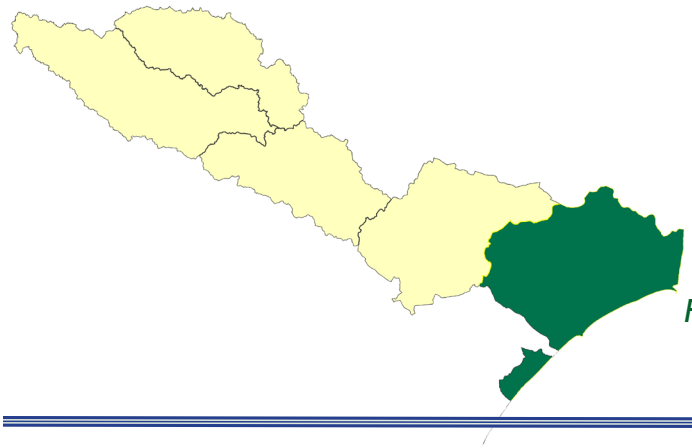


Pamlico Sound

Subbasin HUC 03020105

From the Pamlico Estuary to the Outer Banks

Water Quality Overview: Water quality concerns in this subbasin are focused on shellfish harvesting and recreational uses. A majority of the Impaired water for shellfish harvesting occur in prohibited shellfish growing areas and are not based on collected fecal coliform data. Swanquarter Bay is the only recreationally Impaired area due to enterococcus data. It is important to check current water quality conditions provided by the Division of Environmental Health before swimming or shellfish harvesting in these areas.

General Description

The Pamlico River Subbasin encompasses 1,683 square miles. The predominant land cover is forest and wetland, with some cultivated cropland. With the exception of the Outer Banks, this subbasin is one of the most rural on the coast. Lake Mattamuskeet and the Swanquarter National Wildlife Refuges cover large areas in this subbasin. The subbasin is outlined in Figure 5-1.

There are six NPDES wastewater discharge permits in this subbasin with a total permitted flow of 1.02 million gallons/day (MGD).

Watershed at a Glance

Counties: Hyde, Dare, Carteret, Pamlico

Towns: Swanquarter, Engelhard, Avon, Buxton, Frisco, Hatteras, Ocracoke, Atlantic, Sealevel, Stacy

Permitted Facilities:

NPDES WWTP: 6
Non-discharge:.....8
Stormwater:
General:.....5

2000 Population: 36,680

Area: 1,683 sq mi.

Current Status and Significant Issues

Use Support Assessment Summary

All surface waters in the state are assigned a classification reflecting the best-intended use of that water. To determine how well waterbodies are meeting their best-intended uses chemical, physical, and biological parameters are regularly assessed by DWQ. These data are used to develop use support ratings every two years as reported to EPA; a collected list of all monitored waterbodies and their water quality rating is called the Integrated Report (IR) and Impaired waters are also reported on the 303(d) list. Water quality evaluation levels and how a waterbody earns a rating of Supporting or Impaired is explained in

Primary Classifications found in HUC 03020105:

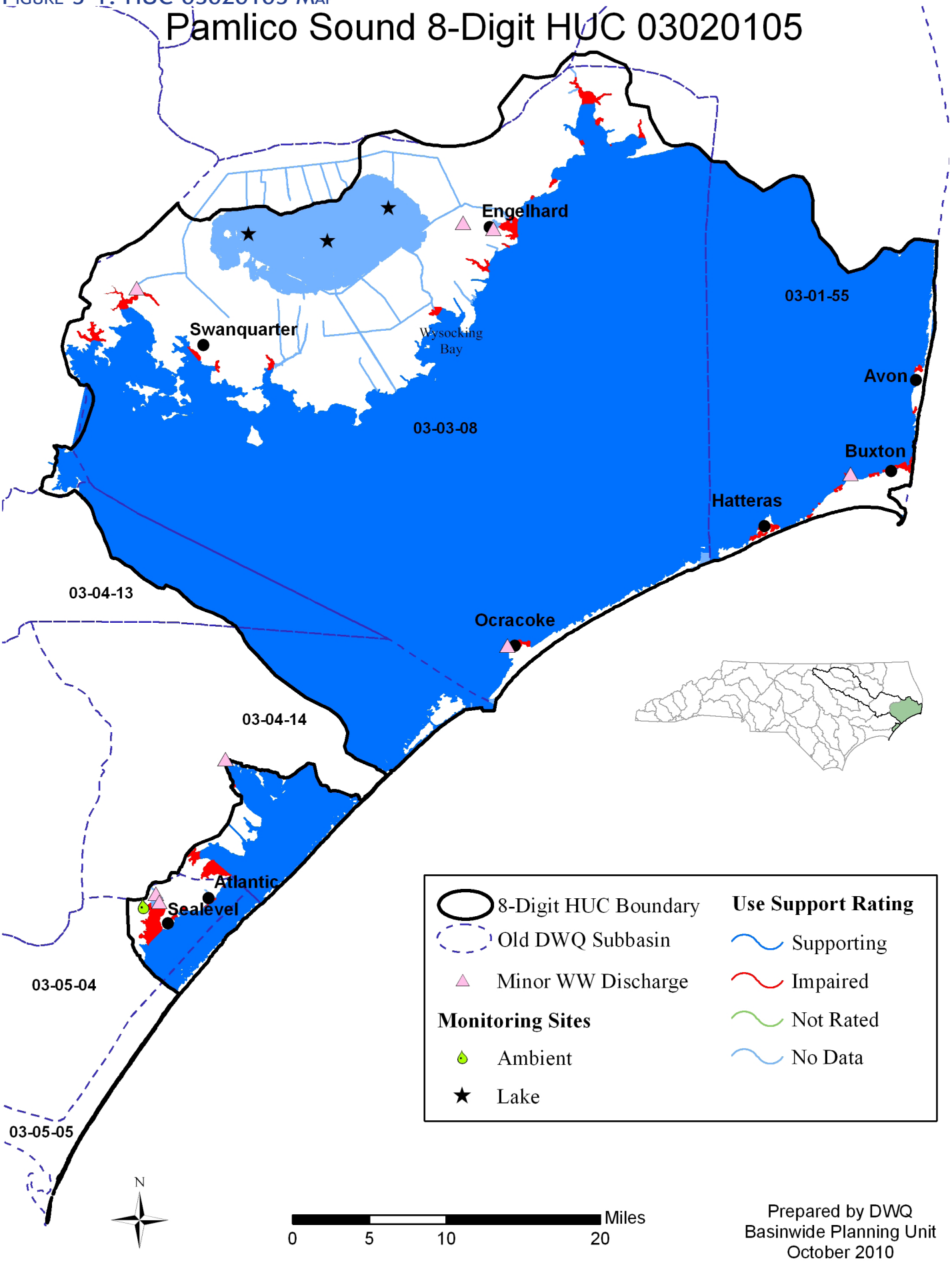
Saltwater	Acres	Freshwater	Miles	Coast	Miles
Total	549,036	Total	14	Total	17

Supplemental Classifications:

SA;HQW.....	484,075	C;Sw.....	13	SB.....	17
SA;ORW.....	24,125	C;Sw,HQW....	1		
SC.....	40,648				
SC;HQW.....	135				
SC;ORW.....	54				

Classification descriptions are found at: http://h2o.enr.state.nc.us/csu/index.html

FIGURE 5-1. HUC 03020105 MAP



detail in the IR methodology. The 2010 (IR) is based on data collected between 2004 and 2008. The most current use support ratings for this subbasin are in Appendix 5A.

In this subbasin, use support was assigned for aquatic life, recreation, shellfish harvesting, fish consumption and water supply categories. Waters are Supporting, Not Rated, or No Data in the aquatic life and recreation categories on a monitored or evaluated basis. All waters are Impaired in the fish consumption category on an evaluated basis based on fish consumption advice issued by the **Department of Health and Human Services** (DHHS). All waters are Supporting in the water supply category on an evaluated basis based on reports from Division of Environmental Health (DEH) regional water treatment plant consultants. Appendix 5A provides a list of waterbodies in this subbasin and their most recent use support rating if monitored.

Recreation

Recreation uses in tidal saltwaters are rated based on NC's Enterococcus standard which requires a geometric mean of < 35 enterococci per 100 ml based upon a minimum of five samples within any consecutive 30 days. Enterococci are a subgroup of the fecal streptococcus group which generally occur in the digestive systems of humans and other warm-blooded animals along with fecal coliform bacteria. According to the EPA, Enterococci bacteria are better able to survive in salt water and, thus, more closely mimic other pathogens than do the fecal coliform bacteria.

Enterococcus samples are collected by the N.C. Recreational Water Quality Program (NCRWQP) within the Division of Environmental Health and not by DWQ. Their sampling results and current swimming advisories are available at: **http://www.deh.enr.state.nc.us/shellfish/Water_Monitoring/RWQweb/home.htm**.

There are 17 coast miles of water classified for primary recreation (SB) in this subbasin. This area from Ocracoke Inlet to Hatteras Inlet is considered Supporting for recreational uses. However, Swanquarter Bay (136 acres), which is not classified for primary recreation, is considered Impaired for recreation based on recreational advisory posting.

The NCRWQP tests recreational beaches during the swimming season beginning on April 1st and ends October 31. All ocean beaches and high-use sound-side beaches (Tier 1) are tested weekly during the swimming season. Lower-use beaches (Tier II and Tier III) are tested twice a month. All sites are tested twice a month in October and monthly from November through March. The NCRWQP currently uses a running geometric mean and single sample test to determine compliance with their rules (15A NCAC 18A .3402): (a) The Enterococcus level in a Tier I swimming area shall not exceed either: (1) A geometric mean of 35 enterococci per 100 milliliter of water, that includes a minimum of at least five samples collected within 30 days; or (2) A single sample of 104 enterococci per 100 milliliter of water. (b) The enterococci level in a Tier II swimming area shall not exceed a single sample of 276 enterococci per 100 milliliter of water. (c) The enterococcus level in a Tier III swimming area shall not exceed two consecutive samples of 500 enterococci per 100 milliliter of water.

Shellfish Harvesting Water

There are 519,897 acres classified as shellfish harvesting waters (SA;HQW), of which 2,419 acres (<1%) are Impaired because of potential fecal coliform bacteria contamination. Specific Impaired waterbodies are listed in Appendix 5A. The Shellfish Sanitation and Recreational Water Quality Section of the Division of Environmental Health (DEH) is responsible for monitoring and classifying coastal waters as to their suitability for shellfish harvesting for human consumption, and inspection and certification of shellfish and crustacea processing plants. Figure 5-2 is a map of DEH shellfish growing areas.

The Shellfish Sanitation Program is conducted in accordance with the guidelines set by the Interstate Shellfish Sanitation Conference contained in the National Shellfish Sanitation Program

(NSSP) Guide for the Control of Molluscan Shellfish Model Ordinance. Classifications of coastal waters for shellfish harvesting are done by means of a Sanitary Survey, which includes: a shoreline survey of sources of pollution, a hydrographic and meteorological survey, and a bacteriological survey of growing waters. Sanitary Surveys are conducted for all potential shellfish areas in coastal North Carolina and recommendations are made to the Division of Marine Fisheries of which areas should be closed for shellfish harvesting. Detailed maps are available from the DEH website showing current shellfish growing areas: http://www.deh.enr.state.nc.us/shellfish/maps.htm.

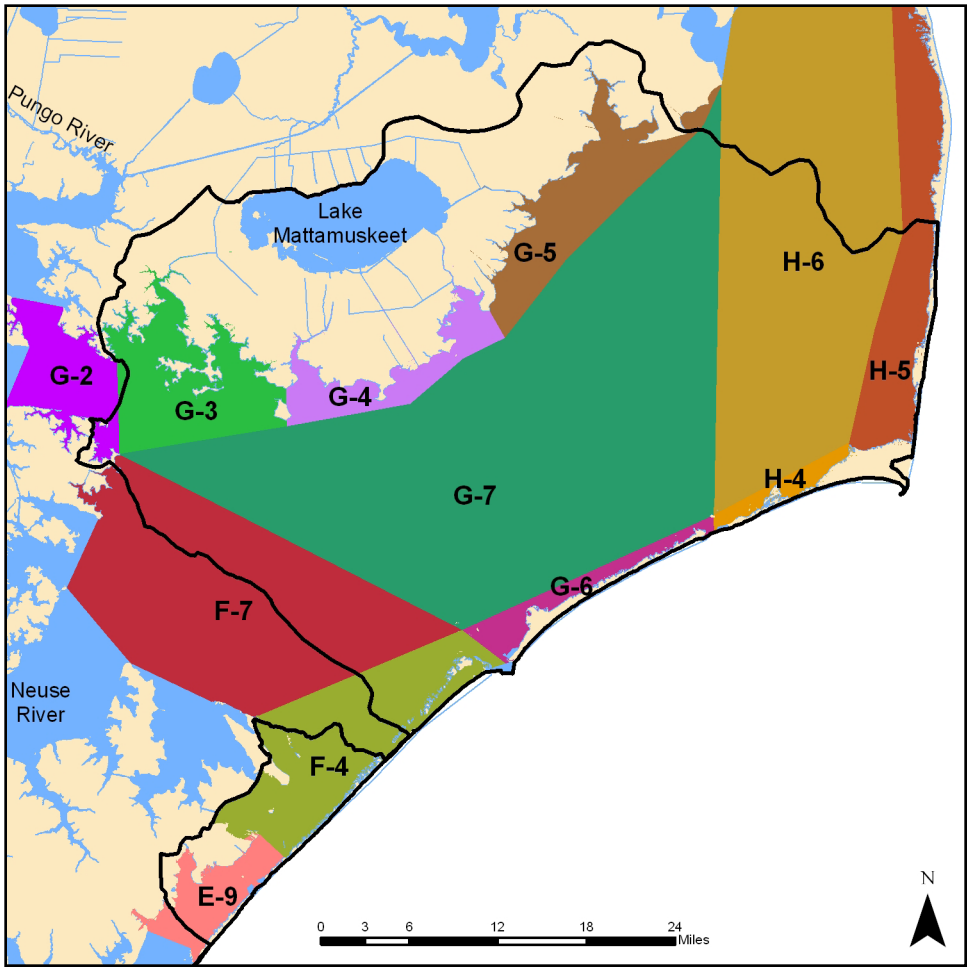
DWQ uses DEH classifications to assign use support ratings for the shellfish harvesting category. By definition, Conditionally Approved-Open areas are areas that DEH has determined do not, or likely do not, meet water quality standards and these areas are rated Impaired, along with Conditionally Approved-Closed and Prohibited or Restricted areas. Only DEH Approved growing areas are rated as Supporting.

This subbasin contains 11 DEH shellfish growing areas including: G-3, G-4, G-5, G-6, G-7, F-4, F-7, E-9, H-4, H-5, & H-6 as shown in Figure 5-2. The following summaries are from the most current and available DEH Shellfish Sanitation Sanitary Surveys. Note, not all growing areas are surveyed by DEH.

According to the Sanitary Survey of Outer Banks, Area H-5, bacteriological water quality has declined in some areas. As a result of the 2006, survey approximately 15 acres are closed to shellfish harvesting in Askins Creek. However, 120 acres of the Cape Creek Area have opened for shellfish harvesting. Area H-5 includes 66,800 acres and oyster and clam production is considered fair. The survey area is characterized by three small-populated areas separated by miles of uninhabited dunes and marshes. The permanent population is estimated at 2,400 while seasonal tourism increases population to 40,000. Several hurricanes impacted this area during this last Sanitary Survey resulting in debris from destroyed houses, fuel tanks and vehicles being washed into the waterways. Most of the area is within Cape Hatteras National Seashore and will never be developed.

The Long Shoal River, Area G-5, 2006 Survey indicates no improvement in overall bacteriological water quality. The land use in the area primarily is forested, agriculture row crops, several non-operational hog farms with lagoons, wildlife refuge, and the largest town is Englehard. Water movement in the area is influenced by wind, and wind is considered

FIGURE 5-2. SHELLFISH GROWING AREAS IN HUC 03020105



the major distributor of pollution. Sampling results indicated a decline in bacteriological water quality in Far Creek and Middletown Creek, while several stations had slight improvements since the 2002 triennial survey.

According to the Sanitary Survey of Hatteras Area, Area H-4, an overall decline in bacteriological water quality has occurred. As a result of the 2007 survey an additional 4.5 acres will be reclassified from Approved to Prohibited for shellfish harvesting. The area covers 5,800 acres, of which 229.5 acres are closed for shellfish harvesting. Oyster production is considered poor and clam production is poor. Samples taken near an area referred to as Little Ditch, showed extremely high bacteria counts, but no major pollution sources were noted. Area H-4 is located along the Outer Banks at the western end of Hatteras Island where tourism is the main industry. Hatteras Village has an approximate population of 1,700 with an increase to 6,000 during peak tourist months; the town of Frisco has approximately 700 permanent residents, increasing seaonally to 5,000. There is no central WWTP within this area and all residences and businesses utilize conventional septic systems. Many of the septic systems are old and are installed in fill or coarse sand, allowing possible discharge to adjacent water via groundwater.

The 2006 Sanitary Survey of the Ocracoke, Area G-6 reports improved bacteriological water quality in the Horsepen Point area and in Silver Lake. Area G-6 is composed of waters adjacent to Ocracoke Island from Shell Island to Hatteras Inlet. The population center of this area is in Ocracoke village, with an estimated permanent population of 790, rising to ~4,500 during the summer. Rainfall is known to have little effect on water quality as the entire area has good tidal movement and high salinity. Bacteriological water quality data collected by DEH resulted in the recommendation of opening shellfish harvesting in the Horsepen Point area; however, Silver Lake will remain closed due to the presence of marinas and other pollution sources.

Cedar Island, Area F-4, consists of the waters of Thorofare Bay, Cedar Island Bay, Back Bay, eastern Core Sound, and the southern portion of Pamlico Sound. There are approximately 300 square miles of water and marshland in this isolated and remote area. The eastern boundary of Area F-4 consists of a chain of uninhabited barrier islands, of which Portsmouth is the most notable. The area has in the past been one of the better oyster producing regions of the state and clam production continues to be good. While the area is predominantly marsh and open water, the communities of Cedar Island and Lola are also located in F-4. The permanent population of this area is just over 300, and little to no population growth can be expected in the future. Quality Seafood maintains a small boat basin adjacent to their fish house, with eight total slips. Runoff from this facility drains to the boat basin and therefore it was recommended that this basin be closed for shellfish harvesting. Both domestic and wild animals are considered to have minor impacts to water quality in this growing area.

Growing Area E-9 is the portion of Core Sound from Hall Point near Atlantic to Oyster Creek and includes Styron Bay, Nelson Bay, Brett Bay, and Oyster Creek. The area is a productive shellfish harvest area for both clams and oysters. The watershed of this area is rural in nature and has experienced little development in recent years, although interest has increased recently in developing the waterfront areas. The area consists mostly of woodland, farmland and marshland. Bacteriological water quality in the majority of Area E-9 is excellent, especially during dry periods. The population has changed very little in recent years and is concentrated mainly around the communities of Atlantic and Sea Level. Drainage from these communities is largely facilitated by a system of ditches running between properties and along roads, and all of these ditches eventually drain into the surrounding creeks and sounds. Overall, stormwater runoff is likely the single largest contributor to water quality degradation in the E-9 area. After periods of heavy rainfall, increases in fecal coliform counts are seen in the Nelson Bay section and in Oyster Creek.

Oyster Restoration

North Carolina Estuary Habitat Restoration project was funded under the American Recovery and Reinvestment Act of 2009. This project aims to create and restore 49 acres of oyster reefs off the inland coast of Hatteras Island. A further goal of the project is documenting the synergistic benefits to other fisheries in the areas around created reefs. The project was approved for $5 million in funds to be managed by the North Carolina Coastal Federation.

Permit Programs

Wastewater Dischargers

The National Pollutant Discharge Elimination System (NPDES) permit program controls water pollution by regulating point sources that discharge pollutants into waters of the United States, as authorized by the Clean Water Act. Non-compliance with permit limits on wastewater flow and constituents can lead to discharge of pollutants that degrade surface waters making them unsafe for drinking, fishing, swimming, and other activities. The NPDES Permitting and Compliance Programs of DWQ is responsible for administering the program for the state. These permits are reviewed and are potentially renewed every 5 years. A list of NPDES permits are listed in Table 5-1 and locations on Figure 5-1.

Table 5-1. NPDES Discharge Permits in HUC 03020105

Permit #	Facility Name	Owner Type	Permit Type	Class	Receiving Stream	Permit Flow MGD
NC0000744	Captain Charlie's Seafood Inc	Non-Gov't	Industrial Process & Commercial Wastewater	Minor	Far Creek	
NC0041530	Ocracoke Reverse Osmosis WTP	Non-Gov't	Water Plants and Water Conditioning	Minor	Pamlico Sound	0.45
NC0070211	Rose Bay Oyster Company	Non-Gov't	Industrial Process & Commercial Wastewater	Minor	Rose Bay Creek	
NC0076571	Gullrock Seafood	Non-Gov't	Industrial Process & Commercial Wastewater	Minor	Gray Ditch	0.005
NC0085707	Cape Hatteras Reverse Osmosis WTP	Non-Gov't	Water Plants and Water Conditioning	Minor	Pamlico Sound	1.8
NC0088668	Engelhard WTP	Gov't - County	Water Plants and Water Conditioning	Minor		0.11

On-Site Wastewater Treatment Systems (Septic Systems)

Wastewater from many households is treated on-site through the use of permitted septic systems instead of being sent to a wastewater treatment facility. Poorly planned and/or maintained systems can fail and contribute to nonpoint source pollution. Wastewater from failing septic systems can contaminate groundwater and surface water. Failing septic systems are health hazards and are considered illegal discharges of wastewater if surface waters are impacted. Information about the proper installation and maintenance of septic tanks can be obtained by contacting the Department of Environmental Health and local county health departments. Local health departments are responsible with ensuring that new systems are sited and constructed properly and an adequate repair area is available. County, town and city planners need to understand the economic and human health ramifications caused by failing septic systems and plan for long-term septic system sustainability.

In 2007, North Carolina Agricultural Research Service completed a report concerning nitrogen contributions from on-site wastewater systems for each river basin. The results for this subbasin

based on 1990 census data indicate a population of 3,763 people using 2,067 septic systems resulting in a nitrogen loading of 37,628 lbs/yr and nitrogen loading rate of 105 lbs/mi^2/yr. (Pradhan et al. 2007).

Non-Discharge

Non-discharge systems have been the preferred alternative to discharge to surface waters for some NSW waterbodies and DWQ requires all new and expanding NPDES permit applicants to provide documentation that considers alternatives to surface waters. Non-discharge wastewater disposal options include spray irrigation, rapid infiltration basins, and drip irrigation systems. Although these systems are operated without a discharge to surface waters, they still require a DWQ permit. The permit insures that treated wastewater is applied to the land at a rate that is protective of groundwater resources, and does not produce ponding or runoff into a waterbody. More information about land application and non-discharge requirements can be found on the DWQ Aquifer Protection Section Land Application Unit website: http://portal.ncdenr.org/web/wq/aps/lau. Non-discharge permits in this subbasin are listed in Table 5-1.

Run-off and spills are not common at non-discharge facilities. In general, maintaining compliance with permit conditions largely falls back to having a properly managed facility. Aging sewer systems may lead to increased flows from inflow and infiltration or a facility may not be properly prepared to expand as flows increase and the upper limits of a plant's capacity is reached. Non-discharge facilities, just like any other, must properly plan for any elevated flows and take action to ensure that the facility is capable of managing the wastewater.

Groundwater moving into surface water is a mechanism to introduce nutrients into the surface water system in the absence of direct discharges and in NSW systems it is important to be able to better quantify these potential nutrient loads. Some facilities have a groundwater monitoring program to measure compliance with groundwater quality standards. However, it should be noted that a facility can be compliant with groundwater quality requirements while still contributing to the overall nutrient loading of a surface water system. A better understanding of the groundwater/surface water interaction process at non-discharge facilities may help identify to quantify nutrient loading from these locations .

Table 5-1. Non-Discharge Permits in HUC 03020105

Facility Name	Permit Type	Permit #	Size
Kinnakeet Shores	Reuse	WQ0002284	Major
Enlisted Mens Barracks - Atlantic Airfield WW	Surface Irrigation	WQ0005233	Minor
Hyde Co Boe-Mattamuskeet Imp	Surface Irrigation	WQ0006131	Minor
NC Prison Facility at Piney Woods	Surface Irrigation	WQ0008489	Major
Single Family Residence	Surface Irrigation	WQ0015234	Minor
Kinnakeet Shores	Gravity Sewer Extension, Pump Stations, & Pressure Sewer	WQ0017527	Minor
Engelhard Sanitary District	Surface Irrigation	WQ0017625	Major
Cape Hatteras Landing	High-Rate Infiltration	WQ0031064	Major

Wetland Or Surface Water Disturbance (401 Certification)

The "401" refers to Section 401 of the Clean Water Act. The North Carolina DWQ is the state agency responsible for issuing 401 water quality certifications (WQC). When the state issues a 401 certification, this certifies that a given project will not degrade waters of the state or violate State water quality standards. A 401 WQC is required for any federally permitted or licensed activity that may result in a discharge to waters of the U.S. Typically, if the United States Army Corps of Engineers determines that a 404 Permit or Section 10 Permit is required because a proposed project involves impacts to wetlands or surface waters, then a 401 WQC is also

required. Locations of 401 WQCs are included on each watershed map. Examples of activities that may require permits include:

- Any disturbance to the stream bed or banks,
- Any disturbance to a wetland,
- The damming of a stream channel to create a pond or lake,
- Placement of any material within a stream, wetland or open water, including material that is necessary for construction, culvert installation, causeways, road fills, dams, dikes, or artificial islands, property protection, reclamation devices and fill for pipes or utility lines, and
- Temporary impacts including dewatering of dredged material prior to final disposal and temporary fill for access roads, cofferdams, storage and work areas.

Riparian Buffers

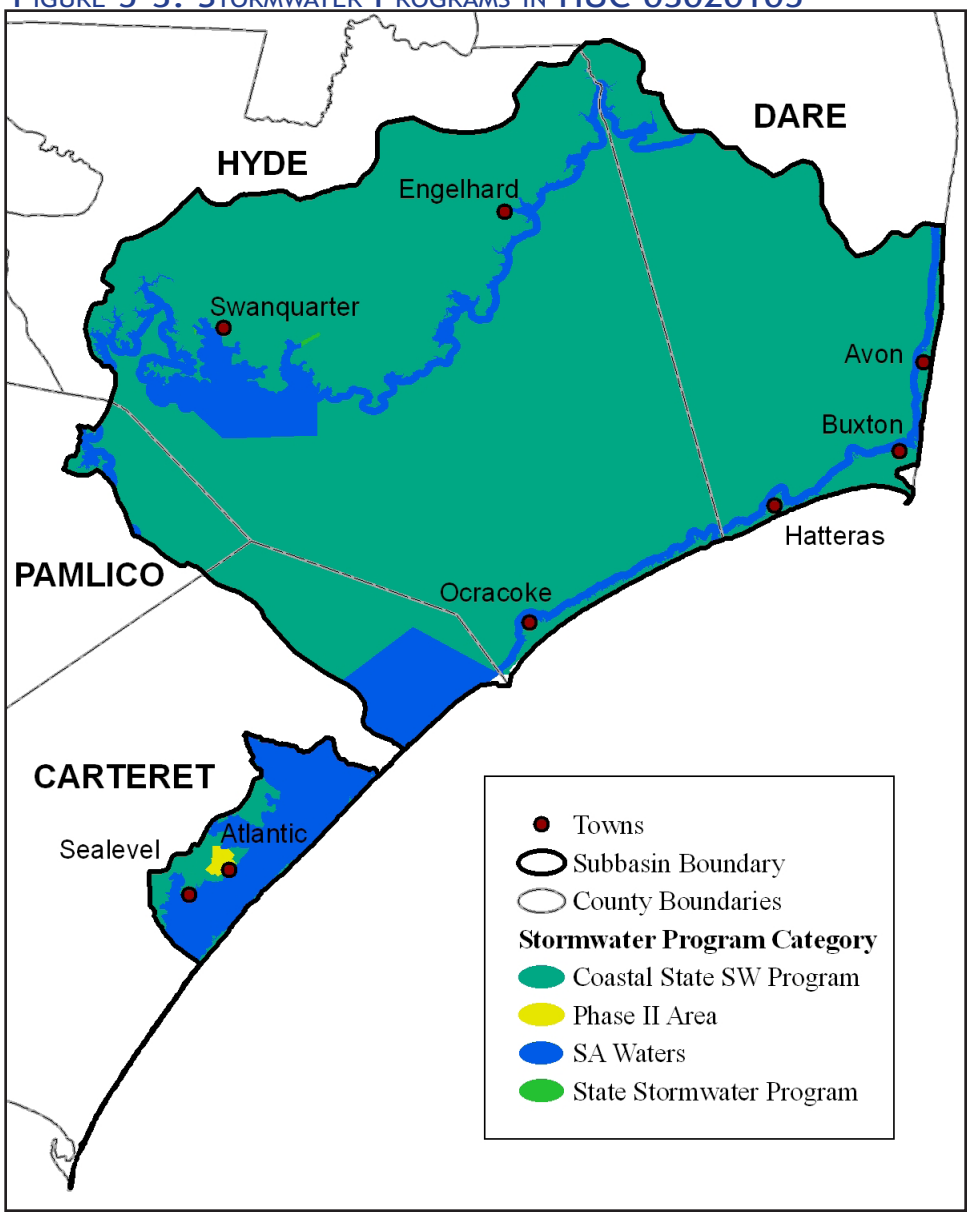
Riparian buffers in the basin are to be protected and maintained on both sides of intermittent and perennial streams, lakes, ponds, and estuarine waters. Tar-Pamlico River Basin Buffer Rules **(15A NCAC 2B.0259)** do not establish new buffers unless the existing use in the buffer area changes. The footprints of existing uses such as agriculture, buildings, commercial and other facilities, maintained lawns, utility lines, and on-site wastewater systems are exempt. A total of 50 feet of riparian area is required on each side of waterbodies; within this 50 feet, the first 30 feet, is to remain undisturbed and the outer 20 feet must be vegetated. Activities that disturb this buffer require a buffer authorization from DWQ or may require a major variance approval from the Environmental Management Commission. More information about the buffer rules are available at: http://portal.ncdenr.org/web/wq/swp/ws/401/riparianbuffers.

Stormwater

DWQ administers several different stormwater programs. The goal of the DWQ stormwater discharge permitting regulations and programs is to prevent pollution from entering the waters of the state via stormwater runoff control. These stormwater control programs include Phase II NPDES and State post-construction, coastal stormwater, HQW/ORW stormwater, Tar-Pamlico River Basin NSW stormwater, and associated with the Water Supply Watershed Program requirements. Figure 5-3 indicates the different stormwater programs in this subbasin.

All counties in this subbasin are required to implement the **Coastal Stormwater Rules**. As of

Figure 5-3. Stormwater Programs in HUC 03020105



July 2009 there are five general stormwater permits issued in this subbasin.

Agriculture

Agriculture is NC's leading industry and is especially strong in the Tar-Pamlico River Basin. Nonpoint source pollution from agriculture is an identified significant source of stream degradation in the Tar-Pamlico River Basin. The approach taken in North Carolina for addressing agriculture's contribution to the nonpoint source water pollution problem is to primarily encourage voluntary participation by the agricultural community and is supported by financial incentives, technical and educational assistance, research, and regulatory programs.

The conversion of agricultural lands to developed lands with impervious surfaces is another potential nonpoint source of pollution. A report by the American Farmland Trust organization identifies this subbasin as having high quality farmland with large areas threatened by development. A map of these areas is available at: http://www.farmland.org/. Some farmers are protecting their land from development through the Conservation Reserve Enhancement Program (CREP). CREP is a voluntary program utilizing federal and state resources to achieve long-term protection of environmentally sensitive cropland and marginal pastureland. These voluntary protection measures are accomplished through 10-, 15-, 30-year and permanent conservation easements. In this subbasin there are approximately 6,655 acres in easements, of which 51% are in 30 year or permanent easements.

North Carolina Agriculture Cost Share Program

Financial incentives are provided through North Carolina's Agriculture Cost Share Program, administered by DENR's Division of Soil and Water Conservation to protect water quality by installing BMPs on agricultural lands. In the Pamlico River Subbasin $879,044 was spent, between 2003-2008, on BMPs to reduce nonpoint source pollution from agriculture. Approximately, 20,786 acres were affected by BMPs that prevented an estimated 5,797 tons of soil, 1,089,537 lbs of nitrogen and 227,321 lbs of phosphorous from running off into surface waters.

DWQ's Animal Feeding Operations Unit The Animal Feeding Operations Unit is responsible for the permitting and compliance activities of animal feeding operations across the state. Poultry farms with dry litter waste are not regulated or monitored by DWQ. Table 5-2 summarizes the number of registered livestock operations, total number of animals, number of facilities, and total steady state live weight (SSLW) in this subbasin. These numbers reflect only operations required by law to be registered, and therefore, do not represent the total number of animals in the subbasin.

Table 5-2. Animal Operations in HUC 03020105

Type	# of Facilities	# of Animals	SSLW
Swine	2	7,045	1,620,085

*Steady State Live Weight (SSLW) is in pounds, after a conversion factor has been applied to the number of swine, cattle or poultry on a farm. Conversion factors come from the US Department of Agriculture, Natural Resource Conservation Service (NRCS) guidelines. Since the amount of waste produced varies by hog size, this is the best way to compare the sizes of the farms.

Restoration, Protection & Conservation Planning

Population

The 2000 census estimated population for this subbasin is 9,433 people and this is expected to increase with the results of the 2010 census. As population increases so does our demand for clean water from aquifer and surface water sources and for the land and water to assimilate wastes. Population estimates for each watershed within this subbasin are listed in Table 5-3.

Table 5-3. Population Estimates in HUC 03020105

10-Digit HUC	2000 Population	2000 Population Density (per sq mi)	2010 Estimated Population	2020 Estimated Population	2030 Estimated Population
0302010501	2,894	12	2,622	2,381	2,135
0302010502	772	42	701	637	572
0302010503	4,204	40	4,733	5,332	5,867
0302010504	1,563	49	1,706	1,820	1,891
03020105	9,433	24	9,762	10,171	10,464
*NC Office of State Budget and Management: http://www.osbm.state.nc.us/					

Land Use

Wetlands are the predominant land cover in this subbasin, which are especially important in protecting coastal water quality conditions. Most development in this subbasin occurs along the shoreline, with an increase in demand for inland marinas pushing development further inland. Table 5-4 lists the percentage of different predominant land cover types within this subbasin based on 2001 land cover data.

Table 5-4. Land Cover Percentages in HUC 03020105

Land Cover Type	Percent
Developed Open Space	2.58
Developed Low Intensity	1.31
Developed Medium Intensity	0.20
Developed High Intensity	0.01
Total Developed	4.09
Bare Earth Transition	2.91
Deciduous Forest	0.30
Evergreen Forest	6.48
Mixed Forest	0.68
Total non-Wetland Forest	7.46
Scrub Shrub	3.01
Grassland Herbaceous	4.66
Pasture Hay	0.22
Cultivated Crops	13.15
Total Agriculture	13.38
Woody Wetlands	36.63
Emergent Herbaceous Wetland	27.86
Total Wetlands	64.50

Central Coastal Plain Capacity Use Area

In 2001, the North Carolina EMC enacted the Central Coastal Plain Capacity Use Area (CCPCUA) rules. These regulations were developed to control groundwater use in the Cretaceous Aquifers in response to decreasing groundwater levels and saltwater intrusion. The CCPCUA rules require groundwater users in the impacted areas to reduce their consumption in three phases between 2008 and 2018. In this subbasin Carteret, Dare, Hyde, and Pamlico counties are within the CCPCUA. More information about the CCPUA is available from Divsion of Water Resources: http://www.ncwater.org/Permits_and_Registration/Capacity_Use/Central_Coastal_Plain/.

Local Initiatives & Conservation Planning

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 Coastal Resources Commission (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 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 improved if impaired. Local communities are required to devise policies that help prevent or control nonpoint source discharges 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. To find more information about these Land Use Plans see the Division of Coastal Managements website: http://dcm2.enr.state.nc.us/planning/about.htm.

Resources & Guides

Planning for sustainable growth in the Pamlico River Subbasin requires awareness, understanding, and implementation of sound design and management options. The coastal environment and natural resources contribute to our quality of life while supporting and promoting economic growth. Communities should anticipate growth while incorporating Low Impact Development technologies in their planning to promote long-term sustainability of our natural resources. The NC Division of Coastal Management with NC Sea Grant and NCSU College of Design developed "The Soundfront Series," informational guides to assist property owners and community planners and managers: http://www.ncseagrant.org/.

NCDENR's One North Carolina Naturally initiative promotes and coordinates the long-term conservation of North Carolina's threatened land and water resources. Each DENR division specializes in management of a specific natural resource, while the collaborative coordination and planning process results in cost effective implementation and management of multiple resources. Natural resource planning and conservation provides the science and incentives to inform and support conservation actions of North Carolina's conservation agencies and organizations. The Conservation Planning Tool was developed to assist in building partnerships through the exchange of conservation information and opportunities, support stewardship of working farms and forests, inform conservation actions of agencies and organizations, and guide compatible land use planning. A link to the interactive map view is found here: http://www.conservision-nc.net/.

Conservation planning is important on a local level to protect natural resources that provide recreational, aesthetic, and economic assets important to community growth and sustainability. The NC Wildlife Resource Commission developed a Green Growth Toolbox to assist towns and cities to grow in nature-friendly ways: http://www.ncwildlife.org/greengrowth/. The tools provide assistance with using conservation data, green planning, green ordinances and green development and site design. Also, a guide to help local governments protect aquatic ecosystems while streamlining environmental review is available: http://www.ncwildlife.org/planningforgrowth/swimming_with_the_current.pdf.

Land conservation accompanied with stream restoration projects can be very successful for protecting water quality. Prevention and protection activities are known to be more cost effective than retrofits and restoration. DWQ strongly encourages conservation in this watershed. Local land trusts can help landowners explore conservation options and identify potential funding sources. For more information about land trusts in North Carolina see the Conservation Trust for North Carolina at: http://www.ctnc.org/site/PageServer. With the assistance of several private companies, land conservancies and state and federal agencies ~153,600 acres are protected within this subbasin.

Sea Level Rise

Sea level rise will adversely impact North Carolina's coastline, specifically the northern coastline because of its underlying geologic structure (Riggs and Ames, 2003). There is a predicted acceleration in coastal erosion and an increase in estuarine shoreline erosion if oceanic processes are altered by increased barrier island elevation through natural or human modifications (Riggs and Ames, 2003). Major loss of land is predicted in Currituck, Camden, Dare, Hyde, Tyrrell, Pamlico and Carteret counties if glacial melting rates increase significantly, as projected by the Intergovernmental Panel on Climate Change (Riggs and Ames, 2003; IPCC, 2001).

"Drowning the North Carolina Coast: Sea-Level Rise and Estuarine Dynamics" by S. Riggs and D. Ames (2003) published by North Carolina Sea Grant provides information specifically addressing northeastern NC. This book provides images and figures explaining sea level rise and coastal erosion. This book is an excellent resource for coastal municipal planners as new developments, utility infrastructure, and other land use decisions are made. Several universities are researching

the impacts of sea level rise on North Carolina's coastal economy; more information about their findings can be found at: http://econ.appstate.edu/climate/. Information about sea level forecasts being developed by National Oceanic and Atmospheric Association and several universities in North Carolina can be found at: http://www.cop.noaa.gov/stressors/climatechange/current/slr/default.aspx. North Carolina also received a $5 million grant from FEMA to develop a sea level rise risk management study. This study incorporates science-based mitigation and adaptation strategies needed and an assessment of risk to property and living systems. The assessment models should be completed in 2011; please see the Division of Emergency Management website for more information: http://www.ncsealevelrise.com/Home.

Construction Grants and Loans

The NC Construction Grants and Loans (CG&L) Section of DWQ provides grants and loans to local government agencies for the construction, upgrades, and expansion of wastewater collection and treatment systems. As a financial resource, the section administers five major programs that assist local governments. Of these, two are federally funded programs administered by the state, the Clean Water State Revolving Fund (SRF) Program and the State and Tribal Assistance Grants (STAG). The STAG is a direct congressional appropriation for a specific "special needs" projects within NC. The High Unit Cost Grant (SRG) Program, the State Emergency Loan (SEL) Program, and the State Revolving Loan (SRL) Program are state funded programs, with the later two being below market revolving loan money. The Section also received an additional Capitalization Grant authorized by the American Recovery and Reinvestment Act of 2009 in the amount of $70,729,100. These funds are administered according to existing SRF procedures. All projects must be eligible under Title VI of the Clean Water Act. In 2001, Hyde County received 3 million in financial assistance for a new WWTP and Sewer System for Swan Quarter. For more information please see the CG&L webpage at: http://portal.ncdenr.org/web/wq/cgls.

Clean Water Management Trust Fund

Created in 1996, the Clean Water Management Trust Fund (CWMTF) makes grants to local governments, state agencies and conservation non-profits to help finance projects that specifically address water pollution problems. The fund has made several investments in the Pamlico River Subbasin. Table 5-5 includes a list of recent projects and their cost.

Table 5-5. CWMTF Projects in HUC 03020105

Application ID	Proposed Project Description	Amount Funded	County
2004B-032 NC Coastal Land Trust - Acq/ McWilliams Tract, Springer's Point	Protect through fee simple purchase 91 acres, adjacent to the Cape Hatteras National Seashore and a previously funded CWMTF acquisition project.	$2,161,000	Hyde
2005B-023 Nature Conservancy, The - Acq/ Davis Tract, Alligator River	Protect 5,010 ac of the Davis Tract through a permanent conservation easement. Tract drains to Long Shoal and Alligator Rivers. Links Alligator Natl Wildlife Refuge to WRC Gull Rock Game Land & protects USAF Dare Co Bombing Range from encroachment.	$1,025,000	Hyde
2008-410 NC Coastal Federation - Rest/ Hyde County-Alligator River Growers Project, Pamlico Sound	Plan restoration of a 10,000 acre farm that operates ditches and canals that collect excess ag drainage and diverts it to Pamlico Sd. Convene stakeholders, develop a hydrologic model, evaluate potential wq impacts, and cost estimates for restoration.	$80,000	Hyde

Recommendations:

- Continue to support Division of Environmental Health in their efforts to identify failing septic systems and identification of bacteria sources. Continue and encourage local education efforts regarding septic system maintenance and replacement.

- Continue to encourage local governments to prepare for sea-level rise and to use of the **flood mapping tool** in development by NC Division of Emergency Management.

References

Pradhan, S.S., Hoover, M.T., Austin, R.E. and H. A. Devine. 2007. Potential Nitrogen Contributions from On-site Wastewater Treatment Systems to North Carolina's River Basins and Sub-basins Technical Bulletin 324. North Carolina Agricultural Research Service North Carolina State University Raleigh, NC.

NC DENR, Division of Environmental Health Shellfish Sanitation and Recreational Water Quality Sanitary Survey Reports: http://www.deh.enr.state.nc.us/shellfish/survey.htm
E-9 Core Sound Area. April 2006
F-4 Cedar Island Area. September 2006
G-5 Long Shoal River Area. March 2006
G-6, Ocracoke Area. July 2006
H-4, Hatteras Area. May 2002 & March 2007
H-5, Outer Banks Area. October 2002 & September 2006