentially extending the contract if work needs to be continued past the end of the federal fiscal year ending September 2020.

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.

Year(s):	Ongoing
Partners:	Varies
Outputs/Deliverables:	Event sponsorship.
Outcomes:	CCMP implementation, increased visibility and improved partner relationships.
FY2019-20 Cost:	$8,500
Estimated Leverage:	$30,000
CCMP Actions:	All
CCMP Outcomes:	All
CWA Core Programs Addressed:	All
EPA Element(s):	Healthy Communities, Direct Assistance

Progress to Date:

- 2019 Hyde, Seek, and Discover, Hyde County (Environmental education, ~120 K-5 students reached)
- 2019 Hyde County Environmental Education Field Day (Environmental education, ~60 K-5 students reached)
- 2019 SciREN Triangle, Raleigh (Tabling, ~50 teachers reached)
- 2019 N.C. Sea Grant Coastal Conference (Sponsorship, organized a technical session on Ecological Flows, ~100 people reached)
- 2020 SciREN Coast, Pine Knoll Shores Aquarium (Tabling, ~45 teachers reached)

FY2020-2021 Plans:

Estimated Cost: $6000

Milestones:

- 2020 Hyde, Seek, and Discover (Environmental education)
- 2020 SciREN Triangle (Tabling)
- 2020 National Estuaries Week Event
- 2021 SciREN Coast (Tabling)
- 2021 Water Resources Research Institute Conference (Sponsorship, Tabling)
- 2021 Coastal Envirothon (Environmental education)
- 2021 N.C. Oyster Summit (Tabling, Sponsorship)

Prioritizing Coastal Habitats and Carbon Resilience Project

Objectives: Support Atlantic coast states that are engaged in resilience planning and working to incorporate blue carbon into their climate mitigation plans.

Description: APNEP was invited to collaborate on a United States Climate Alliance (USCA) project to expand work led by Duke University for the NC-DEQ Natural and Working Lands sub-teams that were established to support N.C. Governor's Executive Order #80. The USCA grant was awarded in Winter 2019 and is a multi-state effort that includes APNEP partners in Virginia and other Atlantic coast states. The project involves spatial analysis to map and prioritize coastal habitats that store carbon, enhance resilience to coastal hazards, and support a variety of species.

Status:	In progress
Partners:	Duke University (Lead), NC-DEQ, N.C. Natural and Working Lands Workgroup, multiple agency and university partners
Outputs/Deliverables:	Spatial analysis, community pilot study (to be selected), workshops, report.
Outcomes:	Identification of priority areas for wetland protection and restoration that have carbon sequestration and resilience co-benefits.
FY2019-20 Cost:	Staff time
Estimated Leverage:	TBD
CCMP Actions:	A2.2, A2.3, B2.3, B3.1, C2.3, D3.3

CCMP Outcomes:	2a, 2b, 2c,3a, 3b, 3d
CWA Core Programs Addressed:	(5) protecting wetlands, (6) protecting coastal waters through the National Estuary Program
EPA Element(s):	Healthy Communities, Direct Assistance

Progress to Date:

- APNEP assisted NC-DEQ and NWL workgroup in writing support letters to the USCA for the project.
- APNEP facilitated connections with Virginia partners at Old Dominion University.
- APNEP invited Duke staff to present project information to the N.C. Coastal Resilience Community of Practice Group in March 2020.

FY2020-2021 Plans:

Estimated Cost: Staff Time

Milestones:

- Spring-Summer 2020: Participate in planning meetings.
- Summer-Fall 2020: Participate in prioritization workshops.

APNEP will continue its role of assisting the project team in making connections to scientists, restoration practitioners, resource managers, and communities working in coastal resilience and climate mitigation in N.C. and Virginia to ensure products reflect their feedback and priorities. APNEP staff will work through the Coastal Resilience Community of Practice Group and partners at VIMS to determine the feasibility of integrating the information into other data platforms hosted by partners (Green Growth Toolbox, VIMS NOAA NNBF study outputs, etc.)

Public Outreach: Digital and Print Media Development

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.

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 general 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.

Year(s):	Ongoing
Partners:	Varies
Outputs/Deliverables:	Regularly updated print and digital communications materials
Outcomes:	Increased understanding of the issues affecting the Albemarle-Pamlico region and awareness of APNEP's role in the region
FY2018-19 Cost:	Staff Time

Estimated Leverage: $300
CCMP Actions: All
CCMP Outcomes: All
CWA Core Programs Addressed: (4) addressing diffuse, nonpoint sources of pollution, (5) protecting wetlands, (6) protecting coastal waters through the National Estuary Program
EPA Element(s): Direct Assistance

Progress to Date:

In FY2018-2019, 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. In March 2019 APNEP launched a new website with an updated look, feel and content. This new website is mobile-friendly and designed to meet accessibility standards. APNEP has also developed an interactive ArcGIS Online-based map of 2012-2019 funded projects, with information about partnerships, funding amounts, and project details. This map is embedded prominently on the new APNEP website. APNEP staff also worked in 2019 to redevelop the Partnerships' Annual Work Plan to both better align it with EPA Guidance and to create a product that can serve as a public-facing document for those interested in APNEP's progress and plans.

FY2020-2021 Plans:

Estimated Cost: $2000
Milestones:

- Summer 2020: New printed materials complete (phase 1)
- Summer-Fall 2020: Assessment of need for other printed materials and success stories

APNEP will be continuing to improve and maintain its new website, including its GIS map of past projects and its Soundings blog. Social media platforms, e-newsletter, and other digital products will be updated on a consistent and ongoing basis. As needed, APNEP staff will develop digital and print materials to accompany and illustrate any State of the Sounds reports that are published in 2020 and 2021.

Shad in the Classroom

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 are able to 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 N.C. 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.

Year(s):	2011-Present
Partners:	N.C. Museum of Natural Sciences (Lead), US Fish and Wildlife Service, N.C. Wildlife Resources Commission, N.C. State University, East Carolina University
Outputs/Deliverables:	American shad fry released into the Neuse River in conjunction with USFWS and N.C.WRC restoration efforts, ~30 educators/year trained on rearing and releasing American shad, 1000+ students participating/year.
Outcomes:	Increased community involvement in water quality and habitat protection.
FY2019-20 Cost:	$ 20,000
Estimated Leverage:	$ 11,000
CCMP Actions:	D2.1, D2.2, D2.3
CCMP Outcomes:	1a, 1b, 1c, 1d, 1e, 2a, 2b, 2c, 3b
CWA Core Programs Addressed:	(4) addressing diffuse, nonpoint sources of pollution, (5) protecting wetlands, (6) protecting coastal waters through the National Estuary Program
EPA Element(s):	Trainings, Direct Assistance

Progress to Date:

Shad in the Classroom reaches over 1,000 students each year through 20-30 classrooms that participate in the program. This initiative has consistently grown since its inception, with demand that outstrips the program's capacity to accommodate additional classroom participation. The limiting factor for the program's growth is staff capacity - currently, the program is coordinated by one part-time N.C. Museum of Natural Sciences staff member and it has reached the limits of that person's ability to manage the program. APNEP's funding supports the salary of this staff member, and in addition APNEP staff provide assistance with egg deliveries to schools and shad release day events.

American shad were chosen as the fish species for the program because they have cultural and historic importance in eastern North Carolina and there are active efforts by the N.C. Wildlife Resources Commission to restore their populations in the Roanoke and Neuse river basins. While Shad in the Classroom does not contribute significantly to population restoration efforts, it raises awareness about the issue.

Program outputs (2009-2019) include:

- 247 classrooms reached
- 16,145 students reached (2013-2018)
- 100% positive evaluation of workshops and overall program
- Growth of program from 13 classrooms in 2010 (pre-APNEP funding) to 32 classrooms in 2019
- 30 N.C. counties participating in the program (21 in APNEP region)

FY2020-2021 Plans:

Estimated Cost: $20,000

Milestones:

- April-June 2020: Due to school and field trip closures as a result of the Covid-19 pandemic, in-person activities for Shad in the Classroom were cancelled for 2020. In lieu of in-person activities, the Shad in the Classroom Coordinator completed data entry and evaluation of results from previous years' student pre- and post- surveys. The coordinator also purchased needed materials for 2021 Shad in the Classroom and reevaluated program materials.
- July-September 2020: Communication with interested teachers for 2021 program. Data entry and analysis of student survey.
- October-December 2020: Applications distributed, supplies inventoried, tanks retrieved and/or refurbished, planning for 2021 season begins.
- January-March 2021: Applications reviewed, teachers selected, supplies purchased, teacher training session scheduled and facilitated, shad weeks scheduled with USFWS, N.C. WRC, classrooms, and extension educational activities coordinated.
- April-June 2021: Shad delivered to classrooms, raised, and released. Extension education activities coordinated. Hatchery field trip for teachers. Evaluations returned from classrooms and summary of program completed.

The Shad in the Classroom program plans to continue in spring 2021 as it had in 2019.

Summer Teacher Institute

Objectives: Increase teacher knowledge of watershed science, provide resources to teach watershed science, and increase teacher confidence in utilizing immersive, hands-on, inquiry-based, and outdoor-focused curricula in their classrooms.

Description: Since 2004, APNEP has worked with partner organizations to offer a multi-day professional development opportunity for teachers in the Albemarle-Pamlico region that focuses on the development of skills and knowledge in environmental education methods that support teachers in integrating the outdoors into their curricula. This experience varies each year depending on identified topic and grade level needs but includes curriculum training in earth and environmental sciences with hands-on activities, site visits, and specific content to support inquiry, experiential, and research-based instruction on estuarine and watershed resources. Teachers are able to participate in authentic outdoor learning experiences, including exploration of maritime forest, estuary, and salt marsh ecosystems.

Year(s):	2004 - Present
Partners:	UNC Institute for the Environment (Lead), N.C. Museum of Natural Sciences, North Carolina Coastal Federation, EPA, N.C. Sea Grant, N.C. Aquariums
Outputs/Deliverables:	Approximately 25 teachers trained in hands-on, outdoor environmental education, water quality, and watershed curricula.

Outcomes:	Increased use of environmental education curricula in North Carolina schools.
FY2019-20 Cost:	$ 20,000
Estimated Leverage:	$ 11,000
CCMP Actions:	D2.1, D2.2, D2.3
CCMP Outcomes:	1a, 1b, 1c, 1d, 1e, 2a, 2b, 2c, 3b
CWA Core Programs Addressed:	(4) addressing diffuse, nonpoint sources of pollution, (5) protecting wetlands, (6) protecting coastal waters through the National Estuary Program
EPA Element(s):	Trainings, Direct Assistance

Progress to Date:

UNC Institute for the Environment is the longtime facilitator of this institute, and in 2017 and 2018 incorporated the summer institute into a year-long professional development program called ExPLORE North Carolina. that targeted 4th and 5th grade teachers. Both the Teacher Institute and larger ExPLORE North Carolina program showed educators how to utilize place- and inquiry-based learning strategies to help students learn about North Carolina's rivers, coasts, and watersheds. The main themes of the program are (1) learning from the headwaters to the ocean, (2) involvement of scientists and experts, and (3) integration of new and existing instructional materials/environmental education resources.

From 2012-2018, 145 4th-12th grade teachers were reached through the program (approximately 20 teachers/year) and:

- Through these educators, over 60,000 students have been indirectly reached since 2012
- These educators have come from 19 counties in the APNEP region and 47 counties in North Carolina overall

The ExPLORE N.C. program (2017-2018) had up to 50 contact hours per teacher per year.
Outcomes from pre/post surveys showed:

- Increased knowledge of local ecosystems and watershed science
- Increased confidence in using the outdoors to teach required curriculum
- Increased science teaching and outdoor science teaching self-efficacy beliefs
- Increased awareness and use of local environmental education resources

Other outcomes:

- Teacher knowledge of/enrollment in the N.C. Environmental Education Certification Program
- Creation of outdoor classrooms
- Increased knowledge of and enrollment in other environmental education professional development opportunities
- Seeking grant funding to improve outdoor/ environmental education resources

FY2020-2021 Plans:

Estimated Cost: $20,000

Milestones:

- July 2020: Summer Teacher Institute takes place
- March 13, 2021: Applications due for 2021 Summer Teacher Institute

- July 2021: Summer Teacher Institute takes place

The 2020 Summer Teacher Institute, *At Water's Edge*, is currently scheduled for July at the Trinity Center in Salter Path, N.C. unless any changes in UNC event and travel policies occur due to Covid-19. Content and activities are aligned with the N.C. Essential Standards for 8th Grade Science, Earth/Environmental Science, and AP Environmental Science. At Water's Edge Webpage

Virginia-North Carolina Memorandum of Understanding Implementation

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

Description: In 2017, APNEP facilitated the development and signing of a Memorandum of Understanding (MOU) between the NC-DEQ, NC-DNCR, and Virginia Secretary of Natural Resources to foster interstate collaboration within the Albemarle-Pamlico region that will increase management for healthy ecosystems and communities. The MOU replaces an earlier version signed in 2001.

Year(s):	2017 - present
Partners:	NC-DEQ, NC-DNCR, Virginia Secretary of Natural Resources
Outputs/Deliverables:	New partnerships and activities in Virginia and N.C. focused on protecting and restoring the region.
Outcomes:	Increased capacity to implement CCMP.
FY2018-19 Cost:	Staff Time
Estimated Leverage:	TBD
CCMP Actions:	All
CCMP Outcomes:	All
CWA Core Programs Addressed:	(2) identifying polluted waters and developing plans to restore them, (4) addressing diffuse, nonpoint sources of pollution, (5) protecting wetlands, (6) protecting coastal waters through the National Estuary Program
EPA Element(s):	Healthy Communities, Direct Assistance

Progress to Date:

The MOU has assisted NC-DEQ, NC-DNCR, and Virginia Secretary of Natural Resources in coordinating with APNEP to improve the water quality and ecological health of the states' shared river basins flowing into Albemarle Sound. The MOU specifically calls for tackling regional issues such as nonpoint source pollution, restoring fish passage and spawning habitat, and controlling invasive species. Agencies have also explored opportunities to assist regional, and local governments in incorporating climate change and sea level rise considerations into their planning processes.

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

- **Coastal Wetlands Protection**:

  - Staff participated in a survey conducted by an EPA contractor to provide information for a "Discovery for Coastal Wetlands Demonstration Partnership in Albemarle-Pamlico Sounds," one of three coastal locations chosen nationally to inform the federal Interagency Coastal Wetlands Workgroup about potential opportunities for federal-local partnerships. APNEP connected the contractor with partners and informed them of regional projects and initiatives of interest. The analysis included opportunities to protect and restore coastal wetlands in the shared waterways of APNEP region.
  - Staff worked with VIMS to submit a wetlands protection proposal in response to a request from DEQ about a potential funding opportunity and from the US Climate Alliance. The proposal had previously been submitted for an EPA grant but was not funded.
- **Coastal Resilience:**
  - Staff provided information to EPA staff in headquarters and regions 3&4 to advocate for consideration of the Albemarle-Pamlico watershed region for a proposed federal interagency resiliency pilot project, and funding opportunity to build a federal regional resilience toolkit in 2019. The Portsmouth, Virginia area, just outside of the APNEP region, was chosen for the pilot.
  - **Using Natural and Nature-Based Features to Build Resilience to Storm-Driven Flooding**: More information can be found within the detailed description of this project in the continuing projects section.
- **City of Virginia Beach Coordination:** Staff continued coordination with Virginia Beach city staff and partners, building on relationships developed during planning for the 2018 North Landing River / Albemarle Sound Ecosystem Symposium. Staff were invited to participate in a forum hosted by Councilwoman Barbara Henley in August 2019 to discuss options to mitigate flooding in the city, including the southern watershed.
- **Back Bay Restoration Foundation:** staff connected with the newly revitalized BBRF Director, staff, and board members to discuss opportunities for coordination and collaboration.
- **Stewards of the Southern Watersheds Workshop:** staff assisted in planning this workshop with Lynhaven River NOW, Back Bay National Wildlife Refuge, and False Cape State Park as described in more detail elsewhere in this report.

FY2020-2021 Plans:

Estimated Cost: Staff Time

Milestones:

- APNEP will continue working with partners and stakeholders in 2020-2021 to evaluate the feasibility in North Carolina of applying the local government tools developed for the VIMS "Natural and Nature-Based Features" project and will complete a report for the project team by July 2020.
- APNEP has drafted a concept proposal for a Governor's Agreement and will continue to engage with partners to identify areas of focus for project implementation moving forward. The Leadership Council identified this as a priority task during the January 2020 strategic planning meeting. As of April 2020, a draft was being reviewed by both North Carolina and Virginia senior environmental officials.

- APNEP staff are exploring ways to integrate the actions identified through the E.O. 80 process into MOU implementation and will be participating in an interstate team under the USCA grant described elsewhere in this document.
- APNEP staff are coordinating with partners from Lynnhaven River *NOW* who worked to introduce a resolution through the Virginia legislature in January 2020 directing the Virginia Department of Environmental Quality to conduct a study of the Albemarle-Pamlico Watershed in Virginia. The proposed study includes collecting and analyzing land use and demographic data, water quality, water management, impacts from storms, and data on key species of flora and fauna. APNEP has proposed utilizing the MOU to assist with this effort.
- **Albemarle Chowan Watershed Roundtable**: As of March 2020, efforts are underway to revitalize this group, which has been inactive since 2017. APNEP staff have committed time and assistance to partners at the Chowan Soil and Water Conservation District and Natural Resources Conservation Service to help with coordination as needed. Tasks could include meeting facilitation and logistics, development of outreach and print materials, and assistance with grant writing to secure Virginia based 319 funding set aside for the Southern Watersheds.

Monitor: Estuarine System Status and Trends

Integrated Monitoring Plan & Ecosystem Indicator Development

Objectives: Facilitate the development and implementation of an integrated monitoring network through the guidance of regional monitoring and assessment teams, to 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, 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 to be included in the final APNEP Monitoring Plan.

Year(s):	2017 - Present
Partners:	See list of members on each Monitoring and Assessment Teams
Outputs/Deliverables:	List of indicators and metrics for the Albemarle-Pamlico region, Monitoring Plan.
Outcomes:	Improved understanding of the status and trends of Albemarle-Pamlico estuarine system, detection of environmental changes in support of CCMP implementation.
FY2019-20 Cost:	Staff Time
Estimated Leverage:	$2,441
CCMP Actions:	E1.1, E1.2, E1.3, E2.1, E2.2
CCMP Outcomes:	1a, 1b, 1c, 1d, 1e, 2a, 2b, 2c, 3a, 3b, 3c, 3d
CWA Core Programs Addressed:	(6) protecting coastal waters through the National Estuary Program
EPA Element(s):	Healthy Communities, Direct Assistance

Progress to Date:

In 2017, APNEP convened seven Monitoring and Assessment Teams to develop 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. By the start of 2019, each Team 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 STAC and Leadership Council approval in the interim, by early 2020 staff was developing a proof-of-concept Monitoring Plan whose initial scope was limited to coastal SAV and estuarine water quality that impacts coastal SAV.

FY2020-2021 Plans:

Estimated Cost: TBD

Milestones:

- June 2020: Initial drafts of (1) ecosystem indicators and integrated monitoring framework, and (2) ecosystem monitoring plan for coastal SAV and coastal water quality parameters that impact coastal SAV.
- October 2020: Final draft monitoring framework and plan, possibly featuring a more complete set of APNEP ecosystem outcome indicators (EOIs), stressor, and/or management indicators. Ready for Management Conference review.
- December 2020: Approved monitoring framework and plan.

Recreational Water Quality Monitoring

Objectives: Monitor and test bacterial concentrations in coastal recreational waters, to 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.

Year(s):	2014 - Present
Partners:	NC-DMF
Outputs/Deliverables:	Enterococci bacteria data for approximately 30 recreational water quality testing sites.
Outcomes:	CCMP Implementation, integrated monitoring strategy.
FY2019-20 Cost:	$ 9,000 (extended and renewed for another year), total $18,594
Estimated Leverage:	$ 283,000
CCMP Actions:	D2.3, E1.1, E2.1, E2.2
CCMP Outcomes:	1a, 1b, 1c, 1d, 1e, 2a, 2b, 2c, 3a, 3b, 3c, 3d
CWA Core Programs Addressed:	(4) addressing diffuse, nonpoint sources of pollution, (6) protecting coastal waters through the National Estuary Program
EPA Element(s):	Water Quality, Healthy Communities

Progress to Date:

In 2014 the APNEP Policy Board (now Leadership Council) directed the Partnership to provide bridge funding for the NC-DMF Recreational Water Quality Monitoring Program after funding for the program from the U.S. EPA was decreased. Since then, funding from APNEP has assisted NC-DMF in its recreational water quality monitoring efforts for 30 sites in the Albemarle-Pamlico region, 20 of which are located at public beaches or near popular summer camps. The continuation of monitoring at these sites protects public health and ensures that a long-term data collection effort is continued. Monitoring data from these sites provides a continuous, long-term dataset to study trends in water quality within these estuarine areas.

FY2020-2021 Plans:

Estimated Cost: $9,600

Milestones:

- A new contract began on October 1, 2019 with a total of 27 APNEP swimming sites sampled 19 times throughout the year. Three sites were sampled 31 times throughout the year.
- Sampling will be weekly during the swimming season and all water quality data will be available on the NC-DMF website as soon as sample analysis is completed.

NC-DMF will continue routine water quality monitoring within the Albemarle-Pamlico watershed. APNEP will continue to fund NC-DMF's Recreational Water Quality Monitoring Program in FY2020-2021. The funding amount or number/type of stations monitored is unchanged.

Coastal Submerged Aquatic Vegetation Mapping and Monitoring

Objectives: Monitor and map the extent and density 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.

Year(s):	2005 - Present
Partners:	East Carolina University, NOAA, NC-DMF, N.C. National Estuarine Research Reserve, N.C. Department of Transportation, N.C. Division of Water Resources, UNC-Wilmington, U.S. NRCS
Outputs/Deliverables:	Coastal SAV extent and density maps; report on status and trends of this resource
Outcomes:	New information for decision-makers
FY2019-20 Cost:	$49,717
Estimated Leverage:	$25,000
CCMP Actions:	A1.1, E1.1, E2.1
CCMP Outcomes:	1a, 1b, 1c, 1d, 1e, 2a, 2b, 2c, 3a, 3b, 3c, 3d
CWA Core Programs Addressed:	(6) protecting coastal waters through the National Estuary Program
EPA Element(s):	Living Resources, Direct Assistance

Progress to Date:

Since 2006, 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 underwater grasses and trends in their overall extent and density. Monitoring coastal SAV is

important because among other benefits it serves 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 flights from 2006 through 2008, as well as a second map based on data from 2013 through 2014 and published in 2019. APNEP began acquiring new imagery in 2019 for a third mapping cycle.

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.

FY2020-2021 Plans:

Estimated Cost: $0

Milestones:

- The SAV Team will use the 2006-2008 and 2013-2014 data to produce a metric report on the status and trends of high-salinity SAV extent and cover class. 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.
- Development of a coordinated SAV monitoring strategy.
- Continued Sentinel Network monitoring in established stations, expansion of stations into low-salinity (Currituck Sound and Back Bay) and high-salinity waters.
- SAV flights in 2021 and interpretation of aerial images to produce third-generation map.

Swim Guide Citizen Science Program

Objectives: By organizing this community-oriented, volunteer-driven water monitoring program, Swim Guide helps to empower Eastern North Carolina residents to participate in stream monitoring, be active in restoration, and to be informed of potential environmental health concerns.
Description: APNEP funds Sound Rivers, Inc. to initiate *Swim Guide*, a regional, citizen science water quality monitoring program. Swim Guide fills a void in water quality monitoring by identifying sites on the Neuse and Tar-Pamlico rivers not currently monitored by the NC-DMF Recreational Water Quality Program (see above). Swim Guide engages and educates the community, helps to identify sources of bacteria pollution, and notifies the public of health concerns when using the Neuse and Tar-Pamlico rivers and streams.

Year(s):	2018-Present
Partners:	Sound Rivers
Outputs/Deliverables:	Monitoring equipment, sampling supplies, funding for intern stipends, training for citizen science volunteers.

Outcomes:	Monitoring data, increased understanding of water quality issues in eastern North Carolina, increased community knowledge and engagement
FY2019-20 Cost:	$ 9,500
Estimated Leverage:	$14,304
CCMP Actions:	D1.1, D2.1, D2.3, D3.1, E1.3
CCMP Outcomes:	1a, 1b, 1c, 1d, 1e, 2a, 2b, 2c, 3a, 3b, 3c, 3d
CWA Core Programs Addressed:	(4) addressing diffuse, nonpoint sources of pollution, (6) protecting coastal waters through the National Estuary Program
EPA Element(s):	Healthy Communities, Water Quality

Progress to Date:

In 2018, Swim Guide volunteers who monitored the Tar-Pamlico found that on average, sites did not exceed the U.S. EPA bacterial standard 74% of the time. The overall bacteria levels in the Lower Neuse was slightly lower, with samples not exceeding the standard 89% of the time. Of the sampling sites with routinely high bacteria levels, all were located on the Trent River.

Through the Swim Guide program, Sound Rivers was able to engage with thousands of members of the public each week through posting results and volunteer efforts. Other reported metrics included:

- Number of social media views/week: 101
- Number of website/App views: 66,031
- Number of volunteers trained: 26
- Number of television/print media stories: 6
- Weekend water report video views: 19,802
- Number of text alert subscribers: 322

FY2020-2021 Plans:

Estimated Cost: $4,500

Milestones:

- Summer 2020: Swim Guide program commences.

NEW PROJECTS 2020-2021

The following projects and activities detailed in the previous section are proposed for October 1, 2020 through September 30, 2021 to continue to guide, support, and implement the 2012-22 CCMP and the APNEP mission.

Undesignated CCMP Implementation Projects

(ongoing undesignated category with new projects approved by Management Conference)
Objectives: Targeted CCMP Implementation Projects.
Description: APNEP staff and Leadership Council will work with the Advisory Committees, associated Teams and partners to identify projects that need financial support or administrative support from APNEP for CCMP implementation. A group composed of the Leadership Council and Science and Technical Advisory Committee will evaluate requests and administer the funding for priority projects and activities. In addition to the currently unallocated funds noted here, a total of $64,600 has been allocated to ongoing projects for the upcoming fiscal year (see "Ongoing Projects" section for details). These projects may include: APNEP-North Carolina Sea Grant Fellowship, APNEP printed materials, and support for projects that align with APNEP priorities and CCMP implementation.

Partners:	To be determined by project or activity
Outputs/Deliverables:	Partnership building, CCMP implementation
Outcomes:	CCMP implementation
FY2020-21 Cost:	$ 20,000
Estimated Leverage:	$ 20,000
CCMP Actions:	TBD
CCMP Outcomes:	TBD
CWA Core Programs Addressed:	TBD
EPA Element(s):	TBD

SUPPLEMENTAL PROJECTS (NON-320 FUNDS)

APNEP Estuarine Work Boat

Objectives: Purchase and utilize new work boat.

Description: APNEP purchased a new Bateau 23-foot power boat, motor and trailer with the purpose of increased capabilities to conduct field work by APNEP staff and partners to assist with SAV ground truthing, water quality sampling, and other watershed needs. The challenge of conducting operations within 3,000 square miles of Sounds waters necessitates the need to have one boat stationed in the north and one stationed in the south. State funds were appropriated to cover the purchase.

Status:	Complete
Partners:	NC-DEQ
Outputs/Deliverables:	Boat to be delivered to NC-DEQ before July 1, 2019
Outcomes:	Sampling boat will be housed in the southern reaches of the watershed and used for ground truthing and monitoring.
FY2019-20 Cost:	$43,118 (Provided by NC-DEQ)
Estimated Leverage:	$ TBD
CCMP Actions:	B2.2, C3.3, E1.1
CCMP Outcomes:	2a, 2b, 2c, 3a, 3b, 3c, 3d
CWA Core Programs Addressed:	(6) protecting coastal waters through the National Estuary Program
EPA Element(s):	N/A

Accomplishments and Deliverables:

Both APNEP's older 19-foot work boat and this new work boat have been utilized by APNEP and N.C. Coastal Reserve/National Estuarine Research Reserve staff for ongoing field work needs, including SAV ground truthing, marine debris cleanup and transport of volunteers for the Rachel Carson Reserve.

Sentinel Network Monitoring of Submerged Aquatic Vegetation in Roanoke and Neuse River Watersheds (North Carolina)

Objectives: Obtain multiyear baseline data for assessing low-salinity coastal SAV status and trends in two sub-regions of an SAV sentinel network.

Description: In 2016, APNEP received $75,000 in grant funding from the National Fish and Wildlife Foundation to support the development of SAV as a primary indicator of ecological condition for waters within the Albemarle-Pamlico region. The need to document the effectiveness of implementing CCMP actions through ecological indicator monitoring makes SAV monitoring a priority. This project, conducted in partnership with East Carolina University, will contribute to a multiyear baseline of coastal SAV status and trends in two sub-regions of a SAV sentinel network that is planned for the entire Albemarle-Pamlico estuarine system.

Status:	Completed

Partners:	East Carolina University
Outputs/Deliverables:	Sentinel station monitoring data for use in ecosystem assessment (technical) and environmental indicator report card (non-technical).
Outcomes:	Information from this project increases our understanding of factors controlling SAV distribution and abundance.
FY2019-20 Cost:	Staff Time
Estimated Leverage:	$75,000
CCMP Actions:	E1.1, E1.2, E2.1, E2.2
CCMP Outcomes:	1a, 1b, 1c, 1d, 1e, 2a, 2b, 2c, 3a, 3b, 3c, 3d
CWA Core Programs Addressed:	(6) protecting coastal waters through the National Estuary Program
EPA Element(s):	Living Resources, Habitats

Accomplishments and Deliverables:

SAV in the Neuse River and Albemarle Sound showed variable changes during the survey period. There was a noticeable decline of SAV at multiple sentinel sites. In particular, there was a loss of SAV near Edenton, N.C. (AS-SS-04) since 2015, with a decline of 37 hectares of SAV by 2018. Another site near New Bern, N.C. on the Trent River (NR-SS-07) also showed a complete decline of SAV from 2018-2019. However, the extent of SAV at sentinel site at Kitty Hawk Bay (AS-SS-01) has grown and shrunk during five years of surveys. The SAV at Kitty Hawk Bay appears to be increasing in area covered by SAV, with some decline in biovolume of SAV from 2015 to 2019. Further analysis of these data is required to examine this change and causes for these observed declines, which may be due to increasing turbidity (shallower Secchi depths) and increases in salinity in the sounds. Finally, other causes of these declines in SAV, such as increases in algal blooms (an extensive bloom was observed during visit to AS-SS-04 during 2018, and SAV was totally absent in the survey that year), should be investigated in the future.

Water Level Monitoring Stations

Objectives: Establish three water-level monitoring stations within the Albemarle-Pamlico watershed.

Description: Each station is also equipped with meteorological monitoring equipment and maintained by N.C. 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.

Status:	Complete
Partners:	NC-DEQ, N.C. Department of Emergency Management, N.C. Department of Transportation, U.S. FWS

Outputs/Deliverables:	Flood gauge installation with monitoring equipment to include water level sensor, multi-weather parameter sensor, cellular transmission, battery/solar charging system and geodetic control monuments. Data collected will be analyzed and a flood inundation library will be developed.
Outcomes:	An interactive FIMAN will be produced with real times storm surge information that will be used to inform local communities of flood inundation risk.
FY2019-20 Cost:	$80,000 (Provided by N.C. DEQ)
Estimated Leverage:	$120,000
CCMP Actions:	B2.3, C2.3
CCMP Outcomes:	2a, 2b, 3a, 3b, 3d
CWA Core Programs Addressed:	(5) protecting wetlands, (6) protecting coastal waters through the National Estuary Program
EPA Element(s):	Healthy Communities, Direct Assistance

Accomplishments and Deliverables:

APNEP contracted with N.C. Department of Emergency Management to install three water-level monitoring stations in the Albemarle-Pamlico region's coastal plain. Two gauges are located in Hyde County, and one in Currituck County.

2019 SAV Aerial Images and Analysis

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

Description: In 2019 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 N.C. Department of Transportation acquired aerial imagery submerged aquatic vegetation. The NC-DMF will provided the photo interpretation and ground truthing necessary to analyze the photographic data.

Status:	In progress
Partners:	N.C. Department of Transportation, NC-DMF, NC- DEQ
Outputs/Deliverables:	2019-20 Map of high-salinity SAV extent and density
Outcomes:	Data verified map of SAV through the APNEP region. The map will be used for protection of vital SAV habitat and also the restoration of SAV habitat.
FY2019-20 Cost:	$130,000 (Provided by NC-DEQ)
Estimated Leverage:	$50,000
CCMP Actions:	B2.2, C3.3
CCMP Outcomes:	2a, 2b
CWA Core Programs Addressed:	(6) protecting coastal waters through the National Estuary Program
EPA Element(s):	Living Resources, Habitats

Progress to Date:
Unfortunately, the 2019 images were impacted by poor water clarity in a number of areas and thus images will be acquired in spring 2020 under APNEP 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

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 in order to create a water budget for the northern Albemarle-Pamlico peninsula.

Description: The N.C. 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 N.C. Division of State Parks and U.S. FWS 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.

Status: Proposed; funding not anticipated in the near future due to Covid-19 and state budget issues. APNEP submitted a proposal for funding from the Water Resources Development Grant fund and was notified in May 2019 that the project was recommended for funding. However, due to a NC-DEQ legal policy change APNEP could not serve as the grant administrator. In partnership with Washington and Tyrell counties, APNEP resubmitted the grant application designating Washington County as the grant recipient during the Fall 2019 cycle. The grant awards are currently on hold pending passage of the state budget. APNEP has been working with project partners to refine estimates for match funding and potential partners that have the capacity to conduct the water budget and modeling work. APNEP will work with the county managers to create a Memorandum of Agreement that specifies roles and responsibilities amongst APNEP, county staff, and other partners if the grant is awarded.

Partners:	NC-DEQ, N.C. Department of Agriculture and Consumer Services, Washington County, N.C. Division of State Parks, U.S. FWS, N.C. Cooperative Extension
Outputs/Deliverables:	Engineering and feasibility study to evaluate flood risk and future planning needs, stakeholder engagement process, scenario-based models and visualization, interactive stakeholder engagement tools such as augmented reality sandboxes, web-based maps and data portals.
Outcomes:	Water budget for Washington County, basis for development of collaborative regional water management strategies
FY2020-21 Cost:	$200,000 (Requested from the WRDG)
Estimated Leverage:	$424,547
CCMP Actions:	A3.1, B2.3, C2.3
CCMP Outcomes:	2a, 2b, 3d
CWA Core Programs Addressed:	(5) protecting wetlands
EPA Element(s):	Healthy Communities, Direct Assistance, Water Quality, Habitats, Living Resources

ADMINISTRATION & PROGRAM IMPLEMENTATION

PROGRAM ADMINISTRATION

APNEP staff is responsible for the coordination, planning, and successful completion of partnership functions, including Management Conference and Action Team meetings, APNEP forums, and other APNEP-sponsored/partner events. In addition, staff monitor and often becomes involved in activities of federal and state resource management agencies that relate to CCMP implementation, APNEP mission, and the Albemarle-Pamlico estuarine system. Additional interactions occur with local and regional governments as appropriate. Staff also attend meetings, conferences, and workshops in order to stay apprised of technological advancements that may prove beneficial in the APNEP region and the partnership. Although the Leadership Council and Advisory Committees are instrumental in identifying local environmental issues and prioritizing management actions within each basin, most management actions are implemented by various federal, state, and local agencies on a local, basin-wide, regional, or statewide basis and require staff involvement and interactions.

Host Entity

The North Carolina Department of Environmental Quality currently serves as the host entity for the Office and the partnership. The Office was moved to NC-DEQ's Office of the Secretary in March 2018. The Department is responsible for assisting with administrative and fiscal management of the APNEP-U.S. EPA cooperative agreement, which provides federal funds for APNEP. The Department's efficiency of operation and support of the Management Conference plays a key role in the success of APNEP, including assisting in the administration of the cooperative agreement and other funding sources.

Administrative Costs

Overall administration costs under the federal grant during FY2020-21 are estimated at approximately $476,551 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. Temporary employees added for contract or specific project support will be paid under the budgeted amount for the project.

Indirect Costs

Under the FY2020-21 *Draft Negotiated Indirect Cost Agreement* between NC-DEQ and the U.S. EPA, indirect rate is 15.7% of all salaries supported by this federal grant. Estimated indirect costs will be $57,949 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 N.C. DEQ Headquarters. This site houses the Director, Program Scientist, Program Manager, Policy and Engagement Manager, Quantitative Ecologist, and Communications and Outreach Specialist. The APNEP field office in Washington, N.C. houses the Coastal Habitats Coordinator. The Watershed Manager is collocated with the National Estuarine Research Reserve at the NOAA Laboratory in Beaufort, N.C.. The Virginia Department of Environmental Quality also provides personnel to support CCMP implementation, however this position (currently vacant) is not covered under

program administration as it occurs at no additional cost to the program. *All positions are administered in compliance with N.C. Office of State Personnel rules and policies.*

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 general 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 U.S. EPA §320 Grant and coordinates and manages APNEP contracting and associated activities within NC-DEQ. 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.

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.

Communications and Outreach Specialist
The Communications and Outreach Specialist coordinates APNEP's digital and print communications efforts, as well as managing the Partnership's education and outreach initiatives. The position also supports field/boat-based work with APNEP and its partners. Kelsey Ellis served as Program Associate in this role from May 2017 to September 2018, and as Communications and Outreach Specialist from September 2018 until the present.

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 the program's GIS functions. Dr. Tim Ellis has served in this role since March 2017.

Coastal Habitats Coordinator (Non-federal Match)
This position serves 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 CHPP with three N.C. Commissions: Coastal Resources, Marine Fisheries, and Environmental Management. Jimmy Johnson has served in this role since January 2006. *This position is funded by NC-DEQ and provides a portion of the non-federal match for the* CWA §320 *grant funds.*

Watershed Manager (Non-federal Match)
The primary purpose of this position is to assist APNEP in CCMP implementation. The position supports support to APNEP advisory committees and workgroups and monitoring and assessment efforts. The position works cooperatively with the N.C. National Estuarine Research Reserve in Beaufort, N.C.. Additionally, the position also works towards implementation of the CHPP with the APNEP Coastal Habitats Coordinator. Trish Murphey has served in this role since January 2018. *This position is funded by N.C.DEQ and provides a portion of the non-federal match for the* U.S. EPA §320 *grant funds.*

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 general public and of environmental and public interest organizations, business or industry representatives, academicians, 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 work plan 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.

2019-20 Travel

APNEP staff attended a number of meetings and conferences using the allotted travel funds and specific project funds or administration costs. 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	10/1/18 to 9/ 30/19	Routine Program Activities/ meetings/ projects/ workshops/ conferences/ fieldwork/ MC meetings	APNEP area	10,00
K. Ellis	9/19	Fall NEP Meeting	Delaware	2,000
			Total*	$ 12,000

**Estimated to September 30, 2019*

2020-21 Projected Travel

All travel is allocated into three categories: In-State, Out-of-State, and U.S. EPA Required. All travel, including non-staff travel, must be consistent with published NC-DEQ travel policies (2018) and regulations. Due to the dynamic nature of the Partnership, all travel cannot be scheduled a year ahead: therefore, only an estimate can be provided based on established NC-DEQ rates (below).

Some travel is associated with specific projects, and travel costs are included in budgeted amounts. Rates are listed in the table below.

Funds will also be used for light refreshments and/or meals served at meetings, conferences, training workshops, and outreach activities (events) projects and contracts, consistent with 41 CFR 301-74.7, and as approved by the APNEP Director and through the NC-DEQ travel approval processes.

NC-DEQ TRAVEL RATES*

Item	In-State	Out of State	Overnight Trip	Day Trip
Breakfast	$ 8.60	$ 8.60	Depart Office before 6:00 AM	Depart before 6:00 AM; Extend workday by 2 hours
Lunch	$ 11.30	$ 11.30	Depart Office by 12:00 Noon; Overnight return after 2:00 PM	NA
Dinner	$ 19.50	$ 22.20		Depart before 5:00 PM; Return after 8:00 PM; Workday extended by 3 hours
Hotel	$ 75.10	$ 88.70		NA

**April 2020 rates,* Albemarle-Pamlico *coastal area often exceeds posted hotel rates*

In State:

In-state travel is primarily for APNEP staff to conduct routine business associated with daily operations, field work, staff training or topical meetings germane to the Partnership. It may also cover non-staff for APNEP business (i.e., board and committee members, guest speakers, and experts). Funds are also used to cover meetings as allowed under the NC-DEQ travel guidance. Rates are listed above.

EPA-NEP Associated Out-of-State:

The NEPs generally hold two national meetings each year (these may be in same fiscal year or not). Each program is strongly encouraged to participate in the meetings. The spring meeting is held in the Washington, DC area and the fall meeting is hosted by one of the 28 NEPs. The level of staff participation will vary depending on the agenda for a particular meeting. Generally, one or two staff members attend. Travel may also cover non-staff (e.g., Leadership Council or Advisory Committee members).

Other Out-of-State:

Out-of-state travel is primarily for APNEP staff to conduct business associated with the NEP general meetings (see above), and to attend training or topical meetings germane to the Partnership. It may also cover non-staff (e.g., council and committee members, guest speakers, experts) for NEP-related activities.

2020-21 Projected Travel (320 Funds)

Personnel	Date	Purpose	Location	Estimated Cost
APNEP Staff, Management Conference, and Volunteers	10/2020 – 9/2021	Normal program activities	Albemarle-Pamlico region	$8,000
APNEP Staff	10/2020 – 9/2021	EPA/NEP National Fall Meeting	TBA	$2,000
APNEP Staff	10/2020 – 9/2021	EPA/NEP National Spring Meeting	Washington, DC	$2,000
				$12,000

NON-FEDERAL COST-SHARE (MATCH)

Summary of Match Requirements

As Partnership host (grant applicant), NC-DEQ intends to provide $662,500 for the required 1:1 non-federal matching funds from October 1, 2020 to September 30, 2021. This match will be provided through:

Summary of Non-federal State Match

In-kind Positions (salaries and benefits)	$ 194,884
Water Quality Improvement Project(s) Expenditures:	$ 467,616
TOTAL:	**$ 662,500**

1) **In-kind Services**: NC-DEQ intends to provide $194,884 as part of the required 1:1 non-federal match for federal fiscal year October 1, 2020 to September 30, 2021. 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.

2) **In-kind Project Expenditures Non-federal Match:** The NC-DEQ intends to provide $467,616 as part of the 1:1 non-federal match for federal fiscal year October 1, 2020 to September 30, 2021. 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.

2019-20

During the 2020 federal fiscal year (October 1, 2019 - September 30, 2020), 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 2019 to the EPA *NEPORT* database for 2019 federal fiscal year (October 1, 2018 to September 30, 2019): total leverage was $15.80 for every dollar provided by the U.S. EPA §320 grant, with $9 of that significantly tied to direct APNEP efforts with partners.

2020-21

In 2020-21, APNEP will continue to seek additional avenues for collaborating with various partners to assist in targeting funds to support CCMP implementation actions and the Partnership mission. Where possible, APNEP will actively seek additional sources of funding for APNEP activities and projects to support CCMP goals. We will maintain our goal of 8:1 leverage for the coming year.

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.. The Virginia Department of Environmental Quality also provides support through a position (currently vacant).

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 of the 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 a number of 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 2020-21 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 2020-21 the MATs receiving staff facilitation priority will be those who most closely align with the development of the monitor plan and the focus areas 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 APNEP Projects

Activity Category	CCMP Actions Addressed	Program Title	320 Funds	Match Funds	Total
Engagement	D1 & D2	Albemarle-Pamlico Estuary Highway Signs	$35,000	N/A	$35,000
Engagement	D3.3	Regional Coastal Resiliency Workshop	$0	$27,000	$27,000
Outreach	A2.1, B2.6, D1.3	Aquatic Invasive Species Communication & Outreach Strategy Development	$2,000	N/A	$2,000
Engagement	D2.1, D2.2, D2.3	Stewards of the Southern Watersheds Teacher Workshop	$0	$4,068	$4,068
Monitor	D1.1, D2.1, D2.3, D3.1, E1.3	Swim Guide	$9,500	$14,304	$23,804

Ongoing APNEP 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-*a* 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			
Identify	A2.1, B2.6, C3.1, D1.3, D2.1	APNEP-N.C. Sea Grant Joint Graduate Fellowship in Estuarine Research	$5,750	$5,000	$10,750
Protect & Restore	A2.1, B2.6, C3.1, D1.3	N.C. 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, C4.2, C5.1, C5.2, C5.3, D1.2, D1.4, E1.2	N.C. Coastal Habitat Protection Plan Implementation Support	$0	$24,000	24,000
Protect & Restore	A2.2, B3.1, D3.3	Using Natural and Nature-Based Features to Build Resilience to Storm Driven Flooding Project	$0	$25,000	$25,000
Protect & Restore	B2.2, C3.3	SAV Economic Analysis	$68,193	$0	$68,193
Engage	All	APNEP Action Team Facilitation	$0	$12,000	$12,000
Engage	All	Event Participation & Sponsorship	$8,500	$30,000	$38,500
Engage	All	Public Outreach & Print Media	$0	$300	$300
Engage	D2.1, D2.2, D2.3	Shad in the Classroom	$20,000	$11,000	$31,000
Engage	D2.1, D2.2, D2.3	Summer Teacher Institute	$20,000	$11,000	$31,000
Engage	All	Virginia-N.C. Memorandum of Understanding Implementation	$0	N/A	
Engage		Prioritizing Coastal Habitats/Carbon Resilience			
Engage	D3.3	Building capacity for Climate Resilience in Albemarle-Pamlico region Tribal Communities	$27,500	$27,500	$55,000
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	$18,594	$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

APPENDIX A: 2012 CCMP GOALS AND OUTCOMES

Goal 1: A region where human communities are sustained by a functioning ecosystem

Ecosystem Outcomes:

1. Waters are safe for personal contact.
2. Designated surface and ground water supplies are safe for human consumption.
3. Surface hydrologic regimes sustain regulated human uses.
4. Fish and game are safe for human consumption.
5. Opportunities for recreation and access to public lands and waters are protected and enhanced.

Goal 2: A region where aquatic, wetland, and upland habitats support viable populations of native species

Ecosystem Outcomes:

1. The biodiversity, function, and populations of species in aquatic, wetland, and upland communities are protected, restored, or enhanced.
2. The extent and quality of upland, freshwater, estuarine, and near-shore marine habitats fully support biodiversity and ecosystem function.
3. Non-native invasive species do not significantly impair native species' viability or function, nor impair habitat quality, quantity, and the processes that form and maintain habitats.

Goal 3: A region where water quantity and quality maintain ecological integrity

Ecosystem Outcomes:

1. Appropriate hydrologic regimes support ecological integrity.
2. Nutrients and pathogens do not harm species that depend on the waters.
3. Toxics in waters and sediments do not harm species that depend on the waters.
4. Sediments do not harm species that depend on the waters.

APPENDIX B: 2012-2022 CCMP ACTIONS

IDENTIFY

A1.1 Facilitate the mapping of significant ecological, bathymetric, geologic, demographic, and cultural features.
A1.2 Facilitate the refinement and use of online conservation planning tools.
A2.1 Facilitate the development of protocols and conduct rapid assessments to determine presence and potential threat of invasive species.
A2.2 Create and improve projections of land use and climate change related impacts on the regional ecosystem.
A2.3 Support research on adapting to impacts associated with climate change and sea level rise.
A2.4 Facilitate risk assessments of targeted personal care and pharmaceutical products in the aquatic system.
A3.1 Assess the effectiveness of policies and regulations to minimize wetland loss.
A3.2 Assess the effectiveness of policies and regulations regarding riparian buffers.
A3.3 Develop and refine ecological flow requirements for each major river.

PROTECT

B1.1 Minimize the introduction of toxics from targeted sources.
B1.2 Minimize the introduction of pathogens from targeted sources.
B1.3 Facilitate the protection of natural riparian buffers to reduce runoff.
B1.4 Facilitate the development of state and local policies that support the use of low impact development.
B1.5 Facilitate the use of best management practices on agricultural and silvicultural lands.
B2.1 Facilitate the development and implementation of an integrated freshwater habitat protection strategy.
B2.2 Develop and implement a submerged aquatic vegetation (SAV) protection strategy.
B2.3 Facilitate the development of incentives for protection and management of targeted natural communities and habitats.
B2.4 Facilitate the development of policies to minimize dredge and fill activities in naturalized areas and sensitive habitats.
B2.5 Facilitate protection of designated anadromous fish spawning areas and inland primary nursery areas from marina impacts.
B2.6 Minimize and rapidly respond to the introduction of invasive species through the development and implementation of integrated prevention and control strategies.
B3.1 Assist local governments in the development of incentives for protecting natural shorelines.
B3.2 Develop and distribute educational materials encouraging landowners to protect natural shorelines.
B3.3 Facilitate the development of requirements for living shoreline stabilization projects that optimally protect estuarine aquatic and shoreline habitats while minimizing regulatory requirements.

RESTORE

C1.1 Establish contaminant management strategies for waters not meeting water quality standards.
C1.2 Facilitate the implementation of existing contaminant management strategies.
C1.3 Facilitate the restoration of riparian and estuarine shorelines.
C1.4 Reduce unregulated discharge from wastewater treatment systems.
C1.5 Facilitate voluntary retrofitting of existing development and infrastructure to reduce runoff.
C2.1 Facilitate the development and implementation of coordinated landscape-scale hydrological restoration strategies.
C2.2 Facilitate the development of incentives to replace hardened estuarine shorelines with living shorelines.
C2.3 Facilitate the hydrologic restoration of floodplains and streams.
C3.1 Develop and refine integrated invasive species eradication and control strategies.
C3.2 Develop and implement a coordinated wetland restoration strategy.
C3.3 Develop and implement a submerged aquatic vegetation restoration strategy.
C4.1 Install fish ladders and eel-ways on existing dams and other permanent barriers.
C4.2 Facilitate the removal of dams, culverts, and other in-stream barriers.
C4.3 Restore degraded anadromous fish spawning habitats.
C4.4 Facilitate research to improve fish passage.
C5.1 Construct new oyster habitats.
C5.2 Reduce the adverse impacts of harvests to existing oyster habitat.
C5.3 Facilitate research to improve oyster restoration technologies and methods.

ENGAGE

D1.1 Communicate the importance of stewardship and offer opportunities for volunteerism to further APNEP's mission.
D1.2 Facilitate efforts to improve collaborations to protect and restore ecosystem processes.
D1.3 Coordinate outreach and engagement efforts regarding the impacts of invasive species.
D1.4 Coordinate outreach efforts regarding the proper application of fertilizers to reduce nutrient runoff.
D1.5 Increase opportunities for public access to waterways, public lands, and trails.
D2.1 Provide and promote opportunities for outdoor experiences that connect individuals with the Albemarle-Pamlico ecosystem.
D2.2 Provide environmental education training opportunities for educators in the region.
D2.3 Increase public understanding of the relationship between ecosystem health and human health advisories relating to water, fish, and game.
D3.1 Develop and implement a strategy to improve decision-makers' understanding of the costs and benefits of environmental protection, restoration, planning, and monitoring.
D3.2 Facilitate the development and implementation of basin-wide water management plans to ensure no less than minimum in-stream flows are maintained.
D3.3 Provide assistance to state, regional, and local governments to incorporate climate change and sea level rise considerations into their planning processes.

MONITOR

E1.1 Facilitate the development and implementation of an integrated monitoring network through the guidance of regional monitoring and assessment teams.

E1.2 Assess the value of information for measuring ecosystem and CCMP implementation outcomes.

E1.3 Facilitate the expansion of volunteer monitoring into a core element of the integrated monitoring network.

E2.1 Facilitate the design and content acquisition of a regional database based on partners' data and information needs.

E2.2 Develop and maintain an online resource that clearly conveys regional information in support of ecosystem-based management.