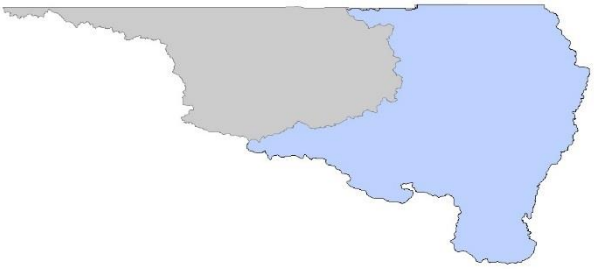
Chapter 4
Chowan River

Hydrologic Unit Code (HUC): 03010203



4.1. General Description

The Chowan River subbasin contains the Chowan River which forms by the merging of the Nottoway and Blackwater Rivers at the VA-NC state line. This river then flows southeastward toward the Albemarle Sound. Major tributaries to the Chowan River include the Wiccacon River, Bennetts Creek (Merchants Millpond), and Salmon Creek. This subbasin is located in the Middle Atlantic Coastal Plain ecoregion and contains 898 square miles, of which 800 square miles are in NC. Many significant natural heritage areas are located within the Chowan subbasin. The Chowan Swamp State Natural Area, administered by the Division of Parks and Recreation, protects more than 6,000 acres. Merchants Millpond supports a diverse assemblage of aquatic plants including several rare species. Tidal Cypress-Gum Swamp, a designated significant natural heritage area, is found along much of the shoreline of the Chowan River and represents an important wetland ecosystem within the Chowan River basin. This subbasin contains portions of the Chowan Game Land, a track managed by the Wildlife Resources Commission. This property is one of four publicly owned conservation lands in the subbasin.

4.2. Population and Land Use

Population for this subbasin is estimated to be around 37,098 or 46 people per square mile based on the 2010 census. The largest municipalities in this subbasin include Ahoskie, Aulander, and Winton. Based on 2010 census data, Ahoskie's population grew 11 percent since 2000, while the other municipalities' populations declined (Table 1-3). Most of the land within the North Carolina portion of the subbasin is forest land covering 35% of the land (Figure 4-1 and Table 4-1). At almost 27%, agriculture land cover types are also prevalent, while only 4% is classified as developed land. The land cover for the entire subbasin is found in Table 4-2.

Figure 4-1 Land Cover for the Chowan River Subbasin of the Chowan River Subbasin (Source: NLCD 2016)

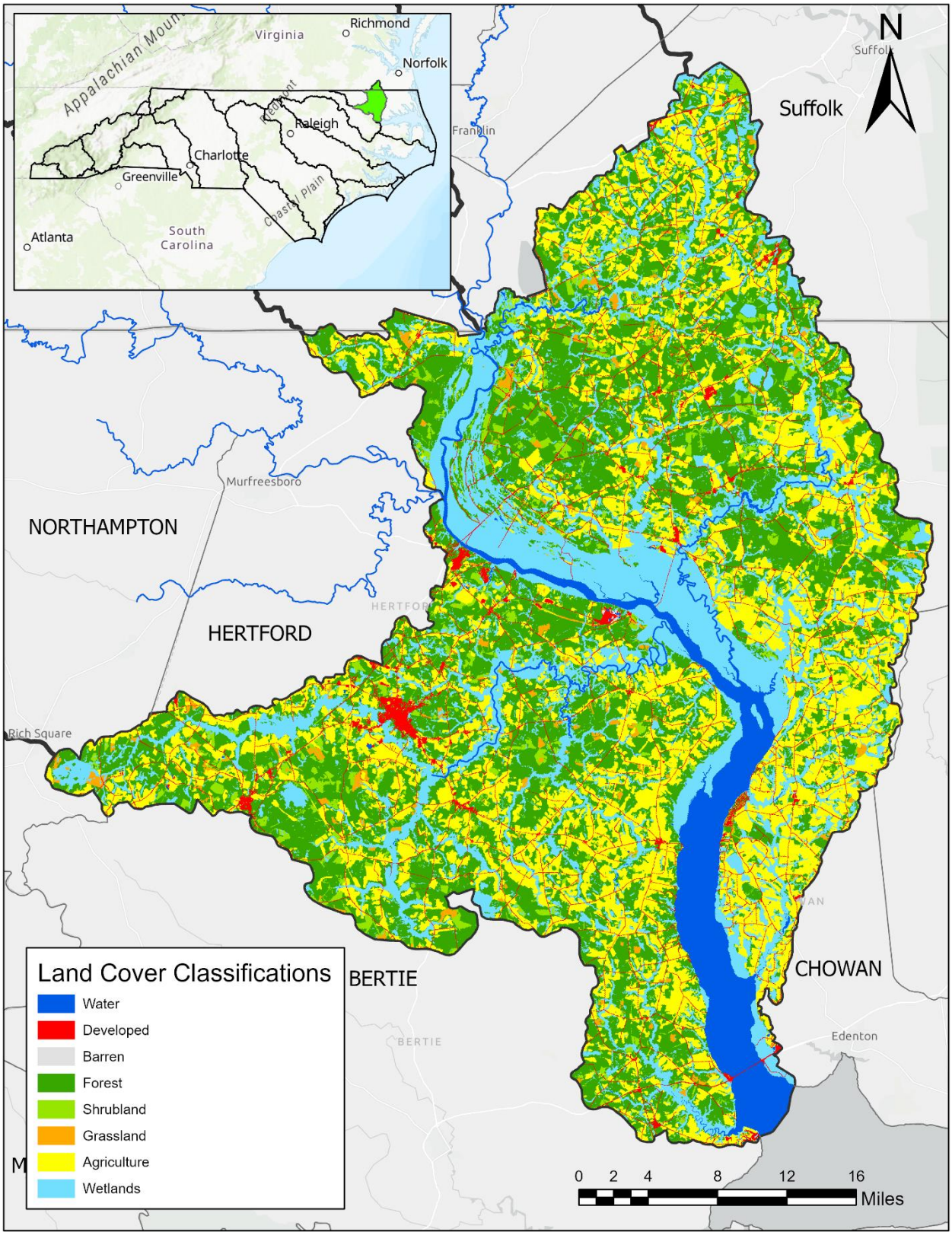


Table 4-1: Land Cover of NC Portion of Chowan River Subbasin

Land Cover Type	2001	2004	2006	2008	2011	2013	2016
Agriculture	27.38%	27.34%	27.24%	27.10%	26.91%	26.99%	26.96%
Barren	0.03%	0.03%	0.03%	0.03%	0.03%	0.03%	0.03%
Developed	4.00%	4.00%	4.07%	4.07%	4.08%	4.08%	4.15%
Forest	32.81%	29.41%	27.35%	27.42%	30.83%	33.81%	35.11%
Water	6.25%	6.29%	6.28%	6.27%	6.28%	6.25%	6.26%
Shrubland	5.84%	6.68%	6.78%	8.54%	7.34%	5.86%	4.30%
Grassland	1.83%	4.42%	6.41%	4.73%	2.68%	1.10%	1.32%
Wetland	21.86%	21.83%	21.85%	21.85%	21.85%	21.88%	21.86%

Table 4-2: Land Cover of Entire Chowan River Subbasin - NC and VA

Land Cover Type	2001	2004	2006	2008	2011	2013	2016
Agriculture	27.95%	27.92%	27.82%	27.70%	27.53%	27.63%	27.60%
Barren	0.03%	0.03%	0.03%	0.03%	0.03%	0.03%	0.03%
Developed	3.99%	3.99%	4.04%	4.04%	4.06%	4.06%	4.12%
Forest	33.21%	30.01%	28.07%	28.07%	31.33%	34.11%	35.31%
Water	5.59%	5.62%	5.63%	5.61%	5.62%	5.59%	5.60%
Shrubland	5.75%	6.47%	6.55%	8.37%	7.11%	5.84%	4.33%
Grassland	1.82%	4.34%	6.22%	4.53%	2.68%	1.07%	1.35%
Wetland	21.65%	21.63%	21.63%	21.65%	21.65%	21.68%	21.67%

4.3. Permits

There are seven permitted NPDES wastewater dischargers (Table 4-3), 17 stormwater (Table 4-4), nine non-discharge (Table 4-5), three land application of residual solids permits (Table 4-5), and 18 animal operation permits issued in the Chowan subbasin.

Table 4-3: NPDES Discharge Permits in the Chowan River Subbasin (2020).

Permit Number	Facility Name	County	Permit Type	Class	Permit Flow GPD	Receiving Stream	HUC-12
NC0033782	Gatesville Elementary School WWTP	Gates	Discharging 100% Domestic < 1MGD	Minor	5,000	Bennetts Creek (Merchants Millpond)	030102030504

Permit Number	Facility Name	County	Permit Type	Class	Permit Flow GPD	Receiving Stream	HUC-12
NC0089541	Ashton Lewis Lumber Co	Gates	Industrial Processing & Commercial Wastes	Minor	Not Limited	Bennetts Creek (Merchants Millpond)	030102030504
NC0033804	T.S. Cooper Elementary School WWTP	Gates	Discharging 100% Domestic < 1MGD	Minor	4,000	Raynor Swamp (Hunters Millpond)	030102030502
NC0043974	Buckland Elementary School	Gates	Discharging 100% Domestic < 1MGD	Minor	6,000	Cole Creek (Lilleys Millpond)	030102030204
NC0088561	Ahoskie WWTP	Hertford	Municipal Wastewater Discharge, Large	Major	1,300,000	Ahoskie Creek (Ahoskie Swamp, Bear Swamp)	030102030304
NC0032719*	Valhalla WTP	Chowan	Water Plants and Water Conditioning Discharge	Minor	Not limited	Rockyhock Creek (Bennett Millpond)	030102030702
NC0089516	Perdue Agribusiness LLC (Cofield)	Hertford	NCCW, BB, RO reject	Minor	Not limited	Unnamed Tributary Deep Creek	030102030206

*New outfall under construction (as of January 2020 permit renewal) – discharge location will be in the Chowan River [AU# 25b], HUC-030102030701, and old DWR subbasin number 03-01-03.
NCCW – Non-Contact Cooling Water; BB – Boiler Blowdown; RO – Reverse Osmosis;

Table 4-4: NPDES Stormwater General Permits in the Chowan River Subbasin (2020).

Permit Number	Facility Name	Owner Type	County	Permit Type
NCG020811	Eure Sand Mine	Individual	Gates	Mining Activities Stormwater Discharge COC
NCG020824	Cofield Mine	Non-Government	Hertford	Mining Activities Stormwater Discharge COC
NCG020836	Copperneck Sand Hole Mine	Non-Government	Chowan	Mining Activities Stormwater Discharge COC
NCG020892	Joseph Parrish Mine	Non-Government	Chowan	Mining Activities Stormwater Discharge COC
NCG030135	Alfiniti, Inc.	Non-Government	Hertford	Metal Fabrication Stormwater Discharge COC

Permit Number	Facility Name	Owner Type	County	Permit Type
NCG050017	Berry Plastics	Non-Government	Hertford	Apparel/Printing/Paper/Leather/Rubber Stormwater Discharge COC
NCG080126	A T Byrum & Son Incorporated	Non-Government	Hertford	Transportation w/Vehicle Maintenance/Petroleum Bulk/Oil Water Separator Stormwater Discharge COC
NCG080762	North Carolina and Virginia Railroad	Non-Government	Hertford	Transportation w/Vehicle Maintenance/Petroleum Bulk/Oil Water Separator Stormwater Discharge COC
NCG080887	Ahoskie Bin	Non-Government	Hertford	Transportation w/Vehicle Maintenance/Petroleum Bulk/Oil Water Separator Stormwater Discharge COC
NCG100032	Goodnews Auto Sales & Salvage	Non-Government	Bertie	Used Motor Vehicle Parts Stormwater Discharge COC
NCG100239	Ahoskie Pull Parts	Non-Government	Hertford	Used Motor Vehicle Parts Stormwater Discharge COC
NCG140102	Commercial Ready-Mix Products	Non-Government	Hertford	Ready Mix Concrete Stormwater/Wastewater Discharge COC
NCG140331	Ready Mix Inc - Roanoke-Chowan	Non-Government	Bertie	Ready Mix Concrete Stormwater/Wastewater Discharge COC
NCG150063	Tri-County Airport	Non-Government	Bertie	Air Transportation Stormwater Discharge COC
NCG210185	Ashton Lewis Lumber Company	Non-Government	Gates	Timber Products Stormwater Discharge COC
NCG210420	Enviva Pellets Ahoskie LLC	Non-Government	Hertford	Timber Products Stormwater Discharge COC
NCS000134	Avoca Farms - Merry Hill	Non-Government	Bertie	Stormwater Discharge, Individual

Table 4-5: NPDES Non-Discharge Permits in the Chowan River Subbasin (2020).

Permit Number	Facility Name	Owner	County	Permit Type	Permit Flow GPD
WQ0000267	Gates Correctional Center #4130	County of Gates	Gates	Wastewater Irrigation	25,000
WQ0000777	Aulander Town - WWTP/Spray Facility	Town of Aulander	Hertford	Wastewater Irrigation	333,510
WQ0001536	Perdue Grain and Oilseed LLC	Perdue Grain and Oilseed LLC	Hertford	Wastewater Irrigation	35,000

Permit Number	Facility Name	Owner	County	Permit Type	Permit Flow GPD
WQ0002096	Pinewood Manor Rest Home	Jor Enterprises LLC	Hertford	Wastewater Irrigation	7,500
WQ0003885	Town of Ahoskie WWTP	Town of Ahoskie	Hertford	Wastewater Irrigation	406,000
WQ0005910	Avoca Farms - Merry Hill	Avoca Inc	Bertie	Wastewater Irrigation	50,000
WQ0011119	Colerain WWTP	Town of Colerain	Bertie	Wastewater Irrigation	75,000
WQ0012404	CF Nitrogen Site in Tunis, NC	C F Industries Inc	Hertford	Groundwater Remediation	54,795
WQ0040672	Stevens Towing - Riverbulk Terminal WWTF	Stevens Towing Co of North Carolina LLC	Chowan	Wastewater Irrigation	12,710
WQ0036706	Ahoskie WWTP	Town of Ahoskie	Hertford	Land Application of Residual Solids (503)	-
WQ0002368	Town of Weldon	Town of Weldon	Northampton	Land Application of Residual Solids (503)	-
WQ0038835	Terra Renewal Services – Mountaire Farms/Tyson Foods	Terra Renewal Services Inc.	Gates	Land Application of Residual Solids	-

Table 4-6: Animal Feeding Operation (AFO) Permits – Chowan River Subbasin (2020)

Permit Number*	Facility Name	Combined Owner	County	Watershed Name	Number of Lagoons
AWS370015	Paul Lilley Farm	Paul Lilley	Gates	Sarem Cr-Chowan R	2
AWS370059	Sarem Farms, Inc.	Sarem Farms Inc	Gates	Sarem Cr-Chowan R	2
AWI370037	Lawrence Farms	Lawrence M	Gates	Sarem Cr-Chowan R	-
AWS080010	Farm 35 & 33	Murphy-Brown LLC	Bertie	Ahoskie Cr	4
AWS460007	Farm 40	Murphy-Brown LLC	Hertford	Ahoskie Cr	2
AWS660084	Plantation Sow Farm	Maxwell Foods LLC	Northampton	Ahoskie Cr	3
AWS460003	DBA Merritt Farms	Donald Merritt	Hertford	Wiccacon R	1
AWS370003	George Lang Farm	George Lang	Gates	Bennetts Cr	1
AWS370004	BHI3	Michael McPherson	Gates	Bennetts Cr	1
AWS370006	Indian Neck Hog & Poultry Farm	William Rountree	Gates	Bennetts Cr	2
AWS370012	Byrum Farm	Wayne Byrum	Gates	Bennetts Cr	1
AWS210002	Billy R. Nixon Farm	Billy Nixon	Chowan	Holiday I.-Chowan R	1
AWS210004	Stallings Family Farm	Cheryl Stallings	Chowan	Holiday I.-Chowan R	2
AWS210015	Curtis Byrum Farm	Curtis Byrum	Chowan	Holiday I.-Chowan R	3
AWS460004	Lena Lowe Farm	Lena Lowe	Hertford	Holiday I.-Chowan R	1

Permit Number*	Facility Name	Combined Owner	County	Watershed Name	Number of Lagoons
AWS460015	Brian Mitchell Farm	Brian Mitchell	Hertford	Holiday I.-Chowan R	1
AWS210022	Beaver Swamp Hog	Ivey Ward	Chowan	Holiday I.-Chowan R	-
AWS210006	Michael Nixon Farm	Michael Nixon	Chowan	Chowan R	1
*Permit Type: AWS – Swine State COC, AWI – Animal Individual State Permit					

4.4. Biological Health

The Biological Assessment Branch (BAB) of DWR monitors macroinvertebrates using two biological indices. The Ephemeroptera, Plecoptera, Trichoptera (EPT) index is a measure of pollution-sensitive aquatic insects inhabiting a waterbody. A stream showing high EPT richness is less likely to be polluted than one with low richness in the same geographic region. In addition, they evaluate the streams biotic integrity (BI), which measures the presence of pollution-tolerant species. High BI values characterize streams that have poor water quality and are dominated by pollution-tolerant species.

The Chowan River basin has two types of stream collection methods: Swamp and Coastal B (boat). Coastal B rivers are defined as waters in the coastal plain that are deep (non-wadeable), freshwater systems with little or no visible current under normal or low flow conditions. Other characteristics may include an open canopy, low pH and low DO. There currently are not approved biological criteria for these Coastal B streams, and therefore a bioclassification of Not Rated is assigned to these sites. The BAB defines swamp streams as streams that are within the coastal plain ecoregion and have little to no visible flow during certain parts of the year. Little or no flow usually occurs during summer months, but flowing water should be present in swamp streams during winter months. Samples are collected during winter months (February to early March) because sampling during the high-flow months provides the best opportunity for detecting differences in naturally occurring communities. Swamp stream bioclassification fall into three categories: Natural, Moderate and Severe. For specific methodology defining how these ratings are given, refer to the Benthic Standard Operating Procedures (SOP).

Most of the swamp samples collected in the Chowan River basin showed a higher Biotic Index when compared to samples collected in previous years. Based on field observations, land use has moved from mature forested land cover to shrubs, open fields, and new, immature tree plantings. The loss of mature forested areas may be impacting the benthic communities in these swamp streams. The loss of forested areas may also be contributing to higher stream flows during months that would normally be low to no flow which can impact characteristics typically associated with swamp stream. It could also contribute to the higher Biotic Index. More research and data need to be collected to understand the correlation between the changes in the swamp benthic communities and changes in land use as it relates to the loss of mature forested areas. A study was done on a fourth order blackwater creek in southeastern North Carolina where a clear-cut was monitored downstream two and half years before the clear-cut happened, during the clear-cut and for two years following the clear-cut (Ensign and Mallin, 2001). These findings were measured against a similar control site without clearcutting. Their findings showed an increase in total suspended solids, total nitrogen, total phosphorous, total Kjeldahl nitrogen and fecal coliform bacteria, and significantly lower dissolved oxygen over a 15-month period. Algal blooms were also present after the clearcutting, which had not been there during the two- and half-year monitoring period before the clearcutting. A 10-meter uncut buffer was left along the stream but appeared to be insufficient in preventing impacts to water quality.

Biological samples were collected during the winter and summer months of 2015 as part of the basinwide sampling five-year cycle. Five benthic macroinvertebrate sites were collected in 2015 compared to seven in 2010. The 2015 basin sampling efforts were reduced primarily because of the lack of personnel resources. Most of the sites sampled rated Moderate bioclassification with only one site receiving Not Rated in 2015. Chinkapin Swamp (DB3) was the only site that declined in bioclassification rating and the Chowan River (DB14) declined based on provisional bioclassification criteria. The fish community was last sampled in 2000 because currently there are no coastal plain metrics and criteria. Table 4-7 lists the biological sites and their ratings.

Table 4-7: Benthos Biological Sample Results in Chowan River Subbasin.

Station ID	Waterbody Name	Assessment Unit #	Drainage Area (mi^2)	Assessment Method	Sampling Date	Bioclassification
DB5	Chowan River	25a1	2470	Boat	7/31/2000	Good-Fair
					9/28/2005	Good
					7/21/2010	Not Impaired
					7/11/2015	Not Rated
DB4	Chowan River	25a2b	4350	Boat	8/1/2000	Good
					9/27/2005	Fair
					7/23/2010	Not Impaired
DB6	Cole Creek	25-12-7	32.1	Swamp	2/10/2000	Moderate
					2/8/2005	Moderate
					2/24/2010	Moderate
					2/3/2015	Moderate
DB1	Ahoskie Creek	25-14-1	135.1	Swamp	2/9/2005	Not Rated
				Full Scale	8/25/2005	Not Rated
DB7	Stony Creek	14-1-6	59.8	Swamp	2/10/2000	Moderate
					2/10/2005	Moderate
DB8	Wiccacon River	25-14	265	Boat	8/1/2000	Fair
					8/22/2005	Fair
DB3	Chinkapin Swamp	25-14-3	50	Swamp	2/10/2000	Natural
					2/10/2005	Natural
					2/25/2010	Natural
					2/2/2015	Moderate
DB24	Duke Swamp	25-17-1	42.7	Swamp	2/24/2010	Moderate
DB2	Bennetts Creek	25-17	83	Swamp	2/9/2005	Moderate
DB14	Chowan River	25c	4920	Boat	8/1/2000	Good-Fair
					8/22/2005	Good
					7/20/2010	Not Impaired
					7/11/2015	Not Rated
DB15	Eastmost Swamp	25-24-1	13.3	Swamp	2/22/2000	Moderate
					2/10/2005	Moderate
					2/25/2010	Moderate
					2/2/2015	Moderate
DB27*	Cricket Swamp	25-24-2	4	Swamp	3/6/2012	Moderate

*Special study monitoring not part of 5-year basin cycle monitoring

4.5. 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 4-8, and their locations are found in Figure 4-2 below.

Table 4-8: Ambient Stations in Chowan River Subbasin

Station ID	Station Location	County	State	Stream AU#	Stream Classification
D0000050	NOTTAWAY RIVER AT US258 NEAR RIVERDALE VA	SOUTHAMPTON	VA	NA	NA
D0001800	BLACKWATER RIVER .5 MI UPS MOUTH NEAR WYANOKE	GATES	NC	25a1	B, NSW
D0010000	CHOWAN RIVER NEAR RIDDICKSVILLE	HERTFORD	NC	25a1	B, NSW
D6250000	CHOWAN RIVER AT US 13 AT WINTON	HERTFORD	NC	25a1a	B, NSW
D8356200	CHOWAN RIVER AT CM 16 NEAR GATESVILLE	GATES	NC	25a2c	B, NSW
D8950000	CHOWAN RIVER AT CHANNEL MARKER 7 AT COLERAIN	CHOWAN	NC	25b	B, NSW
D9490000	CHOWAN RIVER AT US 17 AT EDENHOUSE	BERTIE	NC	25c	B, NSW

There was a single short-term Random Ambient Monitoring System (RAMS) station located in the Chowan subbasin, monitored monthly for two years between 2011 and 2012 (Table 4-9). 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. It is recommended that as funding, personnel, laboratory capacity resources become available the RAMS program incorporate collection of nutrients and where appropriate, chlorophyll *a* samples. Since most of the RAMS stations are located in smaller headwater streams, this would help the division understand "background" nutrient concentrations in smaller watersheds, especially in nutrient sensitive waters (NSW) watershed. This information could give some perspective to nutrient concentrations and chlorophyll *a* throughout the basin.

Table 4-9: Random Ambient Stations (RAMS) in Chowan River Subbasin

Station ID	Station Location	County	RAMS Year	Stream AU#	Stream Classification
D9515000	CRICKET SWAMP OFF SR 1346 NEAR ASHLAND	BERTIE	2011-2012	25-24-2	C, NSW

4.6. Local Water Quality

There are three partial and four whole watersheds (HUC-10) in the North Carolina portion of the Chowan River subbasin made up of 34 subwatersheds (HUC-12). To determine the source of a pollutant in a watershed it is useful to break down a large drainage area into smaller areas. This approach also helps identify where monitoring and restoration is being conducted and where it is in need. The Basin Planning Branch in the Chowan River basin should work with the Nonpoint Source Planning branch, Soil and Water Conservation districts, Natural Resources Conservation Service and whoever else we can to improve our understanding of point and nonpoint sources and encourage continued efforts to implement restoration and best management practices to reduce nutrients, sediment loads and flow volume to the receiving streams of these watersheds. Table 4-10 list the number of benthic and ambient monitoring sites that were sampled for the 2005-2015 assessment period by watersheds. Figure 4-3 shows the location of these watersheds.

Figure 4-2: Monitoring Locations in the Chowan River Subbasin

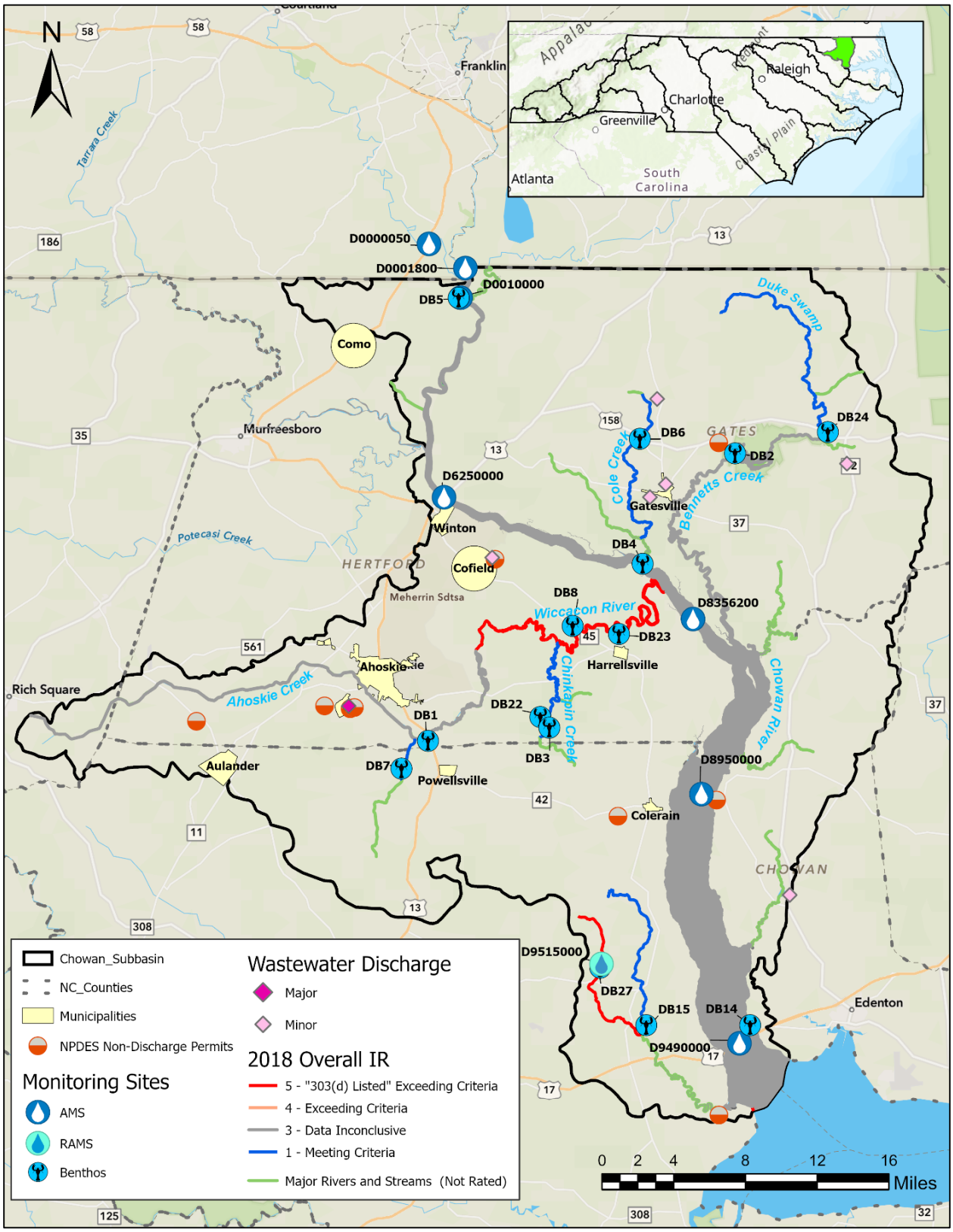


Figure 4-3: HUC-10 watersheds in the Chowan River Subbasin

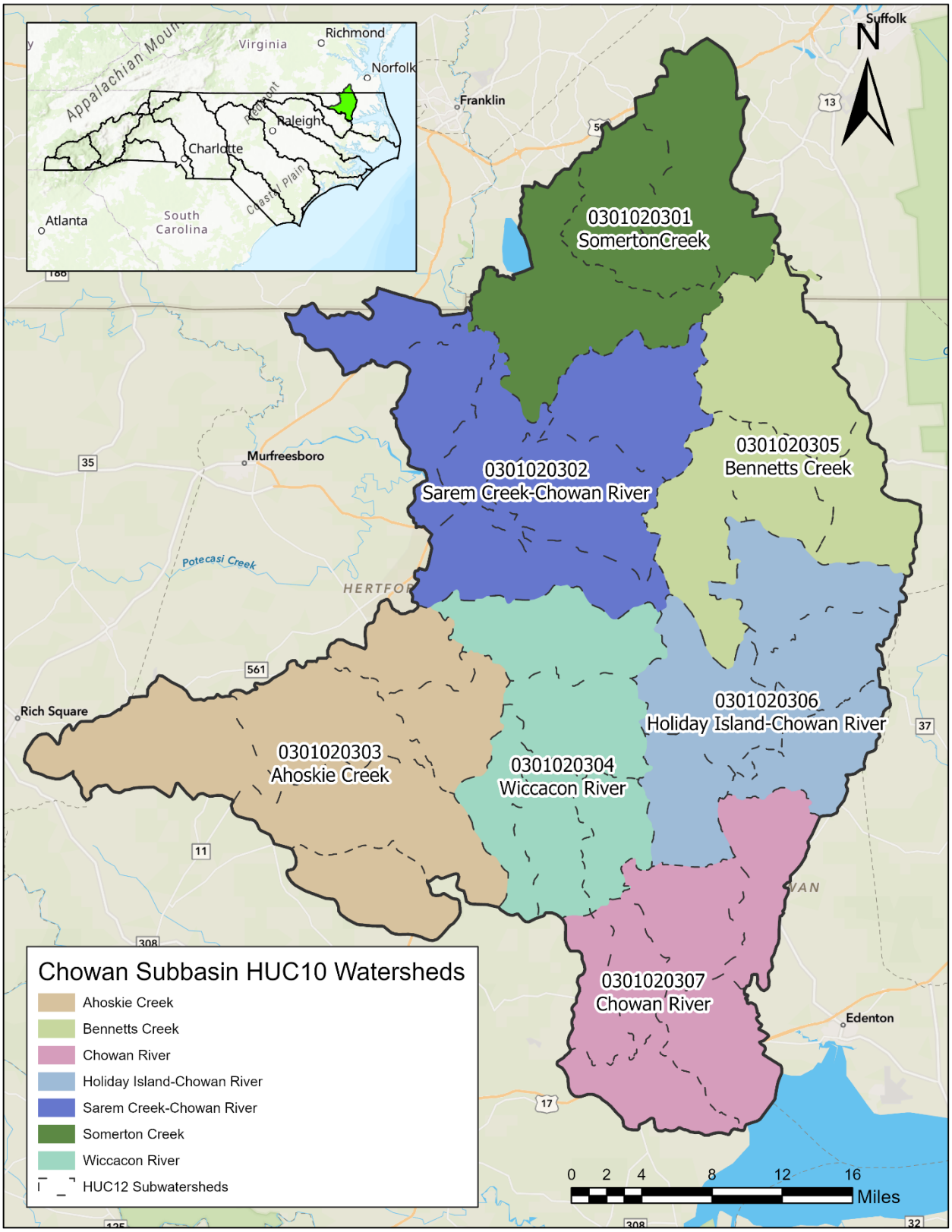


Table 4-10: Number of Benthic and Ambient Sites in the Chowan River Subbasin by HUC-10 Watershed

Watershed Name	HUC-10	Area (mi^2)	Benthic Sites	Ambient Stations	RAMS Stations
Mill Creek-Nottoway River*	0301020112	1.15	0	1	0
Kingsale Swamp-Blackwater River*	0301020205	0.15	0	1	0
Somerton Creek*	0301020301	29.59	0	0	0
Sarem Creek - Chowan River*	0301020302	151.63	3	2	0
Ahoskie Creek	0301020303	169.67	2	0	0
Wiccacon River	0301020304	106.45	2	0	0
Bennetts Creek*	0301020305	106.65	2	0	0
Holiday Island - Chowan River	0301020306	119.57	0	2	0
Chowan River	0301020307	116.78	3	1	1

*Denotes a partial watershed in North Carolina and the area was only calculated for that portion in NC.

4.7. Kingsale Swamp-Blackwater River (HUC: 0301020205)

Kingsale Swamp-Blackwater River watershed is considered part of the Blackwater Subbasin which drains a portion of Virginia containing the Blackwater River. There is one ambient monitoring station in this watershed. The lower Blackwater River is impaired by VA DEQ for Fish Consumption Use based on a Virginia Department of Health fish consumption advisory (issued 10/29/03; modified 7/27/05 and 8/31/07) due to Mercury contaminant found in fish tissue. The fish consumption advisory includes all tributaries of the Blackwater River. The Blackwater River was also impaired for dissolved oxygen although Virginia is requesting to formally reclassify the Middle, Lower-Middle, and Lower portions of the Blackwater River to Class VII Swamp Water during the next triennial review of Virginia's Water Quality Standards. It was determined all six Blackwater segments are impaired due to natural conditions and were moved to category 4C based on EPA approval letter dated April 8, 2010 (VADEQ, 2019).

4.8. Mill Creek-Nottoway River (HUC: 0301020112)

Mill Creek-Nottoway River watershed is considered part of the Nottoway Subbasin which drains a portion of Virginia containing the Nottoway River. There is one ambient monitoring station in this watershed located in Virginia. The Upper, lower-middle, and lower portions of the Nottoway River is also impaired by Virginia DEQ for Fish Consumption Use based on a Virginia Department of Health fish consumption advisory due to Mercury contaminant found in fish tissue. The upper Nottoway River is impaired for recreation use based on *Escherichia coli* (E. coli) data. The Lower portion of Nottoway River is impaired for aquatic life due to low dissolved oxygen levels (VADEQ, 2019).

4.9. Somerton Creek (HUC: 0301020301)

Somerton Creek watershed encompasses approximately 30 square miles and has the greatest percentage of forest (55.5%) land and relatively low agriculture (18.5%) land compared to the rest of the Chowan River watersheds. Somerton Creek originates in Virginia and drains to the Chowan River near the VA/NC boarder. There are no NPDES permitted wastewater dischargers, animal operations, ambient monitoring stations, or benthic monitoring sites in this watershed. There are four land application of residual solids fields, but those field have never been used. Part of the Chowan Swamp Game Land borders Somerton

Creek near the confluence with the Chowan River. The VA portion of Somerton Creek is impaired for aquatic life use based on benthic macroinvertebrate bioassessments data and for recreation use based on E. Coli data. A previous dissolved oxygen impairment in the VA portion of Somerton Creek was delisted based off a natural conditions report confirming the dissolved oxygen impairment is due to natural causes rather than anthropogenic (VADEQ, 2006).

4.10. Sarem Creek-Chowan River Watershed (HUC: 0301020302)

The Sarem Creek – Chowan River watershed drains approximately 152 square miles of primarily forest (37.2%) and wetland (32.2%) land cover in North Carolina. This watershed is where the Nottoway and Blackwater Rivers from Virginia meet to form the Chowan River in North Carolina. It includes the municipalities of Winton, portions of Como, and Cofield. There is two NPDES permitted wastewater dischargers in the watershed. There are two ambient monitoring stations and three benthic monitoring sites in the watershed. There are three permitted animal operations and one non-discharge permitted facility in the watershed. There are also four land application of residual solids fields in the watershed, but those fields have never been used.

Chowan River [AU# 25a1; Primary Surface Water Classification: B, Supplemental Classification NSW; Length is 1.8 river miles]

Sampling Year	Bioclassification (DB5)
2000	Good-Fair
2005	Good
2010	Not Impaired
2015	Not Rated

This section of the Chowan River drains a portion of northeastern portion of Hertford County and northwestern portion of Gates County. The benthic monitoring site DB5 is the uppermost benthic monitoring site on the Chowan River. Benthic sampling from 2010 and 2015 show the biologic community has improved since the 2005 assessment period. This site had the highest EPT of any other sampling site in the Chowan River basin. Given the provisional status of criteria for large, non-wadeable coastal plain rivers, the 2010 and 2015 samples were assigned Not Impaired and Not Rated bioclassification, respectively. However, for purposes of inter-year comparison, both the 2010 and 2015 collections would have received an Excellent bioclassification. Co-located at this benthic sampling location is an ambient monitoring station D0010000. No water quality standards were violated at this AMS station in 2018 assessment. Historically, this station was on the impaired waters list for dissolved oxygen impairment from 1998 until 2010. This station was de-listed in 2010 as the low pH and dissolved oxygen standard violations were due to natural conditions in the watershed (US EPA, 2010). The 2018 IR reports that no water quality standards were exceeded at the ambient monitoring station (D0010000) or biological community station (DB5) on the Chowan River aside from mercury in fish tissue. Benthos, arsenic, dissolved oxygen, and iron were determined to be Data Inconclusive in the 2018 IR.

Chowan River [AU# 25a2a; Primary Surface Water Classification: B, Supplemental Classification NSW; Length is 24.4 river miles]

This section of the Chowan River drains a portion of northeastern portion of Hertford County and northwestern portion of Gates County. This segment of the Chowan River was previously on the impaired waters list since 2002 for exceeding the standard for Cadmium (2 µg/l for freshwater and aquatic life) standard at the ambient monitoring station D6250000. The new dissolved metals standard was applied to this site and it is now meeting the new criteria for Cadmium. This portion of the Chowan River has been removed from the impaired waters list in 2018 (US EPA, 2019). Annual mean turbidity values are elevated

at this station (D6250000) relative to the upstream at ambient station (D0010000). This is possibly due nonpoint source pollution from Potecasi Creek and Meherrin River. The 2018 IR reports that no water quality standards were exceeded at the ambient monitoring station (D6250000) on the Chowan River aside from mercury in fish tissue. Cadmium, chloride, copper, fluoride, and iron were determined to be Data Inconclusive in the 2018 IR.

Chowan River [AU# 25a2b; Primary Surface Water Classification: B, Supplemental Classification NSW; Length is 9.5 river miles]

Sampling Year	Bioclassification (DB4)
2000	Good
2005	Fair
2010	Not Impaired

This section of the Chowan River drains a portion of east-central of Hertford County and west-central portion of Gates County. The 2010 sampling showed that the biological community has improved since the previous assessment period. Samples obtained from this site have previously been assigned bioclassification. However, these ratings were based on provisional criteria. Given the provisional status of criteria for Coastal B rivers, the 2010 sample was assigned a Not Impaired bioclassification. However, for purposes of inter-year comparison, the 2010 collection would have received an Excellent bioclassification based on the provisional criteria. This site was not sampled in 2015 due to lack of time and resources. The 2018 IR reports that the benthic community was determined to be Data Inconclusive and did not exceed criteria at the biological community station (DB4) on the Chowan River. There is an impairment for mercury in fish tissue.

Perdue Grain and Oilseed, LLC (WQ0001536) is located near the Town of Cofield. This facility rehabilitates and repairs sprayfields, replaces equipment and can pump and haul to a nearby facility if needed. Currently, there are no ongoing or reoccurring issues with this facility.

CF Nitrogen Site in Tunis, NC (WQ0012404) installed a cut-off wall around site to prevent discharge of nitrogen enriched groundwater to surface water. See the Permitted and Registered Activates chapter (Chapter 7) for more information related to this site.

Cole Creek [AU# 25-12-7; Primary Surface Water Classification: C, Supplemental Classification NSW; Length is 9.5 river miles]

Sampling Year	Bioclassification (DB6)
2000	Moderate
2005	Moderate
2010	Moderate
2015	Moderate

Cole Creek is a tributary of Sarem Creek and drains a portion of east-central Gates County. This tributary has maintained its Moderate rating and appears to have stable water quality. While the bioclassification did not change at this site, the benthic species in 2015 were noticeably more tolerant than previous years. Part of this shift may have been due to the difficulty in finding areas of steady flow in 2015 or may have reflected the steady loss of forest in the watershed. While the bioclassification did not change, BAB staff recommend subsequent sampling to establish whether this species shift was a one-year event or a watershed-wide trend. Likely influences on water quality appear to come from agriculture and forestry practices, although there are a few very small municipalities located within the watershed. Significant noncompliance issues have been reported at the permitted wastewater facility for Buckland Elementary School (permit NC0043974) which discharges upstream of the monitoring site. A notice of violation (NOV) has been issued every year from 2003-2016 for fecal coliform bacteria consistently exceeding permit limits. The wetland system that is used for treatment of the wastewater was replaced in 2017. Crushed red brick in the system was tinting the wastewater red (which was causing high fecal

coliform readings due to UV light not penetrating the colored water) and has been replaced with rock and new wetland plants have been planted. DWR regional staff are working with the facility and inspections will continue to monitor the progress. The 2018 IR reports that the biological community at station DB6 on Cole Creek is Meeting Criteria, but there is an impairment for mercury in fish tissue.

4.11. Ahoskie Creek Watershed (HUC: 0301020303)

Ahoskie Creek watershed drains approximately 170 square miles of primarily forest (43.0%) land and has the largest percentage of developed (5.5%) land of the Chowan River basin watersheds. This watershed includes the municipalities of Ahoskie, Aulander, and Powellsville. There is one NPDES permitted wastewater discharger in the watershed. There are no ambient monitoring stations. There are two benthic monitoring sites which were last sampled in 2005 in the watershed. There is one fish community station, but the IBI is undergoing revisions in the Chowan. There are three permitted animal operations, three non-discharge facilities, and four land application of residual solids field in the watershed.

Ahoskie Creek [AU# 25-14-1a and AU# 25-14-1b; Primary Surface Water Classification: C, Supplemental Classification NSW; Length is 39.3 river miles]

Sampling Year	Bioclassification (DB1)
Feb - 2005	Not Rated
Aug - 2005	Not Rated

Ahoskie Creek is the main stream flowing through the Ahoskie Creek watershed. This stream drains a portion of southwestern Northampton County, south-central Hertford and north-central Bertie County. Ahoskie Creek remains as a Not Rated bioclassification at site DB1 since the 2005 sampling cycle. This site was one of many not sampled in subsequent sampling cycles (2010 and 2015) due to lack of resources. Its 2005 bioclassification was Not Rated due to its transitional nature from Coastal A to Swamp. Additional data are needed in both winter and summer periods to determine the most appropriate time to assess these waterbodies. The 2018 IR reports that the biological community station (DB1) on Ahoskie Creek is Data Inconclusive. There is an impairment for mercury in fish tissue.

Recommendation:

Upstream from benthic site DB 1 is one of two USGS stream gages (USGS: 02053500) in the entire Chowan River Basin. There are no ambient monitoring sites in the Ahoskie watershed. When resources become available, it would be beneficial to co-locate an AMS site with the USGS Ahoskie Creek 02053500 site. This would allow to calculate nutrient loads in the future.

Data from the Town of Aulander WWTF (WQ0000777) and Pinewood Manor Rest Home (WQ0002096) does not indicate any issues. The Town of Aulander also received funding from DWI to support Wastewater and sewer system improvements, as well as, a Water Asset Management Plan. Additional information related to funding from DWI can be found in the Water Quality Initiatives and Funding chapter (Chapter 6).

The Town of Ahoskie operated a land application of residuals system for wastewater treatment and disposal under permit WQ0003885. This facility is no longer the primary wastewater treatment and disposal system for Town of Ahoskie. The land application of residuals system was not able to comply with the permit requirements due to excessive infiltration and inflow, variations in weather conditions, hydraulic constraints and capacity of the spray fields. For this reason, the town entered into a Special Order by Consent (SOC) in 2004. After evaluating several options, the town built a new 1.3 million gallons

per day (MGD) wastewater treatment system with the disposal options being reuse of the effluent at an industrial facility or discharge to Ahoskie Creek. Ahoskie NPDES permit NC0088561 became effective September 2007 and did not start discharging until July 2011. The primary means of disposal is reuse at NUCOR Steel for cooling water, when reuse is not possible due to plant shutdowns or maintenance issues, the facility will discharge to Ahoskie Creek. The land application of residuals system will continue to operate at a permitted capacity of 0.406 MGD. The wastewater treatment system has nitrogen limits (3 mg/L) and phosphorus limits (1 mg/L) in compliance with the Chowan nutrient management strategy. Currently, there are no ongoing or reoccurring issues with this facility. The Town of Ahoskie received funding from DWI for an Automatic Meter Reading (AMR) system. Additional information related to funding from DWI can be found in the Water Quality Initiatives and Funding chapter (Chapter 6).

Stony Creek [AU# 25-14-1-6; Primary Surface Water Classification: C, Supplemental Classification NSW; Length is 2.2 river miles]

Stony Creek drains a portion of north-central Bertie County and south-central Hertford County. Stony Creek continues to meet water quality criteria as a result of the Moderate bioclassification at site DB7 during the 2005 sampling cycle. The 2018 IR reports that the biological community station (DB7) on Stony Creek is Meeting Criteria. There is an impairment for mercury in fish tissue.

Sampling Year	Bioclassification (DB7)
2000	Moderate
2005	Moderate

Recommendation:

This was another site that was not sampled during the 2010 and 2015 cycles, due to lack of resources. Active forestry operations were observed during the 2005 sampling period. Since this site has not been sampled in 15 years, DWR recommends that when time allows to resample this site to see if increased deforestation in the area has influenced the biological community.

4.12. Wiccacon River Watershed (HUC: 0301020304)

The Wiccacon River watershed drains approximately 106 square miles of primarily forest (40.3%) and agriculture (31.7%) land cover. This watershed includes the municipalities of Colerain and the southern portion of Cofield. There are no NPDES permitted wastewater dischargers in the watershed. There are no ambient stations and one benthic monitoring sites in the watershed. There is one permitted animal operation and one non-discharge permitted facility in the watershed. There is one fish community station, but the IBI is undergoing revisions in the Chowan.

Wiccacon River (Hoggard Swamp) [AU# 25-14; Primary Surface Water Classification: C, Supplemental Classification NSW; Length is 22.5 river miles]

Wiccacon River drains a portion of southern Hertford County and northern Bertie County. This stream has remained on the impaired waters list since at least 1998 due to biological impairment. The first station established to monitor the benthic macroinvertebrate community reported fair and poor bioclassification results between 1983 and 1995. The station was moved upstream of the confluence of Brooks Creek for the 2000 and 2005 biological assessments, but the benthic macroinvertebrate community continued to report fair bioclassification results. This site was not assessed in the past two cycles 2010 or 2015 due to staffing reductions. The macroinvertebrate

Sampling Year	Bioclassification (DB8)
2000	Fair
2005	Fair

community collection for 2005 in the Wiccacon River indicated problems caused by nutrient enrichment and low dissolved oxygen (NC DWQ, 2007). The Wiccacon also has historically had generally low DO levels (NC DENR, 1992). Potential sources of the low DO were not identified; however, the watershed consists primarily of agricultural land and many of the tributaries have been channelized throughout the years. This segment of the Wiccacon River remains on the list of impaired waters for biological impairment (benthos) and mercury in fish tissue.

Recommendation:

DWR continues to support the recommendation from the 2007 Chowan River Basin Water Quality Plan which encourages the use of nonpoint source BMPs to reduce nutrient and sediment loads. Funds should be appropriated to encourage more traditional BMPs (strip planting, no-till, cover crops) and new technologies. DWR will work closely with other resource agencies to prioritize implementation of efforts to address agriculture impacts within this watershed. Water quality monitoring efforts should also be focused in this watershed to determine the cause of the Wiccacon River impairment.

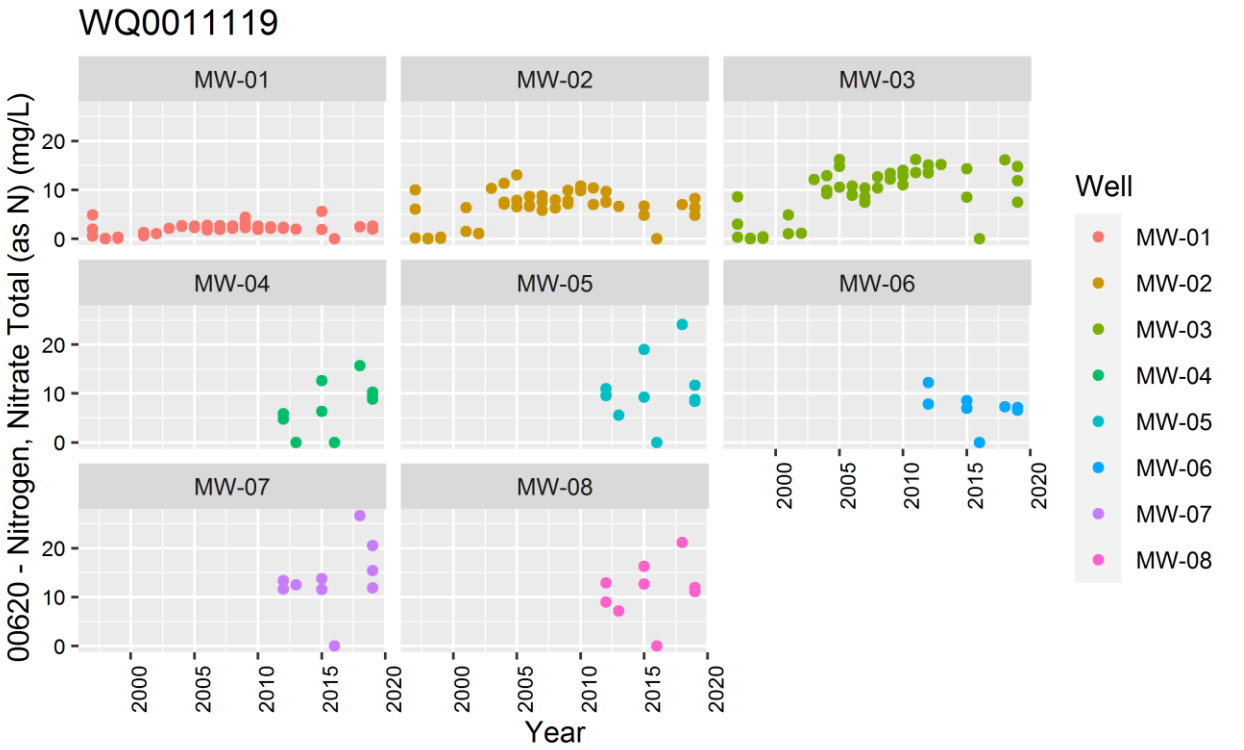
Chinkapin Swamp [AU# 25-14-3; Primary Surface Water Classification: C, Supplemental Classification NSW; Length is 7.1 river miles]

Sampling Year	Bioclassification (DB3)
2000	Natural
2005	Natural
2010	Natural
2015	Moderate

Chinkapin Swamp is a tributary which meets with the Long Branch tributary to form Chinkapin Creek (Cessions Millpond). Chinkapin Creek is a southern tributary of the Wiccacon River which drains the southeastern region of Hertford county and the northeastern region of Bertie county. The area around this site is wooded with agricultural use in the headwaters of the drainage area. A natural bioclassification has been assigned to this the Chinkapin Swamp, until 2015 when the bioclassification dropped to Moderate. The drop in bioclassification may reflect the declining amount of forest in the watershed. Further monitoring will be necessary to establish a clear trend at this location. The 2018 IR reports that the biological community station (DB3) on Chinkapin Swamp is Meeting Criteria. There is an impairment for mercury in fish tissue.

The Town of Colerain WWTF (WQ0011119) is located near the headwaters of Chinkapin Swamp. Nitrate is routinely detected above the groundwater standard in a few monitoring wells, including up-gradient (MW-08) and cross-gradient wells (Figure 4-4). There is a poultry operation up-gradient and if it is active that could be an area of nutrient input as well as agricultural influence surrounding this facility. The Washington Regional Office (WARO) of NCDEQ determined the effluent concentrations are not sufficient to cause violations of groundwater standards, however they are not certain of the integrity of the lagoon liner.

Figure 4-4: Nitrate concentrations in the groundwater monitoring wells surrounding the Town of Colerain wastewater treatment facility.



4.12. Bennetts Creek Watershed (HUC: 0301020305)

Bennetts Creek watershed drains approximately 107 square miles of primarily forest (37.5%) and wetland (25.0%) areas with agricultural (27.2%) areas boarding most of the headwaters and swamps in the upper region of the watershed. This watershed includes the small municipality of Gatesville. There are two small public school NPDES permitted wastewater dischargers and one industrial process and commercial wastewater discharger in the watershed. There are no ambient, one benthic and three lake monitoring locations in the watershed. There are four permitted animal operations and one non-discharge permitted facility in the watershed. There are two land application of residuals fields, but those fields have never been used.

Duke Swamp [AU# 25-17-1; Primary Surface Water Classification: C, Supplemental Classification NSW; Length is 13.5 river miles]

Sampling Year	Bioclassification (DB24)
2010	Moderate

The Duke Swamp watershed drains the northeastern Gates County and flows into Bennetts Creek upstream of Merchants Millpond. The upper watershed of Duke Swamp is overwhelmingly agricultural with few residences or municipalities. Duke Swamp was added as a Basinwide Site in 2010 to complement Cole Creek as the only basinwide swamp sites within Gates County and has not been sampled prior to 2010. The upper portion of the sampling reach was shallow due to extensive braiding. Duke Swamp obtained a bioclassification rating of Moderate in 2010. The 2018 IR reports that the biological community station (DB24) on Duke Swamp is Meeting Criteria. There is an impairment for mercury in fish tissue.

Bennetts Creek (Merchants Millpond) [AU# 25-17; Primary Surface Water Classification: C, Supplemental Classification NSW; Length is 23.3 river miles]

Sampling Year	Bioclassification (DB2)
2005	Moderate

This Bennetts Creek benthic monitoring site was dropped in 2010, due to its close downstream proximity to Merchants Mill Pond. Impoundments, such as a mill pond, can result in downstream sections of the river having lowered dissolved oxygen levels, decreased flows, and increased temperatures. In winter, those effects are minimized and this sampling effort would likely not have recorded these effects. The bioclassification at this site was Moderate in 2005. The 2018 IR reports that the biological community station (DB2) on Bennetts Creek is Meeting Criteria. There is an impairment for mercury in fish tissue. The 2018 reports that chlorophyll *a*, dissolved oxygen, and water temperature are all Data Inconclusive.

Merchants Millpond was monitored in May and August 2015. Lake surface dissolved oxygen dropped below the state water quality standard of 4.0 mg/L for an instantaneous reading in August. This may be within the natural conditions for this millpond, which exhibits many characteristics associated with a Swamp Water designation, such as tannic waters, buttressed trees, and shallow depth. Duck weed and watermeal are present on the surface of Merchants Millpond while submerged aquatic macrophytes occur throughout the lake. Overall, Merchants Millpond was eutrophic in 2015. This lake has consistently exhibited elevated biological productivity since it was first monitored by DWR in 1981.

The N.C. Parks and Recreation Trust Fund Authority earmarked $4,484,597 to be used in the acquisition of 2,775 acres at Hammocks Beach, Hanging Rock, Carver Creek, Chimney Rock, Merchants Millpond, New River, and Mount Mitchell state parks. The new park lands will protect natural resources, improve park access, and management and provide land for new visitor facilities.

The Gates County WWTF (WQ0000267) is making changes to their facility. The spray system has been taken up by the county. This facility historically had runoff occur in the late 90's early 2000's. The WARO of NCDEQ responded to this by decreasing their permitted flow, by over half. They are building a new system to do activated sludge treatment.

4.13. Holiday Island-Chowan River Watershed (HUC: 0301020306)

The mainstem of the Chowan River flows through this watershed receiving streamflow from the Wiccacon River, Bennetts Creek, and Indian Creek. This watershed drains approximately 120 square miles of primarily agriculture (38.4%) land. This watershed has the highest percentage of agricultural land of all the Chowan River basin watersheds. This watershed has no NPDES permitted wastewater dischargers and one non-discharge permitted facility. There are two ambient monitoring stations and no benthic sites in the watershed. There are six permitted animal operations in the watershed.

Chowan River [AU#25a2c & 25b; Primary Surface Water Classification: B, Supplemental Classification NSW; Length is 18.2 river miles]

This section of the Chowan River from Wiccacon River to the old subbasin 03-01-03/03-01-04 boundary drains a portion of Hertford County, Gates County, northeastern Bertie County and northwestern Chowan County. No biological samples were collected in this watershed. Data was collected from two ambient monitoring stations (D8356200 and D8950000). Relatively high chlorophyll *a* concentrations which exceeded the 40 µg/L standard were observed at the ambient water quality monitoring station near

Gatesville (D8356200) and Colerain (D8950000). This section of the Chowan River has also experienced multiple severe algal blooms in the last few years. Visit the Algal Bloom Map to view where the blooms have been observed. Special attention is given to station near Colerain (D8950000) in the Nutrient Sensitive Water History and Current Nutrient Conditions chapter (Chapter 6) as this station best captures the changes in the algal community and the bloom intensities as of 2018 and 2019. The 2018 IR reports that the water quality in the Chowan River at stations D8356200 and D8950000 is Meeting Criteria with the exception of iron which is Data Inconclusive. There is an impairment for mercury in fish tissue. Stevens Towing - Riverbulk Terminal WWTF (WQ0040672) was recently issued a NPDES non-discharge permit in May of 2020.

4.14. Chowan River Watershed (HUC: 0301020307)

This watershed has one NPDES permitted wastewater dischargers that is located on the subbasin watershed line between the Chowan River and Pasquotank River basins. There are is one ambient monitoring station and two benthic monitoring sites in the watershed. There is one permitted animal operation in the watershed and one non-discharge permitted facility in the watershed.

Chowan River [AU# 25c; Primary Surface Water Classification: B, Supplemental Classification NSW; Length is 7.8 river miles]

The Chowan River, from the historic subbasin 03-01-03/03-01-04 boundary to the mouth of the river is deified by a line extending in a southerly direction from Reedy Point on the north shore to Albemarle Sound to a point of land on the south side of the mouth of Black Walnut Swamp. This section of the Chowan River receives drainage from major portions of Northampton, Hertford, Gates, Chowan, and Bertie counties within North Carolina. This section of the Chowan River also experienced severe algal blooms since 2015 with relatively high chlorophyll *a* concentrations, that exceeded the 40 µg/L standard. Visit the Algal Bloom Map to view where the blooms have been observed.

Sampling Year	Bioclassification (DB14)
2000	Good-Fair
2005	Good
2010	Not Impaired
2015	Not Rated

Benthic macroinvertebrate sampling in 2015 resulted in a lowest EPT since 2000 and was substantially lower than 2010. A low EPT possible indicates higher pollution. The presence of many estuarine or freshwater-tolerant crustaceans indicates frequent saltwater intrusions into this area of the river which may also inhibit some obligate freshwater taxa. At the time of sampling a large Anabaena cyanobacterial bloom was underway. Given the provisional status of criteria for Coastal B rivers, this site was assigned a Not Rated bioclassification. However, for purposes of inter-year comparison, the 2010 would have received a Good bioclassification and the 2015 sampling would have received a Good-Fair bioclassification. This represents an overall decline in the system. This site has oscillated between Good-Fair and Good since the site was first sampled in 1983. The 2018 IR reports that the water quality in the Chowan River at ambient monitoring station D9490000 is Meeting Criteria with the exception of iron and chlorophyll *a* which are Data Inconclusive. The biological community at station DB14 is also Data Inconclusive. There is an impairment for mercury in fish tissue.

Rockyhock Creek [AU# 25-22; Primary Surface Water Classification: B, Supplemental Classification NSW]

Rockyhock Creek is a tributary which flows into Bennett Millpond then to the Chowan River. This tributary was not monitored. Water quality conditions are of concern here because Valhalla WTP (NC0032719) is discharging to an unnamed tributary to Rockyhock Creek. The tributary has been blocked off by road construction. So now most of the wastewater is infiltrated (via the lagoon) in the groundwater which then flows to Bennett Millpond. This has resulted in ponding and plume of chloride, iron and manganese to form in the groundwater under this facility. Groundwater in and around the lagoon has exceeded the iron and chloride groundwater standards. Since this facility is positioned on the hydrologic divide between the Chowan and Pasquotank River basins, groundwater has been migrating to the west and the east. The investigations performed by the WARO of NCDEQ so far have found that the groundwater plume has impacted the surface water in an unnamed tributary that flows into Bennetts Millpond, but no impacts (exceedances of surface water standards) have been observed in the pond its self. In response to this issue a SOC (S16-003) was issued in February 2018. A new discharge permit was issued in January of 2020 to relocate their discharge location to the Chowan River. Recently, they are modifying the SOC to evaluate a regionalization of water plants with the Town of Edenton and Perquimans County. Chowan County received funding from DWI for projects related to Valhalla WTP solids handling, water supply and water systems. Additional information related to funding from DWI can be found in the Water Quality Initiatives and Funding chapter (Chapter 6).

Eastmost Swamp [AU# 25-24-1; Primary Surface Water Classification: C, Supplemental Classification NSW; Length is 9.1 river miles]

Sampling Year	Bioclassification (DB15)
2000	Moderate
2005	Moderate
2010	Moderate
2015	Moderate

Eastmost Swamp drains a portion of the eastern Bertie County. This stream joins Salmon Creek, which drains directly into the Albemarle Sound. Since 2000, Eastmost Swamp has maintained a moderate bioclassification and 2015 was no different. This stream is forested on both sides of the stream, yet matures trees were absent in areas directly adjacent to the channel during the 2015 sampling event. Like other swamp samples in 2015, the Biotic Index was elevated compared to recent years, which indicates poor water quality. This may or may not have anything to do with the declining amount of forests in the watershed (54% in 1992 to 34% in 2006) since no other water quality parameters are significantly different from previous years. The 2018 IR reports that the biological community station (DB15) on Eastmost Swamp is Meeting Criteria. There is an impairment for mercury in fish tissue.

Cricket Swamp [AU# 25-24-2; Primary Surface Water Classification: C, Supplemental Classification NSW; Length is 8.3 river miles]

Sampling Year	Bioclassification (DB27)
2012	Moderate

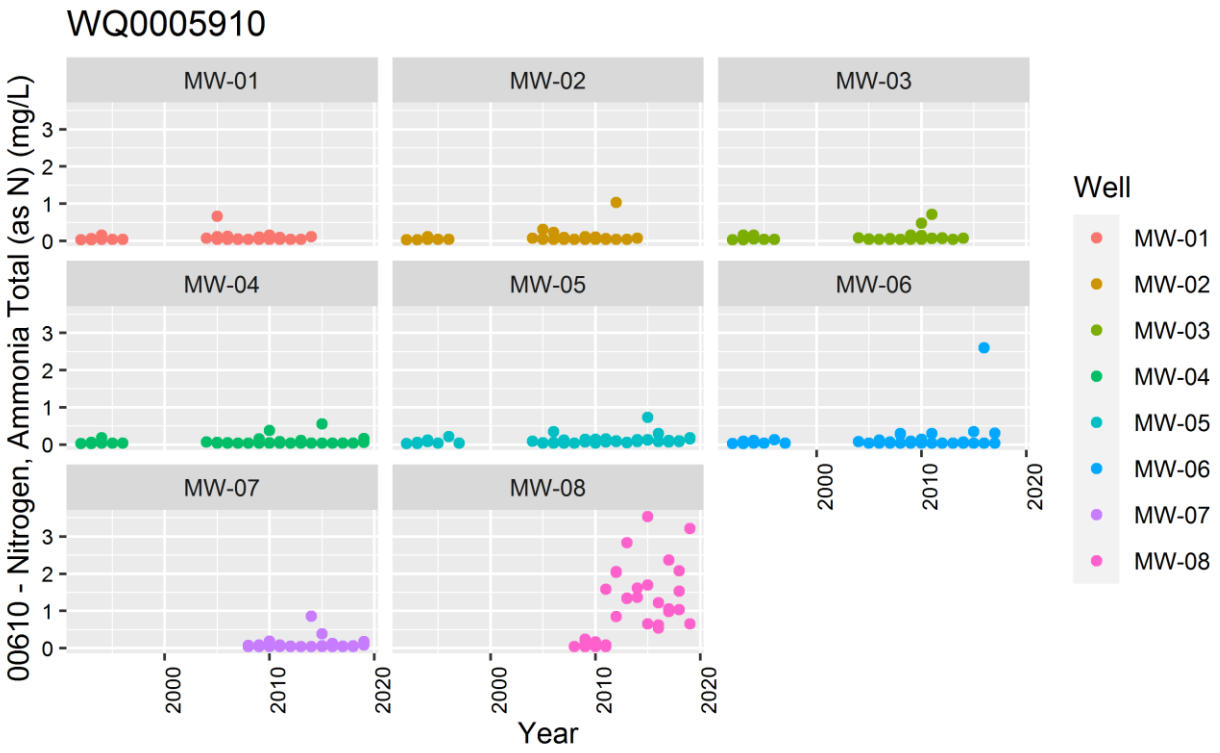
Cricket Swamp drains a portion of the eastern Bertie County. This stream was sampled in 2012 as part of the RAMS supplemental 106 grant work. The drainage area of this stream to this sample location DB27 is 4 square miles with a stream width of 4 meters. As of 2016, the land cover in this area is primarily forest (50.10%), agriculture (35.49%), and wetlands (9.63%). There are no NPDES permitted facilities, animal operations, land application of residual solids fields or non-discharge permitted facilities in the drainage area. The 2012 sampling included the collection of physical, chemical and biological information. The physical and

chemical parameters were monitored on this stream at RAMS station D9515000. The analysis of this sampling resulted in a pH impairment. This stream was subsequently placed on the impaired water list in 2014. This stream remains on the impaired water list. The source of the low pH has not been determined but could be the result of natural conditions. The natural conditions contributing to the low pH could be reactions with acid soils and drainage of swamp-like water. The soils in this watershed are composed of extremely acid to strongly acid soils (28.8%) and very strongly acid or strongly acid soils (62.7%). Additionally, the biological assessment used the Swamp biocriteria for this stream. NC has an exception process for waters that are swamp-like but are not formally classified as Sw or swamp waters. These swamp-like waters are in the coastal plain and are usually near classified Sw waters or have been sampled using swamp biocriteria. Swamp streams stop flowing in summer months but have visible flow during late winter. A natural conditions assessment should be conducted to determine if the sources of low pH water is caused by natural conditions. The biological assessment resulted in a Moderate bioclassification. The 2018 IR reports that aside from the low pH water impairment other water quality parameters are Meeting Criteria with the exception of iron which is Data Inconclusive. The biological community station (DB27) on Cricket Swamp is Meeting Criteria. There is an impairment for mercury in fish tissue.

Cricket Creek flows into Salmon Creek which flows into the Chowan River and the Albemarle Sound. The Merry Hill Facility (WQ0005910) is located near the mouth of Salmon Creek before flowing into the Chowan River. Nitrate concentrations in the groundwater has been detected at elevated levels in groundwater monitoring well four (MW-04) of this facility (Figure 4-5). A consultant's report concluded that this monitoring well is hydraulically separate and therefore the nitrate concentrations detect in this monitoring well are not related to any wastewater activity from their storage or irrigation fields. WARO of NCDEQ agrees with this conclusion and as a result the monitoring well is being replaced to a location downgradient of the storage pond and field. Monitoring wells seven (MW-07) and eight (MW-08) of this facility are located in the Pasquotank River basin. These monitoring wells have shown declines from the initially high nitrate concentrations over time (Figure 4-5). The initial source of the elevated nitrate concentrations is presumed to be agriculture related. Although nitrate has declined in these wells the WARO of NCDEQ is evaluating the ammonia levels in monitoring well eight (MW-08) which are elevated above the Interim Maximum Allowable Concentrations for Groundwater of 1.5 mg/L (Figure 4-6).

Figure 4-5: Nitrate concentrations in the groundwater monitoring wells of facility WQ0005910

Figure 4-6: Ammonia concentrations in the groundwater monitoring wells of facility WQ0005910



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