Contents

Chapter 4 Southern Shore of the Albemarle Sound

4.1   General Description

The area south of the Albemarle Sound contains the Scuppernong River, Deep Creek, Kendrick Creek and several tributaries, many of which are channelized. This area is composed of four watersheds (HUC 10) units including the Edenton Bay-Albemarle Sound, Bull Bay-Scuppernong River, Gum Neck-Alligator River, and Alligator River watersheds. These HUC 10 units comprise 1,100 square miles of land area in the Pasquotank River basin. Most streams are of low relief and often swampy. Ecologically, the subbasin contains characteristics of the Chesapeake-Pamlico lowlands and tidal marshes, as well as nonriverine swamps and peatlands.

4.2   Biological Health

Benthic macroinvertebrate communities are composed of aquatic insects and crustacean species such as crayfish, mollusk-like mussels, clams, and snails, and aquatic worms. Aquatic benthic species are useful for biological monitoring as they are found in all aquatic environments and are less mobile than many other groups of organisms and are easily collectable. Aquatic benthic communities respond to a wide array of potential pollutants. The sedentary nature of benthic macroinvertebrates also ensures that exposure to a pollutant or stress in the environment accurately shows local conditions and allows for the comparison of sites, even within near proximity of each other. DWR biologists incorporated species richness, abundance, composition, and pollution indicator species into the benthic biocriteria used to calculate Index of Biological Integrity (IBI) scores and bioclasssification ratings (Table 4-1 and Figure 4-1). Certain species of benthos, like mayflies (*Ephemeroptera*), stoneflies (*Plecoptera*), and caddisflies (*Trichoptera*), referred to in combination as EPT, are typically highly sensitive to pollution and their presence or absence can be an indicator of water quality condition. EPT species presence has been incorporated into the biocriteria and is used to evaluate some monitoring sites. As previously mentioned, biocriteria (i.e. the methods used to calculate the IBI score), bioclassification assignment, and sampling methodology can vary with region and stream condition.

Table 4-1 Biological monitoring data results – benthic macroinvertebrates. stations are located either on the western side or southern side of the Albemarle Sound. Results from 2005 are displayed if the station was resampled in 2010.

Station ID	Waterbody Name	Assessment Unit Number	Drainage Area (mi²)	Assessment Method	Sample Date	Bioclassification
MB9	Main Canal	30-9-4	2.56	Swamp	2/21/2005	Severe
					3/2/2010	Moderate
MB10	Scuppernong River	30-14-4-(1)	129	Boat	8/25/2005	Poor
					7/20/2010	Not Rated
					7/15/2015	Not Rated
MB27*	Deep Creek	30-14-2	10.1	Swamp	3/11/2014	Moderate
*Special Study monitoring not part of 5-year Basin Cycle Monitoring						

Figure 4-1 Benthic macroinvertebrate sampling sites (2006 – 2015). Stations are located either on the western side or southern side of the Albemarle Sound.

4.3 Ambient Water Quality

Monthly chemical and physical samples are taken by DWR through the Ambient Monitoring System (AMS) stations. Many of the ambient stations are associated with waterbody locations where potential pollution could occur from known land use activities in the subbasin. There are also portions of the subbasin where no water quality data are collected; therefore, we cannot evaluate the condition of the water quality in those areas. Parameters collected depend on the waterbody classification, but typically include conductivity, dissolved oxygen, pH, temperature, turbidity, nutrients and fecal coliform. Each classification has an associated set of standards the parameters must meet in order to be considered supporting the waterbody's designated uses. Ten sample results are required within the five-year data collection window in order to evaluate the water quality parameter and compare it to the water quality standards. Stressors are either chemical parameters or physical conditions that at certain levels prevent waterbodies from meeting the standards for their designated use. Ambient stations are listed in Table 4-2, and their locations are found in Figure 4-2 below.

Table 4-2 Ambient Stations in the Pasquotank River Basin. Stations are located either on the western side or southern side of the Albemarle Sound.

Station ID	Station Location	Active Date	County	Stream AU#	Stream Classification
D999500C	ALBEMARLE SOUND NR EDENTON MID CHANNEL	1997-Present	Washington	26	B, NSW
D999500N	ALBEMARLE SOUND NR EDENTON N SHORE	1997-Present	Chowan	26-1	C, NSW
D999500S	ALBEMARLE SOUND NR EDENTON S SHORE	1997-Present	Chowan	30	SB
D9490000	CHOWAN RIVER AT US 17 AT EDENHOUSE	1969-Present	Bertie	25c	B, NSW
M6920000	KENDRICK CRK AT SR 1300 AT MACKEYS	1982-Present	Washington	30-9-(2)	SC
M6980000	SCUPPERNONG RIV AT SR 1105 NR COLUMBIA	1997-Present	Tyrrell	30-14-4-(1)	C, Sw
M7175000	ALLIGATOR RIV AT US 64 NR ALLIGATOR	1982-Present	Tyrrell	30-16-(7)	SC, Sw, ORW
N9700000	ALBEMARLE SOUND AT BATCHELOR BAY NR BLACK WALNUT	1974-Present	Washington	30	SB
Note: Ambient Monitoring Stations with a letter as the eighth digit indicates a spatial location in context of other stations (i.e. N = North, C = Center, and S = South)					

In the 2007 – 2019 time period, there was one additional short-term (2-year) Random Ambient Monitoring System (RAMS) stations (Table 4-3). This station was not monitored for nutrients or chlorophyll *a* as part of the RAMS program. This station was used to monitor for pesticides, semi-volatiles and volatile organic compounds, dissolved metals and low-level mercury as well as physical parameters.

Table 4-3 Random Ambient Monitoring Stations in the Pasquotank River Basin.

Station ID	Station Location	County	RAMS Year	Stream AU#	Stream Classification
M6930000	DEEP CRK AT SR 1303 NR SCUPPERNONG	Washington	2013-2014	30-14-2	C, Sw

4.4 How to Read the Watershed (HUC 10) Sections

There are four entire watersheds (HUC 10) described in this chapter. To determine the source of pollutants in a watershed, it is useful to evaluate them on a smaller-scale. Smaller-scale evaluations can also help identify where monitoring and restoration is needed or being conducted. Within each watershed, North Carolina assigns numbers to surface waterbodies. For water quality assessment purposes, these numbers are referred to as assessment unit numbers (AU#). A letter attached to the end of the AU# indicates that the assessment unit has been segmented, or broken into smaller pieces, in an effort to target the water quality assessment and the data associated with it. Assessment unit numbers overlap with stream index segments that have a primary surface water classification and can have supplemental water classifications appropriate to the best-intended uses of that water.

The following sections will begin with a description of the watershed (HUC 10) followed by a breakdown of each AU# that is monitored by DWR (Figure 4-3). This plan to does not discuss all the streams within a watershed nor are all waterbodies monitored by DWR. DWR does, however, use qualitative information from stakeholders throughout the basin to understand what is impacting water quality in a particular area. Special attention should be paid to streams that are listed in impaired waters list tables. Recommendations for each of these impaired streams are provided at the bottom of each AU# section. The Albemarle Sound is discussed in Chapter 6 alongside impairments, nutrients, and recommendations.

The Basin Planning Branch (BPB) continually work with the Nonpoint Source Planning Branch (NPSPB), Soil and Water Conservation Districts (SWCD), Natural Resources Conservation Service (NRCS), and various stakeholders throughout the region to improve our understanding of point and nonpoint sources of pollution and encourage continued efforts to implement best management practices (BMPs) and restoration activities that reduce nutrients, sediment loads, and flow volume to the receiving waterbodies. Table 4-4 list's the number of benthic and ambient monitoring sites that were sampled for the 2007-2019 assessment period by watersheds. Figure 4-3 and show the location of these watersheds. Nutrients, chlorophyll a, algal blooms, and nutrient-related recommendations for the Albemarle Sound, Scuppernong River, Alligator River, and Kendrick Creek are discussed in Chapter 6 of this basin plan.

Table 4-4 Summary table of water quality monitoring information in the Pasquotank River Basin by HUC 10 (2020).

Watershed	Area (mi²)	Benthic Sites	AMS Stations (Active)	RAMS Stations	Lakes Stations
Edenton Bay-Albemarle Sound	241	1	5	1	0
Bull Bay-Scuppernong River	272	2	1	1	3
Gum Neck-Alligator River	325	0	0	0	0
Alligator River	262	0	1	0	0

Figure 4-3 Rivers monitored by DWR ambient monitoring and benthic monitoring programs (2020)

4.5   Edenton Bay-Albemarle Sound (HUC: 0301020501)

The Edenton Bay-Albemarle Sound watershed drains approximately 241 square miles of eastern Bertie, southern Chowan, and northern Washington counties (Figure 4-3). This watershed includes the confluences of the Chowan and Roanoke rivers where they meet to form the Albemarle Sound. Major tributaries include Pembroke Creek and Queen Anne Creek which drain into Edenton Bay and Kendrick Creek which drains into Swan Bay. The land cover in this watershed is predominantly agriculture (29.7%) followed by open water (29.6%), wetland (20.6%), forest (13.2%), developed (4.7%), grassland/shrub (2.1%) and barren land (0.1%). There are two streams that are on the impaired waters list (Table 4-5). In addition to the streams listed in Table 4-5, the Albemarle Sound is on the impaired waters list. Please refer to Chapter 6 for more information related to the Albemarle Sound impaired waters. Between 2012 and 2020, a total of $164,226 dollars were used to fund Best Management Practices by the State Cost Share Programs in the Edenton Bay-Albemarle Sound watershed (Table 4-6).

Table 4-5 Impaired Waters in the Edenton Bay-Albemarle Sound.

AU Name	AU Number	Stream Class	Parameter of Interest	303d Year
Kendrick Creek (Mackeys Creek)	30-9-(2)	SC	Nickel (8.3 µg/l, AL, SW)	2008
Main Canal	30-9-4	C;Sw	Benthos (Nar, AL, FW)	1998
Alligator River	30-16-(7)	SC;Sw,ORW	Copper (3 µg/l, AL, SW)	2008

Table 4-6 Best Management Practices Funded by State Cost Share Programs in the Edenton Bay-Albemarle Sound (HUC: 0301020501) (June 2012 – June 2020).

Best Management Practice	Unit type	6/1/2012 - 6/30/2015			7/1/2015 - 6/30/2020		
		Units Implemented	# of Contracts	Cost Share	Units Implemented	# of Contracts	Cost Share
Ag Water Collection System					1	1	$6,615
Cover Crops	ACRE	1481.8	11	$32,490	676.45	7	$34,057
Crop Residue Management	ACRE	365.57	2	$5,484			
Cropland Conversion - Trees	ACRE				2.7	1	$549
Land Smoothing	ACRE	185.96	7	$34,197	220.02	7	$35,827
Nutrient Scavenger Crop	ACRE				250	1	$5,000
Water Control Structure	EACH	1	1	$10,007			
Grand Total		2034.33	21	$82,178	1150.17	17	$82,048

4.5.1 Kendrick Creek (Mackeys Creek) [AU# 30-9-(2); Primary Surface Water Classification: SC; Length is 80 river miles]

Kendrick Creek ambient water quality, from source to U.S. Hwy 64 in Roper, is monitored by a station located near Mackeys (M6920000) (Figure 4-3). This creek was first listed on the 1998 303(d) list of impaired waters based on a 1998 historic listing for water quality standards violations for dissolved oxygen (DO) and pH. The DO and pH impairments were dropped in 2008. Although the DO and pH impairments were removed from this stream segment, this stream remains on the 2018 impaired waters list for a nickel impairment since 2008. Between 2007 and 2019 elevated fecal coliform and turbidity was observed in this stream at the ambient monitoring station (M6920000) which correlate with rainfall events (Table 4-7). Indicating this stream segment transports sediment and bacteria following rain events. Stakeholders in along this stream are encouraged to identify source areas and implement nature-based stormwater solutions.

Table 4-7 Fecal Coliform and Turbidity from AMS Station M6920000 with Daily Rainfall Totals from a Nearby Rain Gage.

Date	Fecal Coliform	Units	Turbidity	Units	Rain Gage Station	Rain Date	Total (in)
12/17/2013	900	#/100ml	80	NTU		12/15/2013	0.59
1/13/2015	2000	#/100ml	180	NTU	COLUMBIA AG GUM NECK, NC US USC00311949	1/13/2015	1.95
4/16/2015	1700	#/100ml	65	NTU		4/15/2015	1.48
3/14/2018	700	#/100ml	70	NTU		3/13/2018	0.90
5/8/2018	110	#/100ml	55	NTU		5/6-5/7/2018	0.86
NOAA Source: https://www.ncdc.noaa.gov/cdo-web/datasets/GHCND/stations/GHCND:USC00311949/detail							

In November 2014, as part of the Triennial Review process, the Environmental Management Commission approved new water quality standards for dissolved metals. These dissolved metal standards became effective as part of the North Carolina Administrative Code at the start of 2015. EPA approved the water quality standards for dissolved metals for North Carolina in April 2016. Kendrick Creek was listed based analysis of total metals samples and because new standards for nickel in class SC waters are based on dissolved metals samples. The ambient station M6920000 on Kendrick Creek was placed on a priority list for sampling to evaluate the new dissolved standard. The necessary data is currently being collected and is expected to be used in the 2024 Integrated Report. DWR recommends continuing to collect these dissolved metals samples until enough data is collected to reassess this stream segment with the new dissolved metals standards. After reassessing the metals impairment, if nickel criteria exceedances are confirmed by assessing the dissolved fraction then a source identification and abatement project is recommended.

The Roper WWTP (NC0036315) discharges into the Albemarle Sound. This facility entered into a Special Order of Consent (SOC) on January 1, 2018. Between May 2014 to February 2016, total suspended residue and fecal coliform effluent limitations have been exceeded on 46 occasions through four separate Notices of Violation. This is largely in part due to the malfunction and unavailability of parts to repair the existing

ultraviolet disinfection system. Another contributing factor leading to non-compliance is the large volume of inflow/infiltration into the collection/treatment systems causing solids washout of the aeriation basin and secondary clarifications units. Between 2013 and 2017 the town applied for a received FY2013 Community Development Block Grant Infrastructure (CDBG-I) NC Department of Environmental Quality Division of Water Infrastructure for Phase I of WWTP Improvements. The town applied for and received FY2017 Wastewater State Reserve Program (WWSRP) for Phase II of WWTP Improvements to address necessary improvements for permit compliance that could not be funded by the CDBG-I. This town applied for and received FY2016 Asset Inventory & Assessment (AIA) grant to investigate the condition of wastewater collection system. The FY 2016 AIA grant is closed out. This town applied for and received FY CDBG-I fund to address priority issues identified in the AIA report. NCDEQ should continue to work with the Roper WWTP to improve this facility and bring them into compliance.

4.5.2 Main Canal [AU# 30-9-4; Primary Surface Water Classification: C, Supplemental Classification: Sw; Length is 4 river miles]

Main Canal, which drains to Kendrick Creek, receives flow from ditches which were established to aid drainage from agricultural areas (Figure 4-3). This stream segment has the only regularly visited basinwide station (MB9) in the Edenton Bay – Albemarle Sound watershed. This stream segment appears to have improved in 2010 relative to the 2005 sampling.

Sampling Year	Bioclassification (MB9)
2005	Severe
2010	Moderate

As noted in 2010, although the total species diversity decreased to an all-time low in 2010, the number of EPT species increased and the biotic index (BI) and EPTBI both decreased relative to previous samples. Although the improvement in the EPT richness, BI, and EPTBI suggest improved physicochemical conditions, the specific conductance data at this location does not support this assertion as it has remained essentially identical (~200 µS/cm). This improvement in 2010 may be related to the increased flows observed in 2010 relative to levels seen in 2005 (NCDENR, 2011).

Main Canal was placed on the impaired waters list in 1998 as a result of a biological impairment. Potential sources were identified as off-farm animal holding and/or management areas, intensive animal feeding operations and nonirrigated crop production. This stream remains on the 2018 impaired waters list for a biological impairment despite the bioclassification change from Severe to Moderate. This stream segment appears to have improved based on the 2010 sampling resulting in a Moderate bioclassification although the reason for the change is unclear. Division of Water Resources (DWR) recommends removal of this stream segment from the impaired waters list until the stream segment can be reassessed during the next benthic macroinvertebrate community sampling event.

4.6 Bull Bay-Scuppernong River (HUC: 0301020502)

Bull Bay-Scuppernong River drain approximately 272 square miles of northwestern Washington and north eastern Tyrrell counties (Figure 4-3). This watershed contains primarily wetland land cover (40.0%) followed by agriculture (35.5%), open water (15.1%), forest (6.0%), developed (2.7%), grassland/shrub (0.6%), and barren land (0.1%). Significant Natural Heritage Areas, include Lake Phelps State Park, Bull Neck Swamp, and East Dismal and the Scuppernong River Swamp Forest. Currently, there are one ambient monitoring station and two benthic macroinvertebrate community. During the 2013 and 2014 sampling years a RAMS station was established on Deep Creek. Between 2012 and 2020, a total of $308,045 dollars were used to fund Best Management Practices by the State Cost Share Programs in the Bull Bay - Scuppernong River watershed (Table 4-8).

Table 4-8 Best Management Practices Funded by State Cost Share Programs in the Bull Bay - Scuppernong River (HUC: 0301020502) (June 2012 – June 2020)

Best Management Practice	Unit type	6/1/2012 - 6/30/2015			7/1/2015 - 6/30/2020		
		Units Implemented	# of Contracts	Cost Share	Units Implemented	# of Contracts	Cost Share
AIM-Water Control Structure - In-Line Structure	EACH				1	1	$524
Closure - Waste Impoundments	EACH				3	1	$26,449
Cover Crops	ACRE	550.355	7	$22,014	1023.705	11	$40,946
Cropland Conversion - Trees	ACRE				61	3	$10,657
Land Smoothing	ACRE	279.13	7	$49,168	471.357	13	$88,787
Long-Term No-till	ACRE				166.6	1	$24,990
Water Control Structure	EACH	20	5	$39,569	2	1	$3,105
Water Control Structure - In-Line Structures	EACH				1	1	$1,836
Grand Total		849.485	19	$110,751	1729.66	32	$197,294

4.6.1 Phelps Lake [AU# 30-14-4-6-1; Primary Surface Water Classification: B, Supplemental Classification: Sw, ORW; Area is 15,938 freshwater acres]

Phelps Lake is the second largest natural lake in North Carolina (NC) located within a vast peninsula between the Albemarle Sound to the north and the Pamlico River to the south. The peninsula contains numerous low-lying swampy areas underlain by thick organic muck and

Sampling Year	Trophic Status (NC TSI)
2009	Oligotrophic
2015	Oligotrophic

relatively well-drained areas with fertile mineral and organic soils. Much of the area has been cleared of vegetation, drained and put into large-scale agricultural use. Phelps Lake was monitored five times in 2009 by DEQ field staff to determine if fire suppression activities conducted in the summer of 2008 and atmospheric deposition from smoke in the area had adverse effect on water quality in the lake. In May 2009, the depth of the lake was down by two feet due to water withdrawn to fight the peat fire. By June, the lake level had returned to normal. In 2009, Lake Phelps was determined to have moderate biological productivity (mesotrophic) in May and June and very low biological productivity (oligotrophic) in July through September (NCDEQ, 2011). Additional information about the 2009 sampling event can be found in the Lake & Reservoir Assessment Pasquotank River Basin.

Lake Phelps was monitored five times in 2015 by DEQ field staff (Figure 4-4). In 2015, the trophic status of this lake was oligotrophic (demonstrated very low biological productivity) in May, June, August and September. In July, the trophic state was mesotrophic (moderate biological productivity) (NCDEQ, 2015).

Additional information about the 2015 sampling event can be found in the Lake & Reservoir Assessment Pasquotank River Basin.

Figure 4-4 Water Quality Data for Phelps Lake, Pasquotank River Basin (NCDEQ, 2015).

		SURFACE PHYSICAL DATA						PHOTIC ZONE DATA									Total Solids	
Date	Sampling	DO	Water Temp.	pH	Cond.	Secchi Depth	Percent	TP	TKN	NH3	NOx	TN	TON	TIN	Chla	Solids Total	Solids Suspended	Turbidity
m/d/yr	Station	mg/L	C	s.u.	µmhos/cm	meters	SAT	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	µg/L	mg/L	mg/L	NTU
HUC 03050105																		
May 13, 2015	PAS012B	8.4	24.3	5.3	92	2.0	100.4%	<0.02	0.26	0.02	<0.02	0.27	0.24	0.03	1.8	71	<6.2	3.3
May 13, 2015	PAS012C	8.4	24.2	5.7	94	1.8	100.2%	0.02	0.27	0.03	<0.02	0.28	0.24	0.04	2.4	68	<6.2	6.6
May 13, 2015	PAS012D	8.3	24.3	5.4	93	0.8	99.2%	0.03	0.32	0.03	0.02	0.34	0.29	0.05	4.5	74	16.0	13.0
June 8, 2015	PAS012B	8.2	25.0	5.5	94	2.0	98.7%	<0.02	0.31	0.02	<0.02	0.32	0.29	0.03	3.2	63	<6.2	3.4
June 8, 2015	PAS012C	8.2	25.1	5.3	93	1.8	99.9%	<0.02	<0.30	<0.02	<0.02	0.16	0.14	0.02	2.5	57	<6.2	2.7
June 8, 2015	PAS012D	8.1	25.3	5.3	93	1.6	98.0%	<0.02	<0.30	0.02	<0.02	0.16	0.13	0.02	3.8	67		6.0
July 13, 2015	PAS012B	7.4	28.3	5.6	93	1.8	95.1%	<0.02	0.21	0.02	<0.02	0.22	0.19	0.03	3.2	59	<6.2	3.8
July 13, 2015	PAS012C	7.6	28.3	5.4	93	1.3	97.6%	0.03	0.22	0.02	<0.02	0.23	0.20	0.03	4.4	60	<6.2	3.5
July 13, 2015	PAS012D	7.2	28.3	5.5	93	1.1	92.5%	0.03	0.28	0.02	<0.02	0.29	0.26	0.03	6.1	64	11.0	8.4
August 5, 2015	PAS012B	7.3	29.6	5.8	100	1.6	95.9%	<0.02	0.22	<0.02	<0.02	0.23	0.21	0.02	3.1	69		2.3
August 5, 2015	PAS012C	7.6	29.7	5.7	98	1.4	100.1%	<0.02	0.20	<0.02	<0.02	0.21	0.19	0.02	6.0	69	<6.2	2.2
August 5, 2015	PAS012D	7.5	29.7	5.4	99	1.2	98.7%	0.02	0.21	<0.02	<0.02	0.22	0.20	0.02	3.5	74	3.5	7.8
September 15, 2015	PAS012B	8.0	24.5	5.8	93	1.8	96.0%	<0.02	0.27	0.01	0.01	0.28	0.26	0.02	2.4	61		1.9
September 15, 2015	PAS012C	8.4	23.9	5.6	94	1.7	99.6%	<0.02	0.26	0.01	0.01	0.27	0.25	0.02	1.8	62	<6.2	1.9
September 15, 2015	PAS012D	8.0	24.3	5.8	94	2.1	95.6%	<0.02	0.23	0.01	0.01	0.24	0.22	0.02	2.6	68	<6.2	3.3

4.6.2 Scuppernong River [AU# 30-14-4-(1); Primary Surface Water Classification: C, Supplemental Classification: Sw; Length is 14 river miles]

Overall, the biological community (MB10) in Scuppernong River has been quite stable since the first assessment in 1983. Several tolerant invertebrate taxa have consistently been collected here and include the damselfly *Enallagma spp*, the dragonfly *Pachydiplax longipennis*, the *hemiptera Belostoma spp*, and the low dissolved oxygen tolerant gastropod *Physa spp*. This site has previously been assigned

Sampling Year	Bioclassification (MB10)
2005	Poor
2010	Not Rated
2015	Not Rated

bioclassifications. However, these bioclassifications were based on provisional biocriteria. Given the provisional status of biocriteria for large, non wadeable coastal plain rivers, the 2010 and 2015 samples were assigned a Not Rated rating. However, for purposes of inter-year comparison, the 2010 and 2015 collection would have both received a Poor bioclassification based on the provisional criteria. No water quality standards were exceeded during the 2018 integrated reporting period. The biological community, dissolve oxygen, and iron parameters were data inconclusive. Elevated fecal coliform values and the annual geometric mean for this stream has been increasing over recent years while turbidity has remained relatively low (Figure 4-5 and Figure 4-6). At the ambient monitoring station (M6980000), a maximum value of 3100 colonies/mL was detected on 6/10/2019. This event correlated with low turbidity 3.2 NTU which could indicate these elevated fecal coliform values could be point source driven. Town of Creswell WTP (NC0027600) and the Creswell WWTP have both had enforcement actions for failure to submit monitoring reports or portions of monitoring reports in 2019. In 2020, Creswell WTP continued to receive notices of violation for failure to submit monitoring reports in 2019. Sources of the elevated fecal coliform could be from the wastewater treatment, animal operations, and/or agricultural land use in the area. This makes it difficult to determine whether the source(s) and more localized investigations are needed.

Figure 4-5 Annual mean turbidity at the ambient monitoring station in the Scuppernong River.
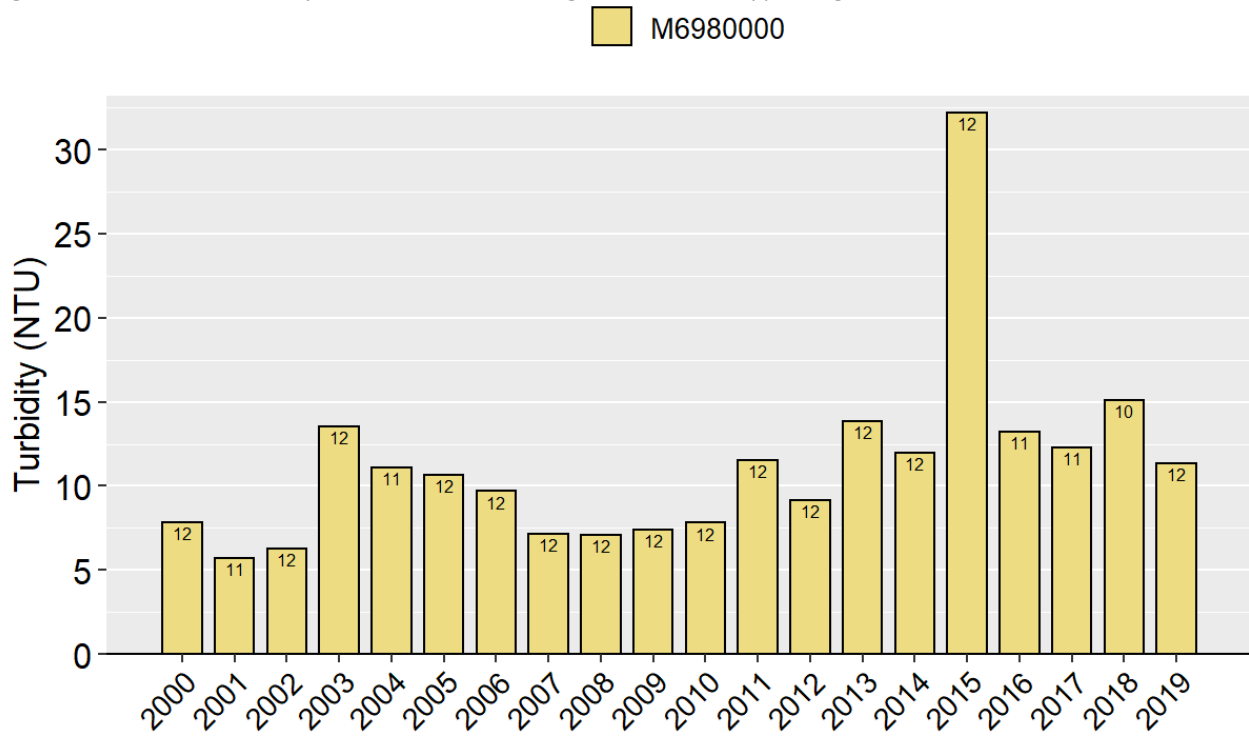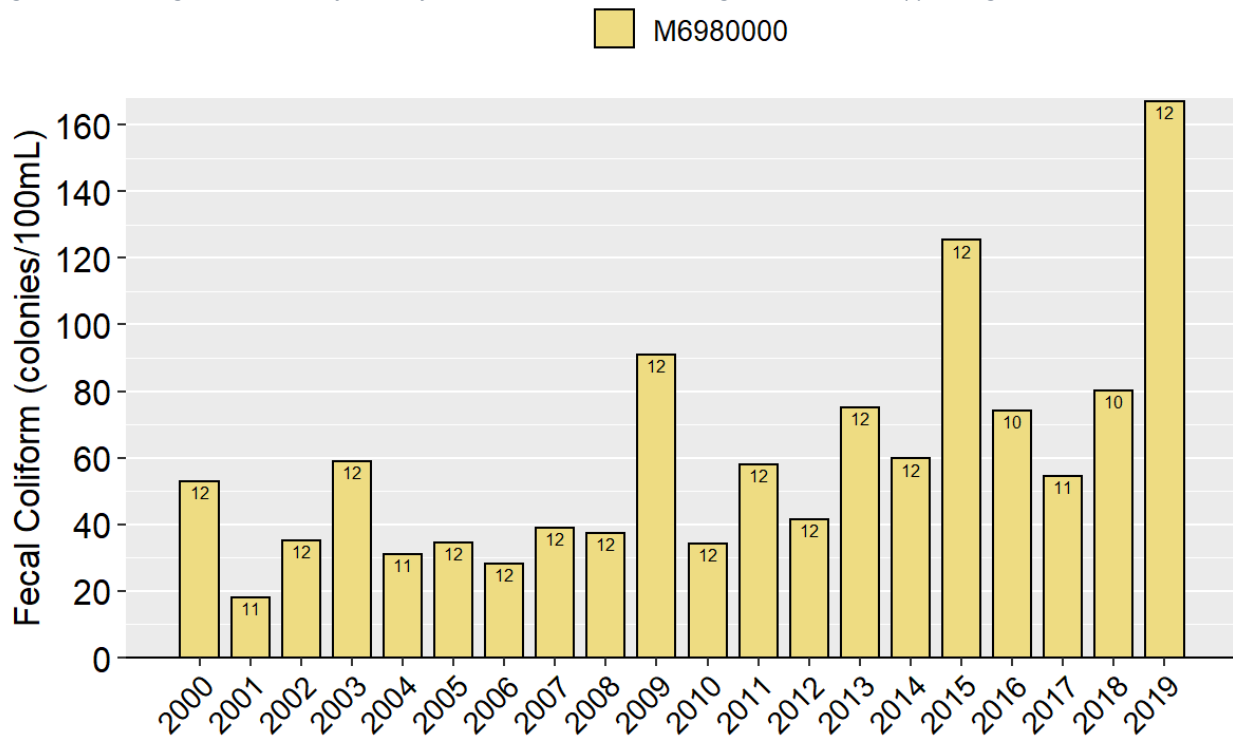

Figure 4-6 Annual geometric mean fecal coliform at the ambient monitoring station in the Scuppernong River.

The Albemarle-Pamlico National Estuary Partnership (APNEP), in partnership with Washington and Tyrrell Counties are currently collaborating on the Scuppernong Regional Water Management Study. The goal of this study is to develop a collaborative approach for a hydrologic study and regional water management strategy for the Scuppernong Coastal System on the Northern Albemarle-Pamlico Peninsula. The study outcomes (APNEP, 2020):

- The collaborative hydrologic study will guide future potential water management implementation actions.

- Inform management actions on- and off- of conservation lands explaining impacts of climate variability and recurrent flooding, improving regional drainage efficiency and community resilience strategies, improving agricultural best management practices, and updating existing plans.

- Provide information and resources to implement actions identified by the Natural and Working Lands Pocosin Wetland Subteam, addressing directives in Executive Order 80 and the Climate Risk and Resiliency Plan.

- The study may benefit regional economic development strategies such as supporting sustainable agriculture and diversifying the rural economy by strengthening water-based economies and capitalizing upon the natural resources of the region through ecotourism and recreation.

- A phased approach is proposed, which includes data gathering and synthesis, hydrologic modeling, development of a hydrologic budget, creation of a visualization and other interactive tools such as web-based interactive maps and data portals, scenario based models, augmented reality sandboxes (a hands-on tool that projects a topographic map onto a sandbox and can be used to simulate water management), and stakeholder engagement to develop collaborative approaches and strategies for regional water management.

4.6.3   Deep Creek [AU# 30-14-2; Primary Surface Water Classification: C, Supplemental Classification: Sw; Length is 8 river miles]

Deep Creek was sampled in 2014 as part of the RAMS Program. This stream received a moderate rating at site MB27. This site was also sampled for all the RAMS Program water quality parameters and no water quality standards were exceeded. Iron was data inconclusive.

Sampling Year	Bioclassification (MB27)
2014	Moderate

4.7   Gum Neck-Alligator River (HUC: 0301020508)

Gum Neck-Alligator River drains approximately 325 square miles of eastern Tyrrell, northeastern Hyde, and eastern Dare counties (Figure 4-3). This watershed contains primarily wetlands land cover (71.8%) followed by open water (14.0%), agriculture (12.4%), developed (1.2%), forest (0.3%) and grassland/shrub (0.3%). Significant Natural Heritage Areas, include Roper Island, Pocosin Lakes National Wildlife Refuge, and Alligator River National Wildlife Refuge. There is a benthic macroinvertebrate community sites, but it has not been sampled since 1995. There are no ambient monitoring stations, NPDES wastewater, non-discharge, or animal operation permits in this watershed. Between 2012 and 2020, a total of $44,143 dollars were used to fund Best Management Practices by the State Cost Share Programs in the Gum Neck-Alligator River watershed (Table 4-9).

Table 4-9 Best Management Practices Funded by State Cost Share Programs in the Gum Neck-Alligator River (HUC: 0301020508) (June 2012 – June 2020).

Best Management Practice	Unit type	6/1/2012 - 6/30/2015			7/1/2015 - 6/30/2020		
		Units Implemented	# of Contracts	Cost Share	Units Implemented	# of Contracts	Cost Share
Cover Crops	ACRE	263.5	2	$10,540	26.33	1	$1,053
Water Control Structure	EACH	6	2	$14,364	7	2	$18,186
Grand Total		**269.5**	**4**	**$24,904**	**33.33**	**3**	**$19,239**

4.8   Alligator River (HUC: 0301020509)

Alligator River drains approximately 262 square miles of northeastern Tyrell and northeastern Dare counties (Figure 4-3). This watershed contains primarily wetland land cover (59.0%) followed by open water (27.0%), agriculture (7.2%), forest (5.4%), developed (0.9%), grassland/shrub (0.4%), barren land (0.2%). Significant Natural Heritage Areas, include Durant Island, Pocosin Lakes National Wildlife Refuge, Alligator River National Wildlife Refuge, and Emily and Richardson Preyer Buckridge Coastal Reserve. There are no benthic macroinvertebrate community sites, NPDES wastewater, non-discharge, or animal operation permits in this watershed. There is one ambient monitoring station (M7175000). Between 2015 and 2020, a total of $82,134 dollars were used to fund Best Management Practices by the State Cost Share Programs in the Alligator River watershed (Table 4-10).

Table 4-10 Best Management Practices Funded by State Cost Share Programs in the Alligator River (HUC: 0301020509) (July 2015 – June 2020)

Best Management Practice	Unit type	7/1/2015 - 6/30/2020		
		Units Implemented	# of Contracts	Cost Share
Cover Crops	ACRE	615.875	3	$28,310
Land Smoothing	ACRE	180.4	4	$53,824
Grand Total		**796.275**	**7**	**$82,134**

4.8.1   Alligator River [AU # 30-16-(7); Primary Surface Water Classification: SC, Supplemental Classification: Sw, ORW, Area is 38,420 acres]

This ambient monitoring station in this stream segment is located near where the U.S Highway 64 bridge crosses the Alligator River. Upstream of this ambient monitoring station the Alligator River is designated as an Outstanding Resource Water. This supplemental classification is intended to protect unique and special waters having excellent water quality and being of exceptional state or national ecological or recreational significance. Nutrients, fecal coliform, and turbidity readings are relatively low compared to other rivers in this area that contribute to the Albemarle Sound. The Alligator River is on the 2018 impaired waters list for copper and iron is data inconclusive.

In November 2014, as part of the Triennial Review process, the Environmental Management Commission approved new water quality standards for dissolved metals. These dissolved metal standards became effective as part of the North Carolina Administrative Code at the start of 2015. EPA approved the water quality standards for dissolved metals for North Carolina in April 2016. Alligator River was listed based analysis of total metals samples and because new standards for copper in class SC waters are based on

dissolved metals samples, then the ambient station M7175000 on Alligator River was placed on a priority list for sampling to evaluate the new dissolved standard. The necessary data is currently being collected and is expected to be used in the 2024 Integrated Report. DWR recommends continuing to collect these dissolved metals samples until enough data is collected to reassess this stream segment with the new dissolved metals standards. After reassessing the metals impairment, if copper criteria exceedances are confirmed by assessing the dissolved fraction then a source identification and abatement project is recommended.

References:

Albemarle-Pamlico National Estuary Partnership. 2020. Draft Scuppernong Regional Water Management Study.

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