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Chapter 8 Water Quality Initiatives and Funding

The future of our rivers, streams, wetlands and estuaries are closely linked to land use decisions made on both a public and private scale with private landowners playing a major role in protecting waters of the state through conservation and various land use management practices. This chapter explores various options for protecting natural resources and includes general information as it relates to local, regional and state initiatives along with planning resources and funding opportunities.

8.1 Local Initiatives

Working at the local level, local organizations and agencies can combine professional expertise in a watershed. Involving a wide array of people in water resource projects brings together a wide range of knowledge and interests and encourages others to become involved and invested in protecting water resources in their own backyard. Local initiatives are essential because people within the immediate area can make decisions that affect change in their own community. It also encourages the community to understand holistically the challenges and opportunities for protecting these resources. Working in coordination across jurisdictional and agency lines can also open the door for more funding opportunities. More diversified funding allows local entities to do more work and be involved in more activities.

The collaboration of local efforts is key to water quality improvements and there are good examples of local agencies and groups using these cooperative strategies throughout the state to protect natural resources. The Division of Water Resources' (DWR) Basin Planning Branch (BPB) applauds and supports the foresight and proactive response of local watershed groups and local governments to protect and manage water resources.

8.1.1 Albemarle Resource Conservation & Development Council, Inc. (ARCD)

The Albemarle Resource Conservation & Development Council, Inc. (ARCD) has collaborated for many years with local governments, universities, and private landowners to construct stormwater wetlands to improve water management and protect water quality throughout the Albemarle region. ARCD's mission is to "wisely conserve natural resources and create opportunities for positive economic and community development", thereby enhancing the quality of life in Camden, Chowan, Currituck, Dare, Gates, Hyde, Pasquotank, Perquimans, Tyrrell and Washington counties (ARCD, 2021).

For more than 40 years, ARCD and Soil and Water Conservation Districts (SWCDs) have collaborated on projects to improve drainage and protect water quality. The Albemarle region is unique in that in addition to each county having a SWCD office, it has the Albemarle SWCD. The Albemarle SWCD is the only multi-county SWCD in the state and consists of the SWCDs from Camden, Chowan, Currituck, Pasquotank and Perquimans counties. Examples of projects in the Albemarle region include:

- Living Shorelines: In 2008, ARCD collaborated with the Perquimans SWCD, the Natural Resource Conservation Service (NRCS) and Perquimans County to construct approximately 1,000 linear feet of living shoreline at the Perquimans County Community Center on the Perquimans River in the Pasquotank River basin. The shoreline was severely damage by Hurricane Isabel and compounded by several additional storm events after Hurricane Isabel. The design was based on a shoreline demonstration project on the adjacent Newbold White House property, which tested three stabilization methods. Rock sills was the only method that could withstand storm events along the shoreline (ARCD, 2019a).

- Restoration Planning and Project Implementation: Since 2015, the ARCD and SWCDs has been following a 9-element watershed restoration plan to improve water quality in the Little River watershed, also in the Pasquotank River basin. It includes an eight-mile stretch of the Little River that has been listed as impaired for chlorophyll-*a* (ARCD, 2019b).

- Citizen Science Water Quality Data Collection: Currently, ARCD is collaborating with the Albemarle Commission Council of Government (COG), SWCDs, and several other partners on a regional approach to water management and water quality protection. Citizen scientists are collecting water samples from key locations in the Chowan and Pasquotank river basins with a focus on determining the cause of algal blooms. With the samples being collected, ARCD is continuously working with researchers to quantitatively assess the relative importance of potential nutrient sources and evaluate the likelihood of increases from each source in contributing nutrients to the recurring algal blooms. The current study is also evaluating trends in the trophic status of the Chowan River and Albemarle Sound. This regional effort is partly funded by a grant from the North Carolina Land and Water Fund (NCLWF) (formerly the Clean Water Management Trust Fund). Results and written reports are available on the ARCD website.

- Resolution to Strengthen Critical Drainage and Water Quality Infrastructure: Eight county boards of commissions around the Albemarle Sound and the Albemarle SWCD have adopted and sent to legislators a resolution to strengthen critical drainage and water quality infrastructure in the region. The resolution calls on state leaders to increase financial assistance to help manage and protect drainage systems and water quality due to more frequent and stronger storm and flooding events. The resolution also calls for financial incentives to encourage owners of swamp forests to conserve a minimum 100-foot buffer along creeks and rivers to protect drainage systems and water quality. In addition, it includes a request to support additional monitoring in the region to help identify potential sources of nutrients and sediment entering the waterways and contributing to the resurgence of algal blooms (Green Saves Green 2021a).

More information about the resolution, as well as other projects underway to help combat water resource issues in the region, can be found on ARCD's "Fighting Algal Blooms" webpage.

8.1.2 Chowan-Edenton Environmental Group (CEEG)

The Chowan-Edenton Environmental Group (CEEG) is a local non-profit group of citizens working together to address environmental matters and to educate residents of Chowan County on how to be good stewards of the Earth. The CEEG's mission since 2007 is to encourage discussion related to community and regional environmental issues, to provide expertise and current research pertaining to critical environmental concerns, and to support actions that serve to reduce or correct local environmental problems. In 2014, the CEEG partnered with NC Sea Grant to collect information about the presence of hydrilla (*Hydrilla verticillata*), an invasive aquatic plant, in the Chowan River. As a result, CEEG developed the Hydrilla Citizen Science Project, a model project that can be replicated by other rural counties bordering North Carolina's sounds and rivers. The CEEG is currently volunteering their time with the ARCD to collect samples in the Chowan and Pasquotank river basins to identify areas of excessive nutrients. Volunteers are collecting weekly samples from Arrowhead Beach, the Chowan River Bridge, Edenton Town Dock, and the fish and wildlife dock near Edenton Airport to send to the National Oceanic and Atmospheric Administration (NOAA) Phytoplankton Monitoring Network (PMN) (Figure 8-1). Digital micrographs as well as water samples (when the blooms are extreme) are sent for analysis.

Figure 8-1 CEEG sample collection sites in the Chowan and Pasquotank River Basin (Map Source: CEEG)

Edenton Town Dock (Lat: 36.05568 N., Long: 076.60987 W)

From September 7th through October 5th, 2016, CEEG collected four samples (once a week) at Site 3 (Table 8-1). All samples showed *Microcystis* exclusively. In 2017, the first of eight samples that showed cyanobacteria was on June 29th at Site 3; the last sample with algae was on August 2nd, 2017. All samples were exclusively *Dolichospermum* except for one mixed sample (with *Microcystis*) on July 5th, 2017. Six samples in 2018, starting on June 26th and ending on August 18th 2018 showed blue-green algal cells. The samples were mostly *Dolichospermum* with a few dates containing *Dolichospermum* mixed with *Microcystis*. In 2019, only two samples collected showed evidence of cyanobacteria, both samples had only *Dolichospermum* – June 18th and July 2nd, 2019. In 2020 for Site 3, *Dolichospermum* was present in our samples on July 7th, July 21st and August 11th. In summary, for most sampling years at Site 3, *Dolichospermum* has been the predominant genera. There are a few examples of mixed *Microcystis* and *Dolichospermum*. The exception to this trend was in 2016 when all collected samples showed exclusively *Microcystis*.

Table 8-1 Site Three, Edenton Town Dock, Chowan County NC

Date	Genera Noted	Date	Genera Noted	Date	Genera Noted
8-3-16	*Dolichospermum*	6-29-17	*Dolichospermum*	7-31-18	*Dolichospermum*
8-10-16	*Dolichospermum*	7-5-17	*Dolichospermum*, *Microcystis*	8-7-18	*Dolichospermum*, *Microcystis*
8-17-16	*Dolichospermum*	7-12-17	*Dolichospermum*	8-21-18	*Dolichospermum*
9-7-16	*Microcystis*	7-19-17	*Dolichospermum*	6-18-19	*Dolichospermum*, less than 5% coverage

Date	Genera Noted	Date	Genera Noted	Date	Genera Noted
9-21-16	*Microcystis*, < 1% slide coverage	7-26-17	*Dolichospermum*	7-2-19	*Dolichospermum*
9-29-16	*Microcystis*, < 1% slide coverage	8-2-17	*Dolichospermum*	7-7-20	*Dolichospermum*, 5% slide coverage,spiral broken up
10-5-16	*Microcystis*, < 1% slide coverage	6-26-18	*Microcystis*	7-21-20	*Dolichospermum*, spiral/plank less than 5%
6-14-17	*Dolichospermum*	7-17-18	*Dolichospermum*	8-11-20	*Dolichospermum* 25% coverage
6-21-17	*Dolichospermum*	7-24-18	possible *Aphanizomenon*	7-31-18	

Site 4 – Fish and Wildlife Dock near Edenton Airport (Lat: 36.01049 N., Long: 075.56456 W)


Chowan River Bridge – 8/6/2018

In 2016, six samples were collected from Site 4 from August 3rd through October 12th (Table 8-2). *Dolichospermum* was present exclusively in the first three weeks that CEEG sampled, followed by one week of mixed *Dolichospermum* and *Microcystis*, and ending with two weeks of exclusively *Microcystis*. In 2017, CEEG collected our first algal sample on May 31st; ten samples were collected mostly every week at Site 4 through August 2nd. In most samples from 2017, *Dolichospermum* was the exclusive genera; with exception, on May 31st, *Microcystis* was the only genera present. In 2018, only four sample times showed cyanobacteria starting on June 19th through August 21st. In these samples, *Microcystis* was the exclusive genera in the first sample, followed by predominately *Dolichospermum* in the next few samples and ending with a mixed *Dolichospermum* and *Microcystis* sample on August 21st. Four samples in 2019 showed cyanobacteria at Site 4 (June 18th – September 3rd) – all samples were *Dolichospermum* only. In 2020, five samples from June 30th through September 19th were collected that contained cyanobacteria cells. These samples primarily were *Dolichospermum* with a few mixed samples including *Microcystis*. In summary, when cyanobacteria were present at Site 4, the predominate genera was *Dolichospermum* that generally shows up earlier in the season. CEEG also saw *Microcystis* at this site but not with the same quantity or frequency as *Dolichospermum*.

Table 8-2 Site Four, Fish and Wildlife Dock near Edenton Airport, Chowan County NC

Date	Genera Noted	Date	Genera Noted	Date	Genera Noted
8-3-16	*Dolichospermum*	6-28-17	*Dolichospermum*	6-18-19	*Dolichospermum*, less than 1% coverage
8-10-16	*Dolichospermum*	7-5-17	*Dolichospermum*	8-6-19	*Dolichospermum*, less than 1%coverage
8-17-16	*Dolichospermum*	7-12-17	*Dolichospermum*	8-13-19	*Dolichospermum*

Date	Genera Noted	Date	Genera Noted	Date	Genera Noted
9-29-16	*Microcystis* and *Dolichospermum*, < 1% slide coverage	7-19-17	*Dolichospermum*	9-3-19	*Dolichospermum*, *Aphanizomenon* (one strand)
10-5-16	*Microcystis*, < 1% slide coverage	7-26-17	*Dolichospermum*	6-30-20	spiral & plank *Dolichospermum* 50% slide coverage some *Microcystis*
10-12-16	*Microcystis*	8-2-17	*Dolichospermum*	7-28-20	*Dolichospermum* less than 1%
5-31-17	*Microcystis*	6-19-18	*Microcystis*	8-11-20	*Dolichospermum* 1% coverage
6-7-17	*Dolichospermum*	8-7-18	*Dolichospermum*	8-25-20	*Microcystis*, *Dolichospermum*
6-14-17	*Dolichospermum*	8-14-18	*Dolichospermum*	9-18-20	*Dolichospermum* 1%
6-21-17	*Dolichospermum*	8-21-18	*Dolichospermum, Microcystis*		

The CEEG also works with the NOAA lab at Morehead City to send tissue and water samples for analysis, as well as chlorophyll-a filters from the sampling points listed above. In 2019, the CEEG, along with university and local partners, were awarded two Community Collaboration Research Grants (CCRG) in 2019. "Using Citizen Science to Understand Nutrient Limitation of Algal Blooms on the Chowan River: Filling Critical Data Gaps and Promoting Community Engagement" is responding to community questions about the resurgence of blue-green algal blooms in the Chowan River. The project aims to use citizen science, as well as samples collected by universities, to determine the nutrient status of the cyanobacteria blooms in Edenton Bay. Partners include University of North Carolina (UNC) – Chapel Hill, UNC-Institute of Marine Sciences (UNC-IMS), CEEG, APNEP, the Town of Edenton and North Carolina State University (NCSU). The "Food Web Transfer of Cyanobacterial Toxins in the Chowan River and Western Albemarle Sound" will examine cyanotoxin accumulation within common fish and shellfish in the Chowan River. Findings will help determine if there is a risk to toxin exposure for people who consume seafood from the Chowan River. Partners include NCSU, NC Department of Environmental Quality (DEQ), North Carolina Sea Grant and CEEG. More information about the CCRG is available online. More information about the results can be found on North Carolina Sea Grant's website.

In the summer of 2020, the CEEG partnered with researchers from Dr. Hans Paerl's lab at UNC-IMS on an APNEP- and NC Sea Grant-funded project to examine the extent of aerosol toxins present when cyanobacteria blooms occur in local waters. The CEEG works collaboratively with citizen groups in Perquimans and Pasquotank counties to provide citizen science training and research opportunities, as well as planning and promoting local environmental awareness events. DWR actively encourage other local counties to establish citizen monitoring groups.

8.1.3 Green $aves Green

Green $aves Green is a non-partisan, non-profit, all-volunteer, local environmental action group. It believes that the Albemarle Region is uniquely positioned to be the model "Green Region" of the state. Its projects are designed to build community support for renewable energy, conservation, and

environmental protection. Green $aves Green is currently collaborating with the ARCD to monitor water quality in the region.

8.1.4 Councils of Governments (COG)

Regional councils of governments (COG) are multi-county planning and development agencies serving different areas of the state. Membership in these councils is voluntary. In North Carolina, 17 councils serve regions that share similar economic, physical and social characteristics. Their function is to aid, assist and improve the capabilities of local governments in administration, planning, fiscal management and development.

The Albemarle Commission (Region R) serves Camden, Chowan, Currituck, Dare, Gates, Hyde, Pasquotank, Perquimans, Tyrrell and Washington counties and the Mid-East Commission (Region Q) serves Bertie, Beaufort, Hertford, Martin and Pitt counties. The Albemarle Commission partnered with the ARCD in 2015 to develop a 9-element watershed restoration plan for the Little River watershed using funds available through the US Environmental Agency's (EPA) Clean Water Act (CWA) Section 205(j) grant. More information about the COGs serving counties in the Chowan River basin can be found on either the North Carolina Association of Regional Councils of Governments (NCARCOG) website or on each COGs' respective website.

8.1.5 Albemarle-Pamlico National Estuary Partnership (APNEP)

The Albemarle-Pamlico National Estuary Partnership (APNEP) works collaboratively to identify, protect, and restore the significant resources of the Albemarle-Pamlico estuarine system. Covering 23,803 square miles, the APNEP management region is the largest in the National Estuary Program. The watershed contains six major river basins draining from 43 counties in North Carolina and 38 counties in Virginia.

APNEP works with multiple partners to understand water resource concerns in the region and participates on outreach efforts to educate local leaders and the general public about coastal watershed and estuarine issues. APNEP's efforts are guided by its Comprehensive Conservation and Management Plan (CCMP), developed in collaboration with regional partners and stakeholders. The CCMP directs APNEP to accomplish 58 targeted "actions" that cover topics such as outdoor education, water quality, invasive species, oysters, habitat restoration, and water flow. APNEP's current CCMP was published in 2012 and is scheduled to be revised in 2022.

APNEP has supported or assisted with many of the initiatives mentioned in this chapter, providing resources towards:

- Monitoring: With the input of its Science and Technical Advisory Committee (STAC), APNEP plans to complete development of an initial Monitoring Plan in 2020, as well as identify high-priority ecosystem indicators and report on their status in the Albemarle-Pamlico region. Once the plan is adopted, APNEP will work with partners to identify ways to continue and support actions to protect and restore water resources in the Pasquotank basin.
- Algal Bloom Outreach and Research: APNEP has partnered with many of the organizations listed in this chapter, providing resources and financial support for projects, ranging from purchasing rapid response test kits to test for algal blooms to signs for public outreach in areas experiencing algal blooms.
- Research Study to Develop Chlorophyll-*a* Standards to Protect Submerged Aquatic Vegetation (SAV): APNEP is funding a project through the UNC Institute for Marine Sciences to 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.

- SAV Monitoring: APNEP has facilitated an SAV Team since the early 2000's to coordinate monitoring, mapping, and outreach efforts. The team established sentinel sites in the Chowan River basin that were surveyed from 2016-2019 utilizing grant funds. Currently, there are no long-term commitments from a partner to continue monitoring efforts.
- APNEP/NC Sea Grant Graduate Fellow in Estuarine Research: A graduate fellow began studying multiple issues related to cyanobacteria toxins in the Chowan River and Albemarle Sound in September 2019. A report is anticipated in 2021.

During the summer of 2015, APNEP participated in the US EPA's National Coastal Condition Assessment (NCCA), a nationwide estuarine monitoring program to assess the health of the nation's estuarine systems.

In August 2020, a Memorandum of Understanding (MOU) between the NC Department of Environmental Quality (DEQ), NC Department of Natural and Cultural Resources (DNCR), NC Department of Agriculture and Consumer Services, NC Wildlife Resources Commission, the Virginia Secretary of Natural Resources, and Secretary of Agriculture and Forestry was signed to renew the shared commitment to collaboratively address environmental issues in the shared river basins between the two states. The MOU specifically calls to protect and restore significant resources, improve spawning habitats in shared river basins, protect areas identified as ecologically healthy, and incorporating climate change and sea level rise into local, state, and regional planning needs.

- Data Sharing: APNEP, DWR, and other agency staff participate in the Watershed Restoration Improvement Team (WRIT), an interagency team working to protect and improve water resources, continually coordinate to identify opportunities to implement the MOU, with discussions largely being focused initially on sharing information and data across state lines. APNEP facilitated connections between basin planners and local partners with staff from the Virginia Department of Environmental Quality (VADEQ) to share data for the basin plan and the CWMTF project and continues to work together with DWR to identify opportunities to improve data and information sharing in the shared waterways.

8.1.6 Coastal Habitat Protection Plan

The North Carolina Coastal Habitat Protection Plan (CHPP) is the result of North Carolina's Fisheries Reform Act (FRA) passed by the General Assembly in 1997. The CHPP is a guidance document that addresses habitat and water quality efforts needed to protect, enhance and restore fish habitat along North Carolina's coasts and aligns closely with APNEP's CCMP. Several agencies within DEQ have jurisdiction over marine fisheries, water quality and coastal management. Representatives from these agencies, along with several agencies outside DEQ, develop and implement the CHPP. The Division of Marine Fisheries (DMF), however, is the lead agency. There are four major goals, with multiple recommendations under each to achieve the overarching goal of long-term improvement of coastal fisheries through habitat protection and enhancement efforts:

- Coordinate and enhance assessment and monitoring of effectiveness of rules established to protect coastal habitats. (Recommendation 1.2b)

- Continue to coordinate among commissions and agencies on coastal habitat management issues. (Recommendation 1.4)
- Enhance management of invasive species with existing programs. Monitor and track status in affect waterbodies. (Recommendation 1.6)
- Support assessments to classify habitat value and conditions by selectively monitoring the condition and status of those habitats. (Recommendation 2.1b)
- Expand habitat restoration, including increasing subtidal and intertidal oyster habitat through restoration. (Recommendation 3.1a)
- Improve management of estuarine and public trust shorelines and shallow water habitats by revising shoreline stabilization rules to include consideration of site-specific conditions and advocate for alternatives to vertical shoreline stabilization structures. (Recommendation 3.4)
- Protect and restore habitat for migratory fishes by restoring fish passage through elimination or modifications of stream obstructions, such as dams and culverts. (Recommendation 3.5b)
- Prevent additional shellfish closures and swimming advisories by continuing to phase out existing outfalls by implementing alternative stormwater management strategies. (Recommendation 4.3c)
- Maintain effective regulatory strategies throughout the river basins to reduce nonpoint pollution and minimize cumulative losses of fish habitat, including use of vegetated buffers and established stormwater controls. (Recommendation 4.6)
- Maintain adequate water quality conducive to the support of present and future mariculture in public trust water. (Recommendation 4.7)

To implement recommendations in CHPP, the CHPP team developed specific actions in a separate implementation plan. The most recent implementation was developed for 2018-2020. DWR has participated in several of the recommendations identified in the CHPP (Table 8-3).

Table 8-3 Implementation of Recommendations Identified in the 2018-2020 CHPP Implementation Plan

RECOMMENDATION: Provide information to focus students in K-12 understanding of biodiversity in lakes, streams, and estuaries.
ACTIONS: ▪ Project WET* ▪ It's Our Water* ▪ NC Stream Watch* ▪ Watershed Wisdom* **More information and interactive links to these programs can be found in the Statewide Initiatives section of this Chapter.*
RECOMMENDATION: Assess invasive submerged aquatic vegetation (SAV) in the APNEP region annually and continue to coordinate invasive SAV treatment with DMF and APNEP.
ACTIONS: ▪ The DWR Aquatic Weed Control Program (AWCP) maintains a database serving as an archive of management activities. The database contains a query tool to allow users to access data by searching by project name. The AWCP database can be accessed here. Full list of plants designated by DEQ as noxious aquatic weeds can be found here.

RECOMMENDATION: DWR and the Division of Mitigation Services (DMS) will support and pursue aquatic passage barrier removal policies and projects where appropriate.

ACTIONS:

- DWR and DMS support and participate in the NC Aquatic Connectivity Team, the lead organization for aquatic passage improvements in NC. The DWR grant program managers (Section 319 and Water Resources Development Program) and the 401 Permitting Unit provide information to the NC Aquatic Connectivity Team about aquatic barrier removal projects. The Southeast Aquatic Resources Partnership (SARP) maintains a comprehensive list of known dam removal projects in North Carolina and throughout the Southeastern United States.

Currently, the CHPP is being amended as called for in the FRA of 1997. The focus of the amendment will be on environmental rule compliance to: protect habitat; monitoring habitat to assess status and regulatory effectiveness; SAV protection and restoration, focusing on water quality improvements, wetland protection and enhancement using nature-based methods; and reducing inflow and infiltration associated with wastewater infrastructure to improve coastal water quality. The goal is to have the amendment finalized and voted on by the three regulatory commissions (Marine Fisheries, Coastal Management, and Environmental Management) during the summer of 2021 for final adoption. Prior to the amendment being adopted, it will be reviewed by DEQ and a series of public hearings will be held. It is anticipated that no changes will be made to CHPP's source document. More information about CHPP and the implementation plans can be found on CHPP's website.

8.1.7 NC Coastal Land Trust

The North Carolina Coastal Land Trust is a non-profit organization formed in 1992 to help protect locally and regionally valuable natural areas. Since its inception, the Coastal Land Trust has protected over 40,000 acres of barrier island beaches, riparian corridors, and other special natural areas. Jubilee Farm in Chowan County placed their property under a conservation agreement in 2001. Rayburn Farm in Perquimans County transferred a conservation easement to the NC Coastal Land Trust in 2002. In August 2017, the Coastal Land Trust purchased 1,000 acres in Bertie County along 3.5 miles of Salmon Creek that was recognized as ecologically significant by the North Carolina Natural Heritage Program (NHP). Before the Coastal Land Trust bought the land, it was permitted for multi-unit development and a marina. The land was given to the State of North Carolina in December 2018 to create the Salmon Creek State Natural Area. More information about the NC Coastal Land Trust can be found on their website.

8.2 Statewide Initiatives

In addition to local and regional projects and initiatives, there are several state and federal agencies that work statewide to protect and educate people about our natural resources. Examples of a few such initiatives are identified here.

Stream Watch is housed within DWR, but it relies on information collected by citizens across the state. The program encourages neighbors, civic groups and businesses to adopt a local stream, keep an eye out for any problems that might occur, and work together to ensure that the stream is healthy and able to support wildlife habitat, recreation and other uses. For more information about Stream Watch and how to get involved, visit the Stream Watch website.

8.2.1 It's Our Water

It's Our Water is a complete curriculum divided into five modules. Each module begins with a short video that presents a water quality topic, reviews scientific principles, shows real-life examples of current water issues, and introduces students to various professions related to water. Classroom demonstrations, discussions, homework, quizzes, and hands-on activities reinforce major concepts and prepare students for field investigation. Students develop an understanding of how these water resource issues affect them directly by investigating the stream nearest their school. The skills and knowledge required in each module build on earlier modules. Students will work towards completing a final project that examines the status of the water quality in their stream and offers recommendations for managing the stream. More information about It's Our Water can be found here.

8.2.2 Project WET

Project WET aims to engage children, parents, teachers and members of the community in water resources education by advocating awareness of water and community involvement in water-related issues. This program achieves this by facilitating training workshops and community events that bring together science, social studies and health education topics. The end result of these community level engagement efforts is a connected network of citizens, professionals and scientists. More information on how to participate in Project WET can be found here.

8.2.3 Watershed Wisdom

Watershed Wisdom is a UNC-TV science-based curriculum, geared toward 4th and 5th grade but useable for all ages. It combines hands-on projects and interactive components to provide a robust, blended lesson that introduces the value of water and maintaining healthy watershed ecosystems. Watershed Wisdom was developed in partnership with North Carolina Sea Grant, Project Wet, North Carolina Watershed Stewardship Network (WSN), and North Carolina Resources Institute (PBS Learning Media and UNC TV, 2020).

8.3 Growth Management and Land-Use Planning

Growth management can be defined as the application of strategies and practices that help achieve sustainable urban development and redevelopment while also conserving environmental qualities and features. Growth management tools range from on-the-ground best management practices (BMPs), such as stormwater wetlands, living shorelines, cisterns and vegetated (riparian) buffers, to establishing water, wastewater and/or stormwater authorities.

Several resources are available for protecting and managing water resources and include information about how to incorporate management strategies into existing and new development or changes in land use. Some examples include:

Watershed Academy: The Watershed Academy is available online through EPA's website. Online training modules, webcasts and publications are available for review.

Center for Watershed Protection (CWP): The Center for Watershed Protection (CWP), also referred to as the Center, is a nonprofit organization dedicated to research and education on the impacts of land use on watersheds throughout the nation. Several articles, reports, etc., are available through an online watershed library (OWL).

Low Impact Development (LID) Center: The Low Impact Development (LID) Center is a nonprofit national research organization that focuses on sustainable stormwater management solutions. Several projects are available for review.

Stormwater Design Manual: The Stormwater Design Manual, developed by the North Carolina Division of Energy, Mineral and Land Resources (DEMLR), is a technical guidance document about implementing the rules pertaining to post-construction stormwater measures. The companion manual, Stormwater Control Measure (SCM) Credit Document, includes the state's estimation of each SCM's effectiveness in protecting hydrology and removing pollutants.

Green Growth Toolbox (GGT): The Green Growth Toolbox (GGT) is a technical assistance tool designed to help communities conserve high-quality habitats as municipalities continue to grow. The toolbox is the result of a cooperative, non-regulatory effort led by the Wildlife Diversity program of the North Carolina Wildlife Resources Commission (WRC). A handbook, GIS dataset, training workshops and technical assistance are available for review and download.

Living Shorelines Academy: The Living Shoreline Academy has created tools to "evaluate the understanding, importance and practice of using living shorelines to enhance on-the-ground storm resiliency and create wetlands." The Academy provides training modules and includes a database of white papers and reports on existing living shoreline projects, a library of living shoreline resources and a map highlighting living shoreline projects across the United States. The Academy was developed in partnership by the NC Coastal Federation, Restore America's Estuaries, the Southern Environmental Law Center, and the EPA. The NC Coastal Federation and DEQ's Division of Coastal Management (DCM) (Coastal Management Estuarine Shorelines) also have several resources available in their websites.

8.3.1 Forest Management and Reforestation

Private forest landowners can work with the North Carolina Forest Service (NCFS) and/or forestry consultants to plan the management of their resources. The NCFS offers several types of plans that can be prepared depending on landowner objectives. The two most frequently used plans are Forest Management Plans and Forest Stewardship Plans (Table 8-4). NCFS personnel often prepare Forest Management Plans for landowners whose primary objective is timber management. These plans provide written prescriptions for specific forestry activities and include recommendations for minimizing impacts to water quality. Forest Stewardship Plans are prepared for landowners who want to enhance natural areas on their property and manage for additional resources beyond timber, including wildlife habitat, cultural resources, recreation, non-timber forest products, or aesthetics.

Table 8-4 NCFS assistance with Forest Management Plans, Stewardship Plans, and the total acres.

Time Period	Forest Management Plans	Total Acres	Stewardship Plans	Total Acres
07/2007-06/2012	411	27,500	53	11,487
07/2012-06/2017	193	9,828	9	633
07/2017-06/2020	75	3,838	4	434

The NCFS also administers the Forest Development Program (FDP). The FDP is a reforestation, afforestation, and forest-stand improvement cost-sharing program (Table 8-5). To qualify, a landowner must have a forest management plan approved by NCFS. Under the FDP, a landowner is partially reimbursed for the costs of site preparation, seedling purchase, tree planting, release of desirable

seedlings from competing vegetation, or any other work needed to establish a new forest. The FDP can complement federal cost-share programs, such as the Conservation Reserve Program (CRP) through the U.S. Department of Agriculture (USDA).

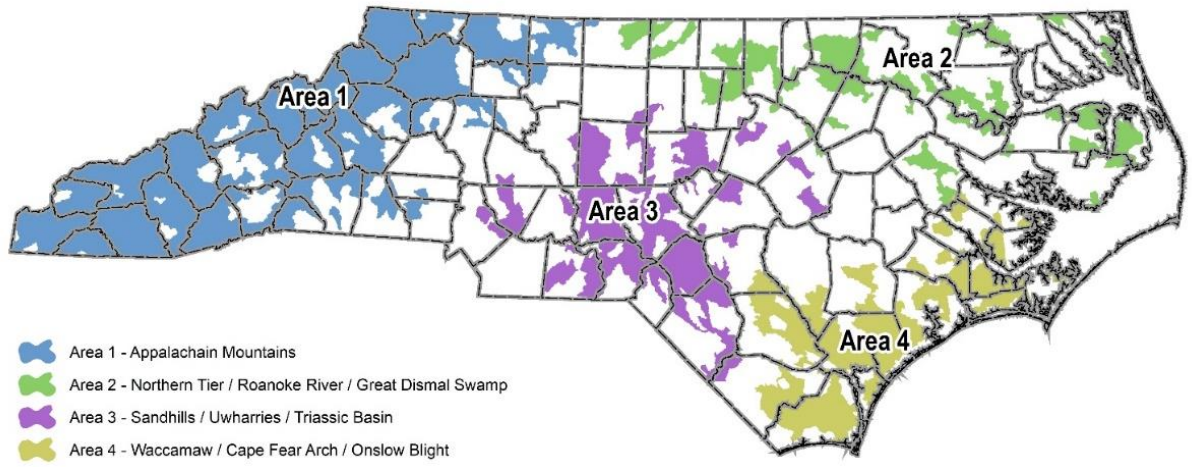
Table 8-5 NCFS assistance with reforestation, non-forested tracts, and total acres

Time Period	Reforestation (After Harvests)	Total Acres	Non-Forested Tracts	Total Acres
07/2007-06/2012	352	13,606	33	542
07/2012-06/2017	161	8,864	15	508
07/2017-06/2020	74	3,941	13	182

8.3.2 Conservation of Forests

There are multiple public and private sources of funds for conserving lands. Specifically for forestlands, the Forest Legacy Program (FLP) is administered by the NCFS for conserving working forests in priority areas that are at-risk of loss or conversion. Funding is provided by the USDA Forest Service, and often matched by other federal or state grant funds, in concert with willing landowners. A proposed project's eligibility to be included in the Forest Legacy Program is determined by both the guidelines outlined by the USDA-Forest Service, plus any requirements identified within the state's Forest Action Plan or other pertinent state law. A portion of the Pasquotank River basin is included in the state's Forest Legacy Priority Areas, illustrated in the map below (Figure 8-2, excerpted from the 2020 North Carolina Forest Action Plan).

Figure 8-2 North Carolina Forest Legacy Priority Areas Map



8.4 Division of Coastal Management

The Division of Coastal Management's (DCM) website states that DCM "works to protect, conserve and manage North Carolina's coastal resources through an integrated program of planning, permitting, education and research. DCM carries out the state's Coastal Area Management Act, the Dredge and Fill Law and the federal Coastal Zone Management Act of 1972 in the 20 coastal counties, using rules and policies of the N.C. Coastal Resources Commission (CRC). DCM serves as staff to the CRC." Coastal Management is part of the Department of Environmental Quality, which is responsible for keeping the

state's environment healthy. DCM partners, and receives part of its funding, from NOAA's Office of Ocean and Coastal Resource Management. DCM is responsible for several programs, including permitting and enforcement; CAMA land-use planning; public beach and waterfront access; North Carolina Coastal Reserves; and grants for marine sewage pumpout stations.

DCM also collects, hosts and analyzes data for oceanfront construction setback and erosion rates (link) and wetlands conservation and restoration (link) to assess the impacts of coastal development. DCM also provides links to tools for stormwater management, environmental justice and social vulnerability indicators, statewide flooding, coastal flooding (link), community assessments, planning and engagement (link), and shoreline management (link).

8.4.1 Land Use Planning

The Coastal Area Management Act (CAMA) requires each of the 20 coastal counties to have a local land use plan in accordance with guidelines established by the CRC. A land use plan is a collection of policies, maps, and implementation actions that serves as a community's blueprint for growth. The management goal for water quality is to maintain, protect, and where possible, enhance water quality in all coastal wetlands, rivers, streams and estuaries. The CRC's planning objective is for communities to adopt policies for coastal waters within their planning jurisdiction to help ensure that water quality is maintained if not impaired and improve impaired waters. Local communities are required to devise policies that help prevent or control nonpoint source discharges (sewage and stormwater) through strategies, such as impervious surface limits, vegetated riparian buffers, maintenance of natural areas, natural area buffers, and wetland protection. They are also required to establish policies and future land use map categories that are aimed at protecting open shellfishing waters and restoring closed or conditionally closed shellfishing waters. The Certified Land Use Plans by county can be found here (link). In the Pasquotank River basin, 10 counties have completed their land use plans and one other is under review (Table 8-6).

Table 8-6 Local Planning Jurisdictions (1/22/2020)

County	Municipalities	Certified Plan	Certification Date	Amended	Implementation Report
Bertie		Plan Maps	Feb 10, 2016		2018 Report
Camden		Plan Maps	Jun. 17, 2005	8/30/12	2017 Report
Chowan	Edenton	Plan	Nov. 15, 2018		2016 Report
Currituck		Plan	May 18, 2007	7/2/19	2017 Report
Dare		Plan	Feb. 24, 2011		2017 Report
Dare	Town of Duck	Plan	Apr. 8, 2005		2017 Report 2019 Report
	Town of Kill Devil Hills	Plan	Nov. 2, 2020		
	Town of Kitty Hawk	Plan	Jun. 17, 2005		2017 Report 2019 Report
	Town of Manteo	Plan	Jul. 27, 2007	2/12/09	2019 Report
	Town of Nags Head	Plan 2017 Draft Plan for State Review	Feb. 24, 2011	12/12/13	2018 Report

County	Municipalities	Certified Plan	Certification Date	Amended	Implementation Report
	Town of Southern Shores	Plan	Aug. 30, 2012		2018 Report 2020 Report
Gates	Town of Gatesville	Plan	Feb. 8, 2017		2019 Report
Hyde		Plan	Mar. 28, 2008		
Pasquotank	Elizabeth City	Plan	Feb. 9, 2012		2016 Report 2018 Report 2020 Report
Perquimans	Hertford Winfall	Plan	Feb. 10, 2016	3/5/2018	2018 Report 2020 Report
Tyrrell	Columbia Joint LUP	Plan Maps	Mar. 25, 2010		2020 - Tyrrell Co. Report 2014 - Town of Columbia
Washington	Town of Creswell, Town of Plymouth, Town of Roper		Under Review		

8.5 Division of Marine Fisheries

The North Carolina Division of Marine Fisheries (DMF) website states "DMF is responsible for the stewardship of the state's marine and estuarine resources. DMF's jurisdiction encompasses all coastal waters and extends to three miles offshore. Agency policies are established by the 9-member Marine Fisheries Commission and the Secretary of the Department of Environmental Quality. North Carolina is a member of the Atlantic States Marine Fisheries Commission, the Mid-Atlantic Fishery Management Council and the South Atlantic Fishery Management Council." DMF is comprised of nine sections that collectively carry out this mandate.

- Fisheries Management (link)
- Marine Patrol (link)
- Habitat and Enhancement (link)
- Shellfish Sanitation and Recreational Water Quality Program (link)
- Public Affairs
- Administrative Services
- Maintenance Services
- License and Statistics (link)
- Information Technology

8.5.1 Artificial Reefs

North Carolina has one of the most active reef enhancement programs in the country due in part to wide public support and dedicated DMF staff. Artificial reefs and oyster sanctuaries are supported by DMF staff

who develop, maintain, evaluate and administer the reef system. Biologists monitor North Carolina's artificial reefs for material stability, material durability, material performance, essential fish habitat and more. Information from these studies helps guide future enhancements. GPS Coordinates and details for each oyster sanctuary (link), artificial reef (link), and cultch planting (link) are available in the interactive Artificial Reef Guide (link).

8.6 Oyster Action Plan

During the late 1880's, the North Carolina oyster industry was especially prolific. Oysters were harvested and shipped by train to New York and San Francisco. The industry peaked in 1902 with 800,000 bushels of oysters, or 5.6 million pounds of oyster meat, harvested. Since the peak year in 1902, industry harvest reached a low of 35,000 bushels in 1994, and the 2017 harvest was 158,000 bushels. The primary reasons for the decline are over harvesting; natural disasters; shellfish diseases; and unsuitable water quality. Despite recovery efforts over the past several years, oysters are still listed as a species of concern*[1]. The monetary value of the oyster industry is about $2 million dollars. Although, this figure is significant, the oyster industry in Virginia is valued at about $18 million. Interest in shellfish growing along the North Carolina coast is clearly on the rise.

Oyster habitat in North Carolina is found on deep water reefs in the Pamlico Sound to low-relief patch reefs in intertidal waters and reefs fringing salt marshes along estuarine shorelines. North Carolina is the only state with both habitats. Oysters and the reefs they form provide ecological, economic, and social benefits. Oysters are "keystone species" because their health serves as an indicator of the overall health of the coastal ecosystem. Oysters provide "food, filter water, and create fish habitat". Oysters are not found in the Albemarle Sound, aside from the lower regions of the Albemarle Sound and northern Roanoke Island during short drought years (NCDENR et al., 1991).

DMF has worked since the 1950s to enhance reef habitat. To this end, DMF annually deposits tens of thousands of bushels of oyster shell, marine limestone, and/or clam shell, called "cultch", in shellfish waters from the Shallotte River to the Pamlico Sound. The cultch is colonized by oyster larvae, called "spat", that attach to the cultch and grow to harvestable size in 18-24 months.

In 2003, a group of oyster stakeholders formed the North Carolina Oyster Blueprint - An Action Plan for Restoration and Protection. Their vision was to see North Carolina become the "Napa Valley of Oysters". The 2015 – 2020 Oyster Restoration and Protection Plan for North Carolina: A Blueprint for Action and other reports from these groups may be found here: https://ncoysters.org. The North Carolina Oyster Blueprint partners with several different groups (https://ncoysters.org/who-we-are/partners/).

8.7 The Nature Conservancy

The Nature Conservancy (TNC) focuses on restoration and protection and has a field office at their Nags Head Woods Preserve, North Carolina. Their team works on conservation and restoration projects, developing spatial tools and resources to help communities use natural systems to build resilience, oyster research, expanding science on management practices that benefit coastal habitats and stewardship of their protected lands within the Albemarle-Pamlico Sound region. TNC partnered with East Carolina

[1] A Species of Concern is a species or vertebrate population for which there is concern or great uncertainty about its status. Species of Concern are not listed or protected under the Endangered Species Act (ESA). Instead, one of the goals of identifying a Species of Concern is to take proactive measures to address conservation needs and hopefully prevent the species from needing protection under the ESA. - NOAA

University and Duke University to study nutrient reducing BMPs in the Albemarle-Pamlico watersheds. These groups utilized the Integrated Valuation of Ecosystem Services and Tradeoffs (InVEST) and Spatially Referenced Regressions on Watershed Attributes (SPARROW) models as screening tools to investigate the implementation of BMPs. This study investigated the use of riparian buffers, cover crops, ditch retention structures, and peatland restoration (Hillman, 2019). The models identified nitrogen and phosphorus hot spots throughout the Albemarle-Pamlico watersheds with further investigation into the various BMPs that could reduce nitrogen and phosphorus input into waterways. Further investigation was conducted on these areas around the Albemarle Sound to determine which of these BMPs would be the best conservation strategy in this region. Their report concluded that the models and associated scenario analysis did not provide a definitive best option for implementing BMPs and employment of the most appropriate BMP will be context dependent, and limited by the willingness of the landowner to enact the various choices (Hillman, 2019). Their study results did identify parcels of land that were owned by the U.S. government as the most important parcels for conservation action, and restoration projects are already underway on many federally owned lands (Hillman, 2019). The Nature Conservancy was advised to focus their conservation efforts on private landowners to compliment the actions on U.S. government owned land (Hillman, 2019). TNC's future land protection efforts in the Pasquotank River Basin are focused on the North River, Green Sea, and Nags Head Woods (Lora Eddy, Personal Communication, October 2020).

8.8 Grants and Funding Opportunities

DWR's Use Restoration Watershed (URW) Program was established to help restore the beneficial uses of impaired waters of the state while also ensuring that protective measures are in place to prevent future degradation. Several guidance documents are available online, including factsheets about watershed planning and how to develop a watershed plan. The program also has a list of financial resources available through federal, state and private entities. Examples of financial resources include the Nonpoint Source EPA Section 319 Grant, North Carolina Land and Water Fund (NCLWF), Water Resources Development Grant (WRDG), Z. Smith Reynolds Foundation, and voluntary cost share programs managed by the North Carolina Department of Agriculture and Consumer Services (NCDA&CS) Division of Soil & Water Conservation (DSWC). Additional information about each of these funding sources can be found on each program's website.

8.8.1 Water Quality

Several grants are administered by DWR. A brief overview of the EPA Section 319(h) and 205(j) grants and the Water Resources Development Grant (WRDG) are included here.

8.8.1.1 Section 319(h) Grants

Through Section 319(h) of the Clean Water Act, EPA provides funds to state, territory and tribal agencies to reduce nonpoint source pollution. Funds must be used to help restore waterbodies currently impaired by nonpoint source pollution. The waterbody must also be located in an area with an approved watershed restoration plan (9Element Watershed Restoration Plan). Funds are allocated through a competitive grant process and are used to implement stormwater and agricultural BMPs and restoration projects on impaired waterbodies. More information about the program can be found on DWR's 319 Grant Program's website.

8.8.1.2 205(j) Water Quality Management Planning Grants

The 205(j) Grant Program is also funded through EPA and provides funding to complete water quality management planning projects. Projects can involve identifying the nature, extent and cause of water quality problems or developing plans to address these problems (i.e., 9-Element Watershed Restoration Plan). Limited competitive funding is available to regional COGs for water quality management planning efforts. More information can be found on DWR's 205(j) Grant Program's website.

8.8.1.3 Water Resources Development Grants (WRDG)

The purpose of the Water Resources Development (WRDG) Program is to provide cost-share grants and technical assistance to local governments throughout the state. Applications for grants are accepted for seven eligible project types: general navigation, recreational navigation, water management, stream restoration, water-based recreation, Natural Resources Conservation Service (NRCS) Environmental Quality Incentives Program (EQIP) stream restoration projects, and feasibility/engineering studies. The non-navigation projects are collectively referred to as state and local projects. The program provides 50% cost share on approved projects.

8.8.1.4 North Carolina Land and Water Fund

Created in 1996, the North Carolina Land and Water Fund (NCLWF) provides grants to local governments, state agencies and conservation non-profits to help finance projects that specifically address protecting and restoring North Carolina's land and water resources. These projects include land acquisitions, capital improvements to wastewater and stormwater infrastructure, and stream restoration projects. NCLWF is managed within the NC Department of Natural and Cultural Resources (DNCR), Division of Land and Water Stewardship . More information (including eligibility requirements) can be found on the NCLWF webpage.

8.8.2 Division of Water Infrastructures

DEQ's Division of Water Infrastructure (DWI) provides financial assistance for projects that improve water quality. Programs administered by DWI fund wastewater collection and treatment systems, drinking water treatment and distribution systems, stormwater quality management systems, and stream restoration. The division also supports the nine-member State Water Infrastructure Authority ("Authority"), which was created by the North Carolina General Assembly in 2013 under General Statute 159G-70. The Authority is an independent body with primary responsibility for awarding federal and state funds for water and wastewater infrastructure projects, recommending ways to maximize the use of available funding resources, and recommending best and emerging utility management practices.

In 2017, the Authority published North Carolina's Statewide Water and Wastewater Infrastructure Master Plan: The Road to Viability ("Master Plan"). The Master Plan presents the state's roadmap for viable water and wastewater utilities that safeguard public health, protect the environment, support vibrant communities, and encourage economic growth and development. The three key areas that require focus to move toward viability are in long-term infrastructure management, organizational management and financial management. The Master Plan applies broadly to owners and operators of water and wastewater utilities and systems that serve the public, and emphasizes that local elected officials, town and county managers, utility governing boards, customers and stakeholders, as well as the public, play key roles in achieving viable utilities.

8.8.2.1 Loans and Grants Administered by the Division of Water Infrastructure (DWI)

DWI administers financial assistance programs for projects that improve water quality through low-interest loans and grants to local governments and certain other non-profit entities for water and wastewater infrastructure. Programs within DWI include the Clean Water State Revolving Fund (CWSRF), the Drinking Water State Revolving Fund (DWSRF), the Community Development Block Grant-Infrastructure (CDBG-I) Program, the State Wastewater and Drinking Water Reserve Programs, Asset Inventory and Assessment Grant Program, and Merger/Regionalization Feasibility Grant Program. More information about each of these programs can be found on DWI's website under "I Need Funding". Projects funded by the State Water Infrastructure Authority can be found in Table 8-7. In July 2020, the Governor signed into law legislation that created the Viable Utility Reserve (VUR) program.

8.8.2.1.1 Clean Water State Revolving Fund (CWSRF)

The Clean Water State Revolving Fund receives federal funding through the US EPA under the Clean Water Act (CWA). This program is available for local governments (counties, cities, towns, sanitary districts, etc.) for wastewater treatment, wastewater collection, reclaimed water, stormwater quality BMPs, stream restoration, and energy efficiency projects for treatment works or collection systems. The CWSRF provides funding through low-interest loans and limited-amount principal interest loans.

8.8.2.1.2 Drinking Water State Revolving Fund (DWSRF)

The Drinking Water State Revolving Fund (DWSRF) receives federal funding through the EPA under the Safe Drinking Water Act (SDWA). This program is available for local governments (counties, cities, towns, sanitary districts, etc.) and certain other non-profit entities for source, treatment, storage, transmission and distribution systems. The DWSRF provides funding through low-interest loans and limited-amount principal interest loans.

8.8.2.1.3 Community Development Block Grant-Infrastructure (CDBG-I)

Funding for the federal Community Development Block Grant-Infrastructure (CDBG-I) Program is provided by the US Department of Housing and Urban Development (HUD). The program provides grants to local government units to address water and wastewater infrastructure needs in HUD-qualified low- to moderate-income communities.

8.8.2.1.4 State Wastewater and Drinking Water Reserve Program

Funding for the State Wastewater Reserve and Drinking Water Reserve Program is provided by the North Carolina General Assembly. The program provides grants and loans for design and construction of critical water and wastewater infrastructure. Funds can be used by units of local government for wastewater collection and treatment projects and public water system projects.

8.8.2.1.5 Asset Inventory and Assessment (AIA) Grant Program

Funding for the Asset Inventory and Assessment (AIA) Grant Program is provided by the North Carolina General Assembly. The program provides grants for developing asset inventories, condition assessment of critical assets and other components of a comprehensive asset management program.

8.8.2.1.6 Merger/Regionalization Feasibility (MRF) Grant Program

Funding for the Merger/Regionalization Feasibility (MRF) Grant Program is provided by the North Carolina General Assembly. The program provides grants for studies to evaluate the potential consolidation of two or more systems, the potential for interconnection with another system for regional wastewater treatment or regional water supply, and the managerial consolidation of systems without physical interconnection.

8.8.2.1.7 Viable Utility Reserve Program

Funding for the Viable Utility Reserve (VUR) program works to build a path toward viable utility systems using long-term solutions for distressed water and wastewater units in North Carolina. This program is currently under development.

8.8.3 Cost Share Programs for Best Management Practices (BMPs)

Several cost share programs are available through both federal and state agencies. The Division of Soil & Water Conservation (DSWC) in the North Carolina Department of Agriculture and Consumer Services (NCDA&CS) administers multiple state cost share programs while the United States Department of Agriculture (USDA) Natural Resource Conservation Service (NRCS) administers several federal cost share programs. The programs typically offer 75% cost share assistance to applicants for the installation of BMPs to protect or improve natural resource concerns. The applicant is responsible for the remaining 25% of the costs, which can include the use of existing material and labor (in-kind services) and/or monetary contributions. There are some cost share and acreage restrictions depending on the BMPs used, the type of operation involved, and/or policies set by the local SWCD or the North Carolina Soil and Water Conservation Commission (SWCC). Cost share incentive payments are also available to encourage the use of certain agronomic management practices.

Between June 2012 and June 2020, nearly $2.0 million has been spent on the implementation of voluntary BMPs in the Pasquotank River basin through the state cost share programs (Table 8-8). Each BMP installed has water quality benefits associated with it and tools are in place to calculate how many acres are affected, how much soil was saved, and the total amount of nitrogen and phosphorus saved. More information about the cost share programs administered by the DSWC and the water quality benefits associated with each can be found on their website. Types and number of BMPs implemented in each of the watersheds is included in the watershed chapters.

8.8.3.1 Agriculture Cost Share Program (ACSP)

The North Carolina Agriculture Cost Share Program (ACSP) was established in 1984 to help reduce nonpoint source runoff and provide guidance to owners and producers on ways to improve their on-farm management of water resources and BMPs. The program is administered by DSWC but managed by the local SWCD. The local SWCD reviews and identifies priorities on an annual basis and calls upon federal, state, local, non-profit, non-government, and natural resource groups for technical, financial, planning and implementation support to restore, enhance and/or maintain natural resources throughout their jurisdictional area. BMPs include vegetative, structural or management systems that can improve the efficiency of farming operations while reducing the potential impacts to surface water and/or groundwater. Applications for cost share assistance through ACSP are ranked based on resource concerns identified by the SWCD.

Table 8-7 Infrastructure Projects Funded by State Water Infrastructure Authority using State and Federal Loans and Grants in the Pasquotank River Basin (January 2014 – July 2020)

Applicant	Project Description	Amount	Funding Program*	Date	County	Council of Government (COG)
Chowan County	Water System AIA	$150,000	AIA	Mar 2019	Chowan	Albemarle Comm
Chowan County	Valhalla WTP Solids Handling	$8,562,000	DWSRF & DWSR-G	Feb 2018	Chowan	Albemarle Comm
Chowan County	Water Supply MRF	$50,000	MRF	Feb 2020	Chowan	Albemarle Comm
Edenton	I/I Improvements	$1,000,000	WWSR-G & WWSR-L	July 2017	Chowan	Albemarle Comm
Edenton	Well Rehab and Storage Tank	$1,336,000	DWSRF	July 2018	Chowan	Albemarle Comm
Edenton	Beaver Hill Water Plant Upgrade	$1,658,700	DWSR-L	Jan 2017	Chowan	Albemarle Comm
Edenton	Freemason Water Plant Upgrade	$2,000,000	DWSR-L	Jan 2017	Chowan	Albemarle Comm
Edenton	Water AIA	$150,000	AIA	Mar 2019	Chowan	Albemarle Comm
Total Funded in Chowan County		**$14,906,700**				
Manteo	Shallowbag Sewer PS Replace.	$1,106,660	CWSRF	July 2019	Dare	Albemarle Comm
Manteo	AMI Meter Replacement	$620,579	DWSR-L	July 2018	Dare	Albemarle Comm
Manteo	Wastewater System AIA	$150,000	AIA	Mar 2019	Dare	Albemarle Comm
Total Funded in Dare County		**$1,877,239**				
Elizabeth City	Raw Wtr. Reservoir Rehab	$1,073,303	DWSRF	Mar 2019	Pasquotank	Albemarle Comm
Elizabeth City	Wastewater AIA	$150,000	AIA	Feb 2020	Pasquotank	Albemarle Comm
Elizabeth City	Potable Water Loss AIA	$150,000	AIA	Feb 2018	Pasquotank	Albemarle Comm
Elizabeth City (DR)	Raw Water Transmission Main	$903,581	CDBG-I	Feb 2018	Pasquotank	Albemarle Comm
Total Funded in Pasquotank County		**$2,276,884**				
Columbia	2017 Sewer Improvements	$1,965,000	CDBG-I	Feb 2018	Tyrrell	Albemarle Comm
Tyrrell County	Sewer Extension for Failing Septics	$2,997,000	CDBG-I	July 2014	Tyrrell	Albemarle Comm
Total Funded in Tyrrell County		**$4,962,000**				
Creswell	Water Treatment Plant Improv.	$755,170	DWSR-G & DWSR-L	Feb 2018	Washington	Albemarle Comm
Plymouth	WWTP Rehab	$2,042,500	CWSRF	July 2017	Washington	Albemarle Comm
Plymouth	Wastewater AIA	$146,585	AIA	July 2016	Washington	Albemarle Comm
Plymouth	Water System Improvements	$175,000	CDBG-I	Mar 2019	Washington	Albemarle Comm
Plymouth	Water System Improvements	$1,000,000	DWSR-G & DWSR-L	Feb 2018	Washington	Albemarle Comm
Plymouth	WTP Rehab	$2,588,947	CDBG-I	July 2014	Washington	Albemarle Comm
Plymouth	Water AIA	$150,000	AIA	Feb 2020	Washington	Albemarle Comm

Applicant	Project Description	Amount	Funding Program*	Date	County	Council of Government (COG)
Roper	Cause/Treatment of TTHM and HAA5 Formations	$50,000	DWTAG	Dec 2014	Washington	Albemarle Comm
Roper	Wastewater System AIA	$100,225	AIA	July 2016	Washington	Albemarle Comm
Roper	WWTP Improvements	$908,000	CDBG-I	May 2014	Washington	Albemarle Comm
Roper	2017 WWTP Improvements	$960,000	WWSR-L	July 2017	Washington	Albemarle Comm
Roper	2018 Water System Impr.	$1,013,675	DWSRF	Mar 2019	Washington	Albemarle Comm
Roper	Wastewater System Improvements	$1,092,000	CDBG-I	Jan 2017	Washington	Albemarle Comm
Total Funded in Washington County		**$10,226,932**				

(*) Funding Program:

WWHUC	Wastewater High Unit Cost Grant (Discontinued in 2015)
WWTAG	Wastewater Technical Assistance Grant (Discontinued in 2015)
DWHUC	Drinking Water High Unit Cost Grant (Discontinued in 2015)
DWTAG	Drinking Water Technical Assistance Grant (Discontinued in 2015)
CDBG-I	Community Development Block Grant - Infrastructure (Federal grant)
CWSRF	Clean Water State Revolving Fund (Federal loan)
DWSRF	Drinking Water State Revolving Fund (Federal loan)
WWSR-G	Wastewater State Reserve Grant (State grant)
DWSR-G	Drinking Water State Reserve Grant (State grant)
WWSR-L	Wastewater State Reserve Grant Loan (State loan)
DWSR-L	Drinking Water State Reserve Loan (State loan)
AIA	Asset Inventory and Assessment (State grant)
MRF	Merger/Regionalization Feasibility Study (State grant)
PF	Federal Principal Forgiveness - CWSRF and DWSRF programs only

8.8.3.2 Community Conservation Assistance Program (CCAP)

The Community Conservation Assistance Program (CCAP) is designed to improve water quality through the installation of various BMPs on urban, suburban, and rural lands, not directly involved in agricultural production. CCAP provides educational, technical, and financial assistance to landowners through the local SWCDs. This program is open to homeowners, businesses, schools, parks, churches, and community groups.

8.8.3.3 Agricultural Water Resources Assistance Program (AgWRAP)

The Agricultural Water Resource Assistance Program (AgWRAP) is designed to identify opportunities to increase water use efficiency and available storage, implement BMPs to protect water resources, increase water efficiency, and increase water storage for agriculture.

8.8.3.4 USDA-NRCS Environmental Quality Incentives Program (EQIP)

The Natural Resources Conservation Service (NRCS) provides financial assistance through the Environmental Quality Incentives Program (EQIP) to cover costs associated with implementing conservation measures. NRCS also provides one-on-one help in planning, constructing, and managing conservation measures. Common conservation practices include cover crops, timber or forest improvement, prescribed grazing, and irrigation practices. In addition to EQIP, NRCS has funds available through the Conservation Stewardship Program (CSP). Information about federal financial assistance programs to help conserve natural resources on agricultural lands can be found on NRCS's website.

Table 8-8 Best Management Practices Funded by State Cost Share Programs in the Pasquotank River Basin (June 2012 – June 2020). Information provided by DSWC.

Best Management Practice	Unit Type	6/1/2012 - 6/30/2015			7/1/2015 - 6/30/2020			Total Units Installed	Total Number of Contracts	Total Cost Share ($)
		Units Installed	Number of Contracts	Cost Share	Units Installed	Number of Contracts	Cost Share			
Abandoned Well Closure	EACH				1	1	$780	1	1	$780
Ag Water Collection System	EACH				1	1	$6,615	1	1	$6,615
Agricultural Water Collection System	EACH				1	1	$10,649	1	1	$10,649
Agricultural Pond Sediment Removal	EACH				1	1	$5,000	1	1	$5,000
Agricultural Water Supply/Reuse Pond	EACH	3	3	$44,063				3	3	$44,063
AIM-Water Control Structure - In-Line Structure	EACH				1	1	$524	1	1	$524
Backyard rain garden	EACH				781	4	$4,947	781	4	$4,947
Cisterns	EACH	1	1	$2,969				1	1	$2,969
Closure - Waste Impoundments	EACH				3	1	$26,449	3	1	$26,449

Best Management Practice	Unit Type	6/1/2012 - 6/30/2015			7/1/2015 - 6/30/2020			Total Units Installed	Total Number of Contracts	Total Cost Share ($)
		Units Installed	Number of Contracts	Cost Share	Units Installed	Number of Contracts	Cost Share			
Conservation Irrigation Conversion	ACRE				1	1	$9,788	1	1	$9,788
Cover Crops	ACRE	2,830	23	$79,262	5774.735	52	$235,412	8,605	75	$314,674
Critical Area Planting	ACRE				4	1	$463	4	1	$463
Crop Residue Management	ACRE	14,808	70	$223,830	6299.06	22	$97,650	21,107	92	$321,480
Cropland Conversion - Grass	ACRE	2.5	1	$655	19.1	1	$5,730	21.6	2	$6,385
Cropland Conversion - Trees	ACRE				87.9	6	$15,174	87.9	6	$15,174
Dare District BMP - oyster reef	EACH				2	2	$8,101	2	2	$8,101
Emergency Access Restoration	EACH				1	1	$2,232	1	1	$2,232
Field Border	ACRE	0.4	1	$1,230				0.4	1	$1,230
Grade Stabilization Structure	EACH				3	3	$9,162	3	3	$9,162
Grassed Waterway	ACRE				0.28	1	$1,167	0.28	1	$1,167
Land Smoothing	ACRE	1,625	43	$259,769	4,246	88	$597,577	5,871	131	$857,346

Best Management Practice	Unit Type	6/1/2012 - 6/30/2015			7/1/2015 - 6/30/2020			Total Units Installed	Total Number of Contracts	Total Cost Share ($)
		Units Installed	Number of Contracts	Cost Share	Units Installed	Number of Contracts	Cost Share			
Long-Term No-till	ACRE	90.1	2	$13,515	262	3	$39,300	352.1	5	$52,815
Marsh sills	LinFT				3,100	4	$32,392	3,100	4	$32,392
Non-Field Farm Road Repair	EACH				1	1	$6,523	1	1	$6,523
Nutrient Management	ACRE				1451	2	$26,117	1,451	2	$26,117
Nutrient Scavenger Crop	ACRE				250	1	$5,000	250	1	$5,000
Permeable pavement	SqFt				1,461	1	$6,000	1,461	1	$6,000
Pet waste receptacle	EACH	3	3	$3,022				3	3	$3,022
PRECISION AGRICHEMICAL APPLICATION	EACH	6	6	$11,840	5	5	$12,688	11	11	$24,528
Precision Nutrient Management	ACRE				1,764	6	$29,996	1,764	6	$29,996
Three Year Conservation Tillage for Grain and Cotton	ACRE	475	6	$28,500				475	6	$28,500
Water Control Structure	EACH	27	8	$63,940	19	10	$48,468	46	18	$112,408

Best Management Practice	Unit Type	6/1/2012 - 6/30/2015			7/1/2015 - 6/30/2020			Total Units Installed	Total Number of Contracts	Total Cost Share ($)
		Units Installed	Number of Contracts	Cost Share	Units Installed	Number of Contracts	Cost Share			
Water Control Structure - In-Line Structures	EACH				1	1	$1,836	1	1	$1,836
Water Supply Well & Pump	EACH				3	3	$14,071	3	3	$14,071
Grand Total			**167**	**$732,595**		**225**	**$1,259,811**		**392**	**$1,992,406**

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