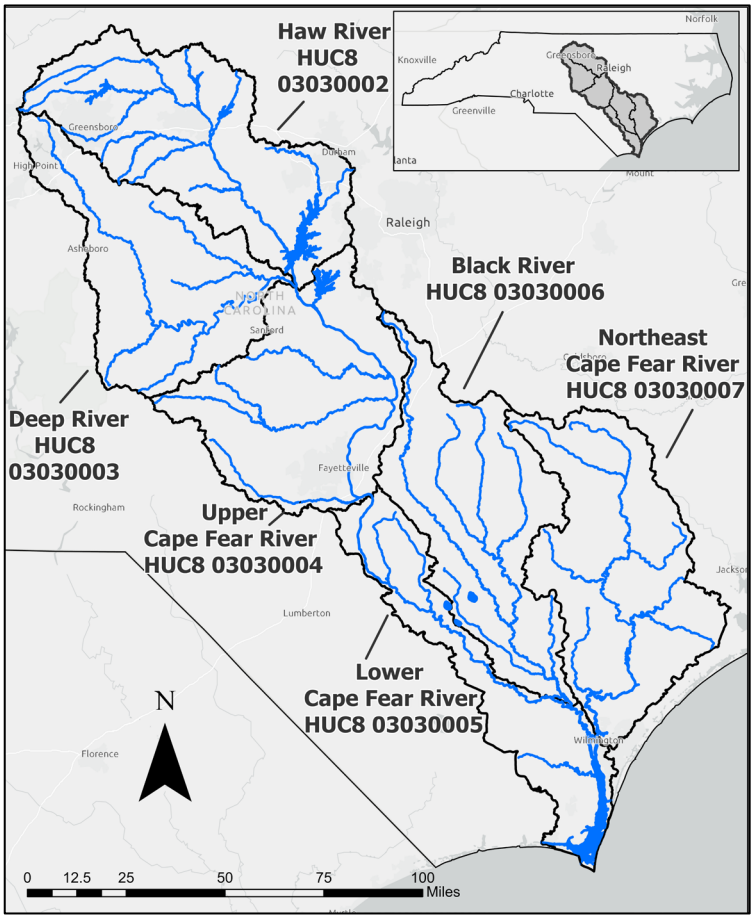

DRAFT
Chapter 3
Cape Fear River Basin
Permitted and Registered Activities

BASINWIDE WATER RESOURCES MANAGEMENT PLAN

CYCLE 4 – CAPE FEAR RIVER BASIN 2026

North Carolina
Department of Environmental Quality
Division of Water Resources
Basin Planning Branch

NORTH CAROLINA
Department of Environmental Quality

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1 Permitted and Registered Activities

1.1 Overview

There are federal and state several programs focusing on protection of water resources in North Carolina. These include programs that oversee wastewater, stormwater, land application of wastewater effluent and biosolids, wetlands and buffers, animal operations, local water supply, public water systems, coastal management, source water protection, groundwater and drinking water protection programs and hazardous waste management. This section includes brief descriptions of the programs, management strategies and resources available for protecting waters of the state. More information about each of the programs can be found on the NC Department of Environmental Quality (DEQ) website and in the Supplemental Guide to Basinwide Planning (2008) as well as other state agency and county websites responsible for permitting or compliance issues. Many documents related to permitted operations are available on in DEQ's documents library, Laserfiche. Data are also available through a DEQ ArcGIS web map, NC DEQ Division of Water Resources Map Locator (or from the DEQ ArcGIS home page, https://ncdenr.maps.arcgis.com/home/index.html).

1.2 Wastewater Management

1.2.1 NPDES Wastewater Discharge Permit

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. It is authorized under the Clean Water Act (CWA). Not complying with permit limits on wastewater flow can lead to degraded water quality, making surface waters unsafe for drinking, fishing, swimming and other activities. The NPDES program in DEQ's Division of Water Resources (DWR) is responsible for the issuance of wastewater discharge permits. This process includes determining the quality and quantity of treated wastewater that the receiving stream can assimilate and incorporates input from stream modeling. The NPDES program is managed by three units, the Industrial Permitting Branch, the Municipal Permitting Branch and the Compliance and Expediated Permitting Staff. The Municipal (Publicly Owned Treatment Works (POTW)) Permitting and Industrial Permitting branches issue both major and minor permits. The US Environmental Protection Agency (EPA) definition for POTW major facilities are those that have a designed flow of ≥ 1 million gallons per day (MGD) or serve a population of 10,000 or more or cause significant water quality impacts. The non-POTW discharges are classified as major facilities based of the number of points accumulated using the NPDES Permit Rating Work Sheet. The worksheet evaluates the significance of a facility using several criteria, including toxic pollutant potential, flow volume and water quality factors such as impairment of the receiving water or proximity of the discharge to coastal waters. The Industrial Permitting Branch is responsible for issuing and renewing Industrial NPDES wastewater permits and providing programmatic support. The Municipal Permitting Branch includes NPDES, Pretreatment, and Collection Systems. It controls and documents the discharge of wastewater from Significant and Categorical Industrial Users to POTWs and is responsible for the various permitting programs for wastewater collection systems. The branch also oversees wastewater collection construction and operation. Examples of Categorical Industrial Users include metal finishing, pharmaceuticals, and organic chemicals, plastics and synthetic fibers. The Compliance and Expediated Permitting Branch issues minor

permits, general permits and is responsible for enforcing requirements listed in the wastewater permit. Permits are reviewed for renewal every five years.

As of 2022, there are 218 NPDES wastewater permitted facilities that discharge to waterways in the Cape Fear River basin, including 50 major and 168 minor facilities (*Table 3-1*). The major facilities account for 95% of the permitted as-built flow (404.998 MGD) and the minor facilities account for 5% of the permitted as-built flow (20.3922 MGD). This does not include the Single-Family Domestic Wastewater Treatment systems (0.078305 MGD), discussed later in this section. More than one-third of the permitted as-built flow discharge is from facilities in the Haw River subbasin followed by the Upper Cape Fear River subbasin which accounted for nearly 25%. *Figure 3-1* displays a heat map of the permitted as-built flow and location of the major and minor facilities (*Figure 3-1* excludes single family systems).

Table 3-1: NPDES Wastewater Discharge Permitted Facilities in the Cape Fear River Basin

Permit Type[1]	Major	Minor	Permitted Facilities[1,2]	Permitted As-built Flow[1,3] (MGD)
Haw River HUC8 03030002				
Municipal Wastewater Discharge, < 1MGD	0	2	2	0.775
Municipal Wastewater Discharge, Large	9	0	9	140
Industrial Process & Commercial Wastewater Discharge	2	4	6	0.4612
Discharging 100% Domestic < 1MGD	0	24	24	1.266
Fish Farms, Packing and Rinsing Wastewater Discharge COC	0	1	1	0
Groundwater Remediation Discharge	0	2	2	0.2304
Groundwater Remediation Wastewater Discharge COC	0	8	8	0
Non-contact Cooling, Boiler Blowdown Wastewater Discharge COC	0	4	4	0
Water Plants and Water Conditioning Discharge	0	5	5	0
Water Treatment Plant Dischargers - Backwash Wastewater from Green Sand & Conventional Systems COC	0	4	4	4
Single Family Domestic Wastewater Discharge COC	0	209	209	0.060735
Total	**11**	**263**	**274**	**146.793335**
Deep River HUC8 03030003				
Municipal Wastewater Discharge, < 1MGD	0	3	3	1.18
Municipal Wastewater Discharge, Large	6	0	6	54.045
Industrial Process & Commercial Wastewater Discharge	0	10	10	1.01
Discharging 100% Domestic < 1MGD	0	13	13	0.2686

Permit Type[1]	Major	Minor	Permitted Facilities[1,2]	Permitted As-built Flow[1,3] (MGD)
Groundwater Remediation Wastewater Discharge COC	0	1	1	0
Non-contact Cooling, Boiler Blowdown Wastewater Discharge COC	0	2	2	0
Water Plants and Water Conditioning Discharge	0	2	2	0
Water Treatment Plant Dischargers - Backwash Wastewater from Green Sand & Conventional Systems COC	0	2	2	0
Single Family Domestic Wastewater Discharge COC	0	40	40	0.01595
Total	**6**	**73**	**79**	**56.51955**
Upper Cape Fear River HUC8 03030004				
Municipal Wastewater Discharge, < 1MGD	1	1	2	1.645
Municipal Wastewater Discharge, Large	9	0	9	100.75
Industrial Process & Commercial Wastewater Discharge	3	0	3	1.25
Discharging 100% Domestic < 1MGD	0	4	4	1.277
Non-contact Cooling, Boiler Blowdown Wastewater Discharge COC	0	3	3	0
Water Plants and Water Conditioning Discharge	0	4	4	0
Single Family Domestic Wastewater Discharge COC	0	3	3	0.00162
Total	**13**	**15**	**28**	**104.92362**
Lower Cape Fear River HUC8 03030005				
Municipal Wastewater Discharge, < 1MGD	0	3	3	1.06
Municipal Wastewater Discharge, Large	4	0	4	18.7
Industrial Process & Commercial Wastewater Discharge	8	6	14	58.19
Discharging 100% Domestic < 1MGD	0	5	5	0.485
Fish Farms, Packing and Rinsing Wastewater Discharge COC	0	1	1	0
Groundwater Remediation Discharge	0	1	1	0.36
Non-contact Cooling, Boiler Blowdown Wastewater Discharge COC	0	5	5	0
Water Plants and Water Conditioning Discharge	0	3	3	0
Water Treatment Plant Dischargers - Backwash Wastewater from Green Sand & Conventional Systems COC	0	2	2	0
Total	**12**	**26**	**38**	**78.795**
Black River HUC8 03030006				
Municipal Wastewater Discharge, < 1MGD	0	6	6	2.991

Permit Type[1]	Major	Minor	Permitted Facilities[1,2]	Permitted As-built Flow[1,3] (MGD)
Municipal Wastewater Discharge, Large	1	0	1	5
Industrial Process & Commercial Wastewater Discharge	0	1	1	0
Non-contact Cooling, Boiler Blowdown Wastewater Discharge COC	0	5	5	0
Water Treatment Plant Dischargers - Backwash Wastewater from Green Sand & Conventional Systems COC	0	1	1	0
Total	**1**	**13**	**14**	**7.991**
Northeast Cape Fear River HUC8 03030007				
Municipal Wastewater Discharge, < 1MGD	0	3	3	1.27
Municipal Wastewater Discharge, Large	3	0	3	20.61
Industrial Process & Commercial Wastewater Discharge	4	9	13	8.524
Discharging 100% Domestic < 1MGD	0	3	3	0.042
Fish Farms, Packing and Rinsing Wastewater Discharge COC	0	3	3	0
Groundwater Remediation Wastewater Discharge COC	0	1	1	0
Non-contact Cooling, Boiler Blowdown Wastewater Discharge COC	0	8	8	0
Water Plants and Water Conditioning Discharge	0	3	3	0
Total	**7**	**30**	**37**	**30.446**
Cape Fear River Basinwide Total				
Municipal Wastewater Discharge, < 1MGD	1	18	19	8.921
Municipal Wastewater Discharge, Large	32	0	32	339.105
Industrial Process & Commercial Wastewater Discharge	17	30	47	69.4352
Discharging 100% Domestic < 1MGD	0	49	49	3.3386
Fish Farms, Packing and Rinsing Wastewater Discharge COC	0	5	5	0
Groundwater Remediation Discharge	0	3	3	0.5904
Groundwater Remediation Wastewater Discharge COC	0	10	10	0
Non-contact Cooling, Boiler Blowdown Wastewater Discharge COC	0	27	27	0
Water Plants and Water Conditioning Discharge	0	17	17	0
Water Treatment Plant Dischargers - Backwash Wastewater from Green Sand & Conventional Systems COC	0	9	9	4
Single Family Domestic Wastewater Discharge COC	0	252	252	0.078305
Basinwide Total	**50**	**420**	**470**	**425.468505**

Permit Type[1]	Major	Minor	Permitted Facilities[1,2]	Permitted As-built Flow[1,3] (MGD)

[1]Active and expired permitted facilities and associated permit data were queried from the NC DWR Basinwide Information Management System (BIMS) in May 2022. Expired permits remain in effect until a renewed permit is issued by DWR.

[2] Permitted facility summary information is based on the number of facilities and as-built flow totals that discharge to the Cape Fear River Basin, two facilities (NC0078344 and NCG590020) included in the tally discharge to the Lower Cape Fear subbasin but are located in the adjacent Lumber River Basin, one facility (NC0088692) was excluded which is located in the Haw River subbasin and discharges to the Roanoke River Basin.

[3]The permitted as-built flow subbasin totals are based on the location of the facility with the exception of NC0078344, NCG590020 and NC0088692. All facilities with a permitted as-built discharge have a single total limit for the entire facility even if there are multiple outfalls, however facilities have outfalls located in two different HUC8 subbasins. One facility (NC0082295) is located in the Northeast subbasin and discharges 0.834 MGD to the Lower Cape Fear subbasin, for this analysis the 0.834 MGD is included in the Northeast Cape Fear Total.

Single-family domestic wastewater systems are installed when soil types preclude the installation of traditional septic systems. These systems require a general permit (NCG550000) from NPDES for discharge of less than 1,000 gallons per day (GDP) of treated domestic wastewater to surface waters. For systems with a discharge greater than 3,000 GDP, system layout, plans and specifications must be reviewed and approved by the state. Guidance for determining the minimum design daily flow for domestic sewage is provided in administrative code (15A NCAC 18A .1949). Effluent limits must be met as part of the permit, and monitoring is required on an annual basis. Additional provisions may also be included in the permit as needed.

The maintenance (and cost) of these systems is different than an onsite wastewater septic system and property owners may need to be educated on the associated costs and care for these treatment systems. Because ownership changes constantly, some property owners may not even be aware that they have a permitted NPDES effluent discharge on their property. Currently, North Carolina real estate disclosure forms do not have a check box option for single-family domestic wastewater treatment systems; however, septic systems are disclosed. When homes are sold, information about the treatment system is not always conveyed. For NCG550000 general permit operation and maintenance information see the October 2020 DEQ technical bulletin and the NPDES general permits website. Because of their potential to impact water quality, *DWR recommends homeowner education on how to properly maintain and operate single-family wastewater treatment systems to reduce their impact on water quality*.

There are many NPDES point-source discharge Single-Family Domestic Wastewater Treatment systems concentrated in the lower part of the Haw River and eastern part of the Deep River subbasins, near Jordan Lake in Chatham, Durham, and Orange counties (*Table 3-2* and *Figure 3-2*). This part of the Piedmont is where the Triassic Basin Level IV and Carolina Slate Belt ecoregions are located. The geology and soils of the Triassic basins of North Carolina present significant difficulties to residents who do not have access to a public water supply and sewage system. Water well yields are typically very low. At many Triassic sites, the soil does not perform adequately during percolation tests for septic drain fields. In 2022, these single-family systems accounted for just a fraction of a percent of the overall permitted as-built in the Cape Fear

River Basin at 78,305 GPD (0.078305 MGD). More information for homeowners on how to address these issues can be found on DEQ's website here.

Table 3-2: Single Family Domestic Wastewater Treatment System in the Cape Fear River Basin

County	Permitted Facilities[1]	Permitted As-built Flow (GDP)[1]
Haw River HUC 03030002		
Alamance	10	3,260
Chatham	65	17,375
Durham	47	11,010
Forsyth	1	450
Orange	84	28,160
Wake	2	480
Haw River - Total	**209**	**60,735**
Deep River HUC 03030003		
Chatham	30	12,230
Forsyth	3	1,170
Lee	3	840
Randolph	4	1,710
Deep River - Total	**40**	**15,950**
Upper Cape Fear River 03030004		
Chatham	1	720
Lee	1	450
Wake	1	450
Upper Cape Fear River - Total	**3**	**1,620**
Cape Fear River Basinwide Total		
Basinwide Total	**252**	**78,305**

[1]Active and expired Single Family Domestic Treatment Systems permit data was queried from the NC DWR Basinwide Management Systems (BIMS) in May 2022. Expired permits remain in effect until a renewed permit is issued by DWR.

Figure 3-1: Permitted Major and Minor NPDES Discharge Facilities and As-built

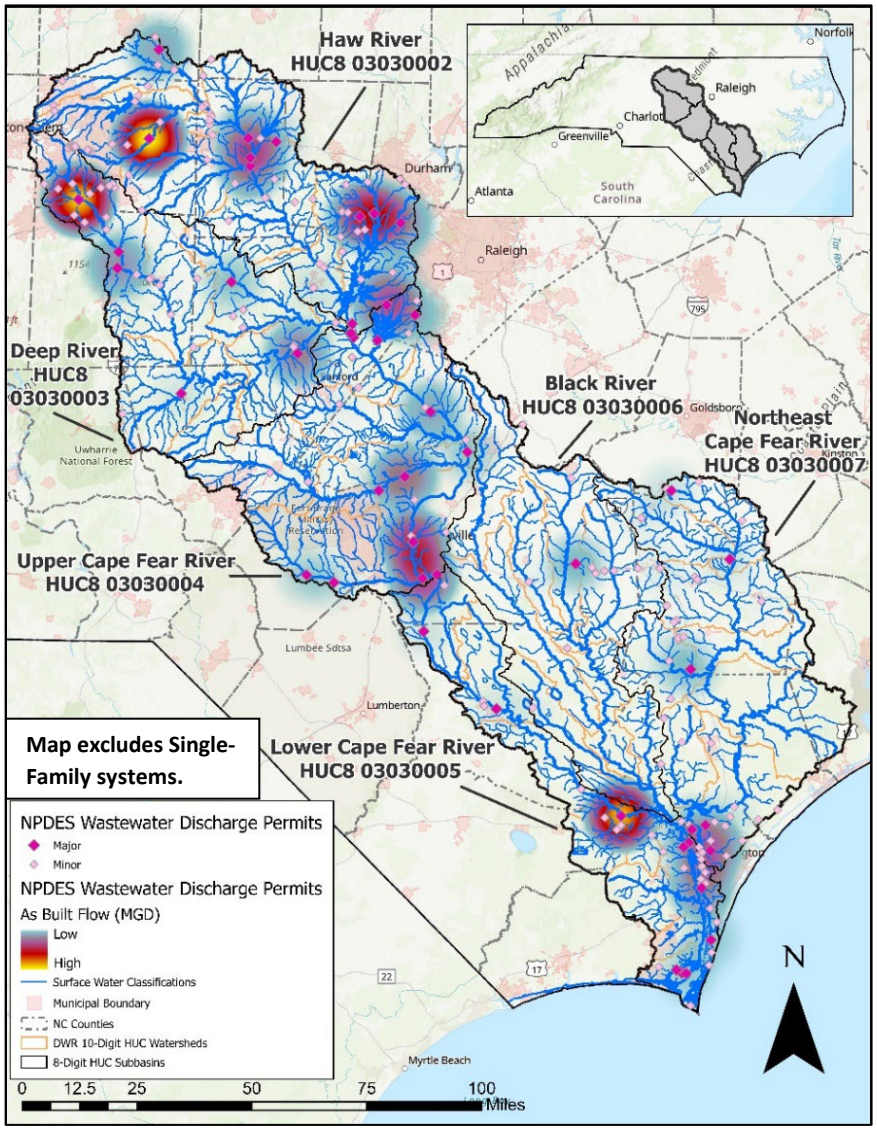
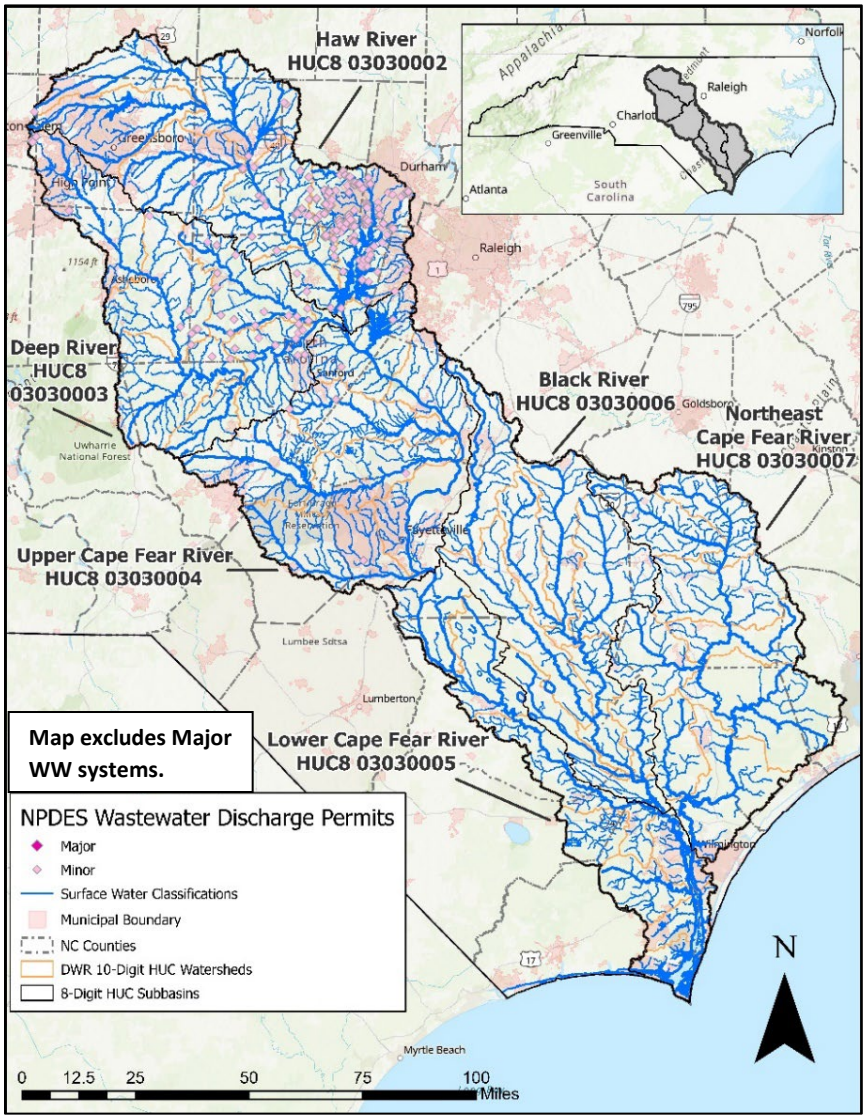


Figure 3-2: Permitted Single Family Domestic Wastewater Treatment Systems



1.2.2 Non-Discharge and Land Application of Residual Solids Permitting

The Non-Discharge Branch (NDB) is responsible for the permitting of facilities that land apply residuals, reclaimed water and wastewater effluent. Residuals, often referred to as biosolids, treated sludge or sewage sludge, are generated during wastewater treatment, water treatment, and air pollution control measures. The program has operational and monitoring requirements similar to those of the NPDES wastewater program; however, the primary difference is that the treated effluent is not discharged to surface waters. Instead, it is applied to the land. Non-discharge wastewater disposal options include irrigation (spray or drip), high-rate infiltration, low-rate infiltration and evaporative systems. Non-discharge residual disposal includes dedicated and non-dedicated residual disposal sites, and agricultural land for crops not consumed by humans. Residuals are also available to the public as fertilizer for home use. During the application process, steps must be taken to assure that residuals are applied at, or below, agronomic rates based on the soil and crop type. If the application is over agronomic rates, the residuals must be taken to a dedicated residual disposal site or landfill. There are 165 permitted non-discharge and residual solids land application permits issued in the Cape Fear River Basin (*Table 3-3*, *Figure 3-3* and *Figure 3-4*), excluding Single Family Residence Wastewater discussed later in this section. A complete list of non-discharge and residual solid land application permits can be found in the Appendix.

It is important to note that there is a direct connection between groundwater and surface water in many places. Non-discharge systems work well when the site is conducive to infiltration. However, problems can arise when the site is a low-lying area with a high groundwater table (thereby inhibiting infiltration), or with nearby wetlands or ditches that can act as a ready conduit for runoff. Most non-discharge wastewater irrigation sites (excluding single-family) have lagoons, which start the treatment process and allows the wastewater to be held until conditions are appropriate to spray. If the water table is high in an application field, water level meters are installed to prevent irrigation until there is a certain vertical separation between the land surface and the water table. Runoff is a potential concern at any irrigation site, but it can be prevented with proper hydraulic loading (water balance), buffering and storage. All the facilities in the Cape Fear River Basin have the potential to cause impacts to surface water or groundwater. *More research needs to be conducted to better establish and understand the relationship between groundwater and surface water in the Cape Fear River Basin.* Such understanding would enable the state to make sound permitting judgments and recommendations to better protect groundwater and surface water quality.

Table 3-3: Permitted Non-Discharge and Residual Land Application Facilities and Fields in the Cape Fear River Basin

Permit Type	Major	Minor	Permitted Facilities[1]	Permitted Field Number[1,2]	Permitted Field Acreage[1,2]
Haw River HUC8 03030002					
Closed-Loop Recycle	0	3	3	0	0.00
Distribution of Residual Solids (503 Exempt)	0	1	1	0	0.00
Distribution of Residual Solids (503)	2	1	3	0	0.00
Land Application of Residual Solids (503 Exempt)	0	0	0	1	12.70
Land Application of Residual Solids (503)	3	2	5	322	4,885.43
Other Non-Discharge Wastewater	0	1	1	0	0.00
Primary Residences Sharing a Common Sewer Line with an ADU/ARB COC	0	2	2	0	0.00
Reclaimed Water	12	4	16	276	1,173.65
Reclaimed Water Distribution	0	2	2	0	0.00
Single-Family Residence Wastewater Irrigation	0	222	222	223	69.96
Wastewater Irrigation	4	17	21	72	146.56
Haw River - Total	**21**	**255**	**276**	**894**	**6,288.3**
Deep River HUC8 03030003					
Distribution of Residual Solids (503 Exempt)	0	1	1	1	10.80
Land Application of Residual Solids (503 Exempt)	0	1	1	15	38.60
Land Application of Residual Solids (503)	4	1	5	222	3,973.64
Reclaimed Water	0	2	2	2	57.47
Single-Family Residence Wastewater Irrigation	0	18	18	18	6.33
Surface Disposal of Residual Solids (503)	0	1	1	0	0.00
Wastewater Irrigation	8	8	16	76	362.22
Deep River - Total	**12**	**32**	**44**	**334**	**4,449.06**
Upper Cape Fear River HUC8 03030004					
Closed-Loop Recycle	0	2	2	0	0.00
Distribution of Residual Solids (503 Exempt)	0	1	1	0	0.00
Land Application of Residual Solids (503 Exempt)	0	0	0	1	112.60
Land Application of Residual Solids (503)	2	2	4	82	1,618.65
Reclaimed Water	5	0	5	4	98.65
Reclaimed Water Distribution	0	4	4	0	0.00
Single-Family Residence Wastewater Irrigation	0	10	10	10	3.42
Wastewater Irrigation	1	3	4	4	11.66

Permit Type	Major	Minor	Permitted Facilities[1]	Permitted Field Number[1,2]	Permitted Field Acreage[1,2]
Upper Cape Fear River - Total	**8**	**22**	**30**	**101**	**1,844.98**
Lower Cape Fear River HUC8 03030005					
Closed-Loop Recycle	0	5	5	0	0.00
Distribution of Residual Solids (503 Exempt)	1	0	1	0	0.00
Distribution of Residual Solids (503)	1	0	1	0	0.00
High-Rate Infiltration	2	0	2	47	349.50
Land Application of Residual Solids (503 Exempt)	0	1	1	26	663.09
Land Application of Residual Solids (503)	1	1	2	45	970.05
Other Non-Discharge Wastewater	0	0	0	3	48.00
Reclaimed Water	2	0	2	17	28.03
Reclaimed Water Distribution	0	1	1	0	0.00
Single-Family Residence Wastewater Irrigation	0	1	1	1	0.13
Surface Disposal of Residual Solids (503 Exempt)	0	1	1	0	0.00
Wastewater Irrigation	1	0	1	6	22.42
Lower Cape Fear River - Total	**8**	**10**	**18**	**145**	**2,081.22**
Black River HUC8 03030006					
Distribution of Residual Solids (503 Exempt)	0	1	1	0	0.00
Distribution of Residual Solids (503)	1	0	1	0	0.00
Land Application of Residual Solids (503 Exempt)	1	1	2	6	386.57
Land Application of Residual Solids (503)	2	2	4	71	2,563.71
Wastewater Irrigation	10	4	14	101	436.82
Black River - Total	**14**	**8**	**22**	**178**	**3,387.1**
Northeast Cape Fear River HUC8 03030007					
Closed-Loop Recycle	0	1	1	0	0.00
Distribution of Residual Solids (503 Exempt)	1	0	1	0	0.00
High-Rate Infiltration	2	0	2	6	3.06
Land Application of Residual Solids (503 Exempt)	1	1	2	17	308.50
Land Application of Residual Solids (503)	1	1	2	62	2,088.45
Reclaimed Water	4	0	4	31	254.20
Surface Disposal of Residual Solids (503 Exempt)	1	0	1	0	0.00
Wastewater Irrigation	6	7	13	112	1,066.50
Northeast Cape Fear River - Total	**16**	**10**	**26**	**228**	**3,720.71**
Cape Fear River Basinwide					

Permit Type	Major	Minor	Permitted Facilities[1]	Permitted Field Number[1,2]	Permitted Field Acreage[1,2]
Closed-Loop Recycle	0	11	11	0	0.00
Distribution of Residual Solids (503 Exempt)	2	4	6	1	10.80
Distribution of Residual Solids (503)	4	1	5	0	0.00
High-Rate Infiltration	5	-1	4	53	352.56
Land Application of Residual Solids (503 Exempt)	4	2	6	66	1,522.06
Land Application of Residual Solids (503)	17	5	22	804	16,099.93
Other Non-Discharge Wastewater	0	1	1	3	48.00
Primary Residences Sharing a Common Sewer Line with an ADU/ARB COC	0	2	2	0	0.00
Reclaimed Water	24	5	29	330	1,612.00
Reclaimed Water Distribution	0	7	7	0	0.00
Single-Family Residence Wastewater Irrigation	0	251	251	252	79.84
Surface Disposal of Residual Solids (503 Exempt)	0	2	2	0	0.00
Surface Disposal of Residual Solids (503)	1	0	1	0	0.00
Wastewater Irrigation	31	38	69	371	2,046.18
Basinwide Total	**88**	**328**	**416**	**1,880**	**21,771.37**

[1]Active and expired permitted facilities and associated fields were queried from the NC DWR Basinwide Information Management System (BIMS) in May 2022. Expired permits remain in effect until a renewed permit is issued by DWR..
[2]Some permitted fields are associated with facilities located outside of the Cape Fear River Basin.

There are many Single-Family Residence Wastewater Facilities in the lower part of the Haw near Jordan Lake, where the Triassic Basin Level IV ecoregion is located. The geology and soils of the Triassic basins of North Carolina present significant difficulties to residents who do not have access to a public water supply and sewage system. The distribution and concentration of nonpoint discharge Single-Family Residence Wastewater Irrigation Systems in the Cape Fear River Basin is similar to the distribution and concentration of Single-Family Domestic Wastewater Systems described in the previous section. Many single-family homes have non-discharge wastewater systems rather than a septic tank in the lower half of the Haw River subbasin, particularly near Lake Jordan in the Triassic Basin Level IV ecoregion in Chatham County. Several other homes have non-discharge wastewater systems in the upper part of the Haw River and eastern side of the Deep River subbasins (*Table 3-4*, *Figure 3-5* and *Figure 3-6*) (See Section 3.2.1).

Figure 3-3: Non-Discharge and Residual Solids Land Application Facilities

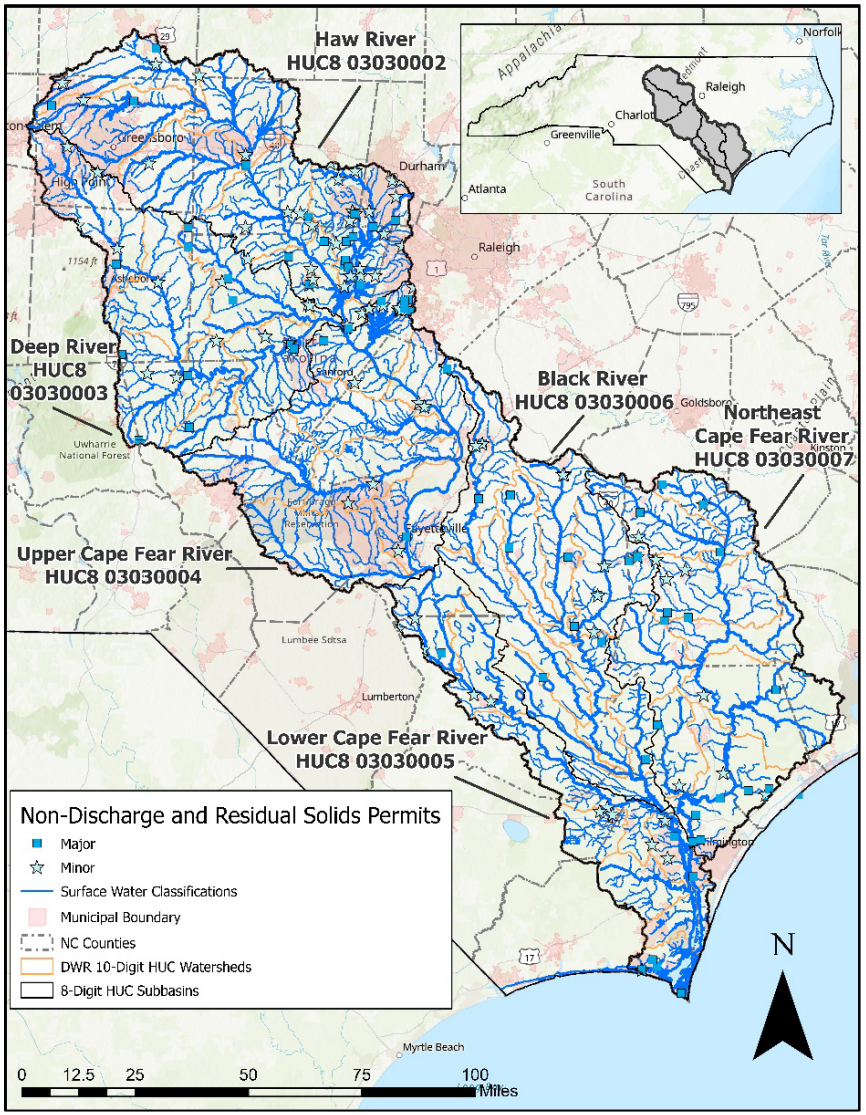


Figure 3-4: Non-Discharge and Residual Solids Land Application Fields

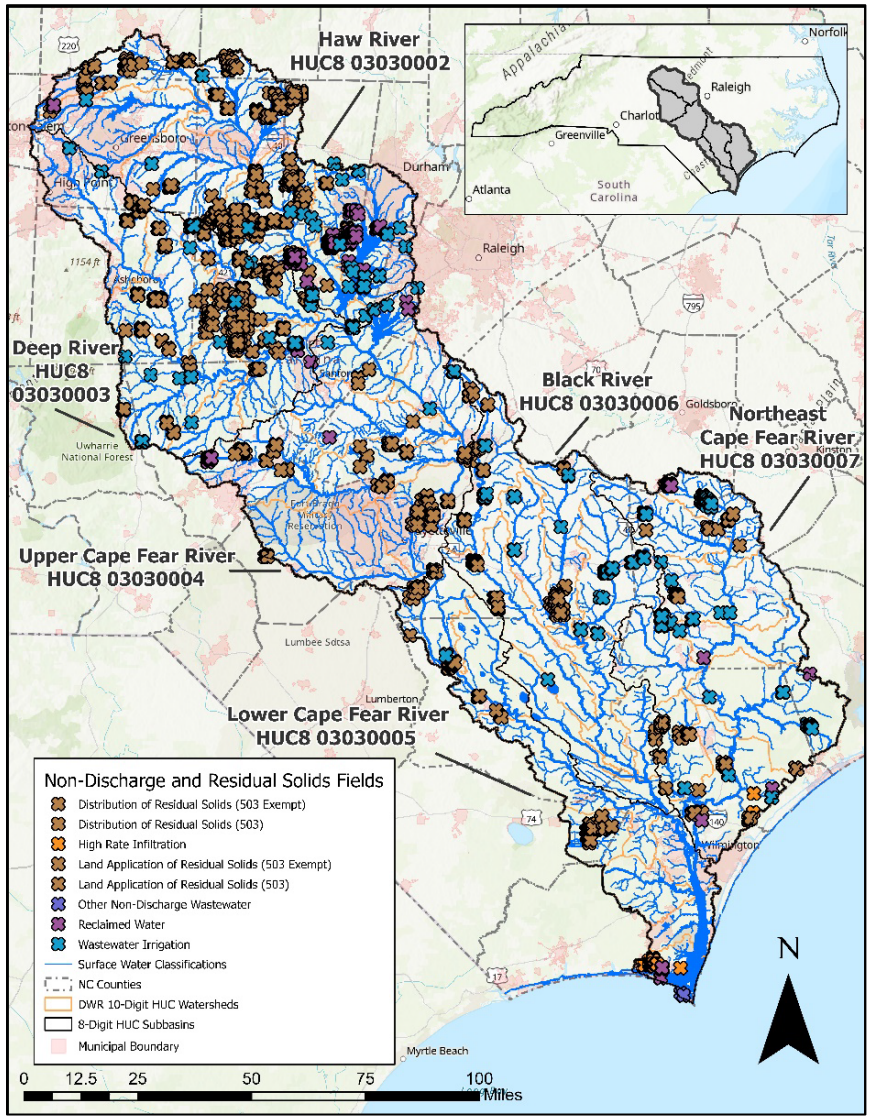


Table 3-4: Single Family Residence Wastewater Irrigation in the Cape Fear River Basin

County	Permitted Field Number	Permitted Field Acreage
Haw River HUC 03030002		
Alamance	27	6.13
Caswell	3	0.95
Chatham	137	45.59
Durham	14	4.56
Guilford	1	0.24
Orange	21	6.85
Wake	20	5.64
Har River - Total	**223**	**69.96**
Deep River HUC 03030003		
Chatham	16	5.5
Randolph	2	0.83
Deep River - Total	**18**	**6.33**
Upper Cape Fear River 03030004		
Chatham	1	0.25
Lee	2	0.59
Moore	1	0.23
Wake	6	2.35
Upper Cape Fear River - Total	**10**	**3.42**
Lower Cape Fear River 03030005		
Brunswick	1	0.13
Lower Cape Fear River - Total	**1**	**0.13**
Cape Fear River Basinwide Total		
Basinwide Total	**252**	**79.84**

[1]Active and expired Single-Family Residence Wastewater Irrigation Systems permit data was queried from the NC DWR Basinwide Information Management System (BIMS) in May 2022. Expired permits remain in effect until a renewed permit is issued by DWR.

Figure 3-5: Non-Discharge Single Family Residence Wastewater Irrigation Permits

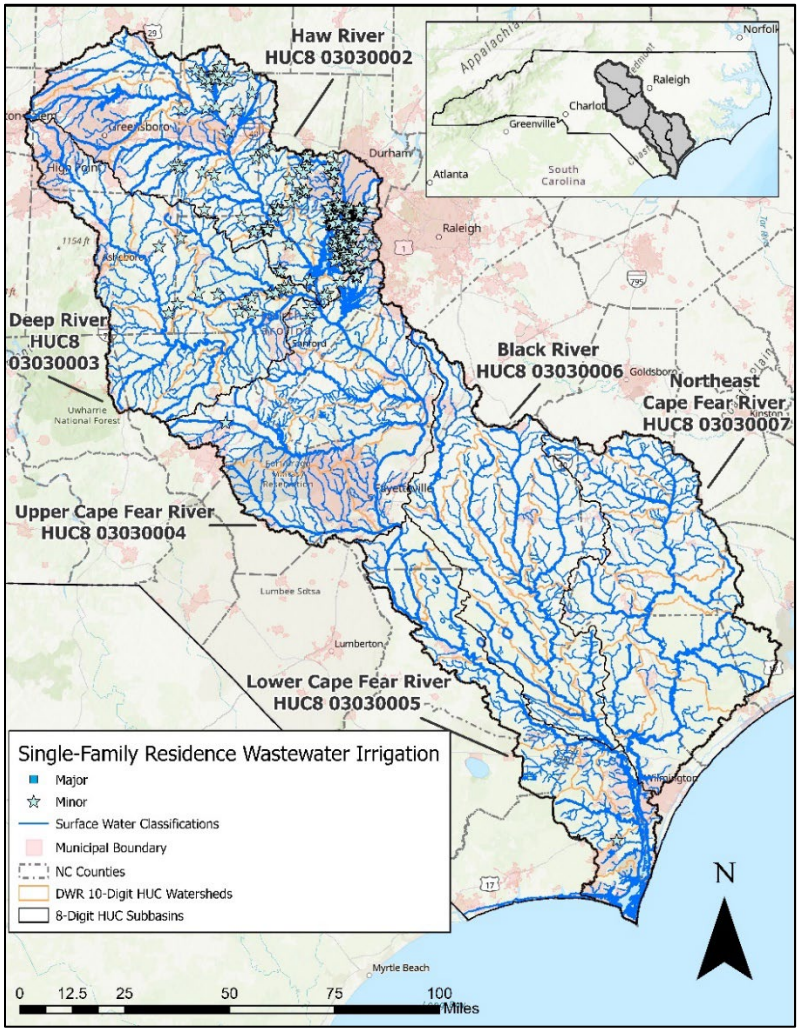
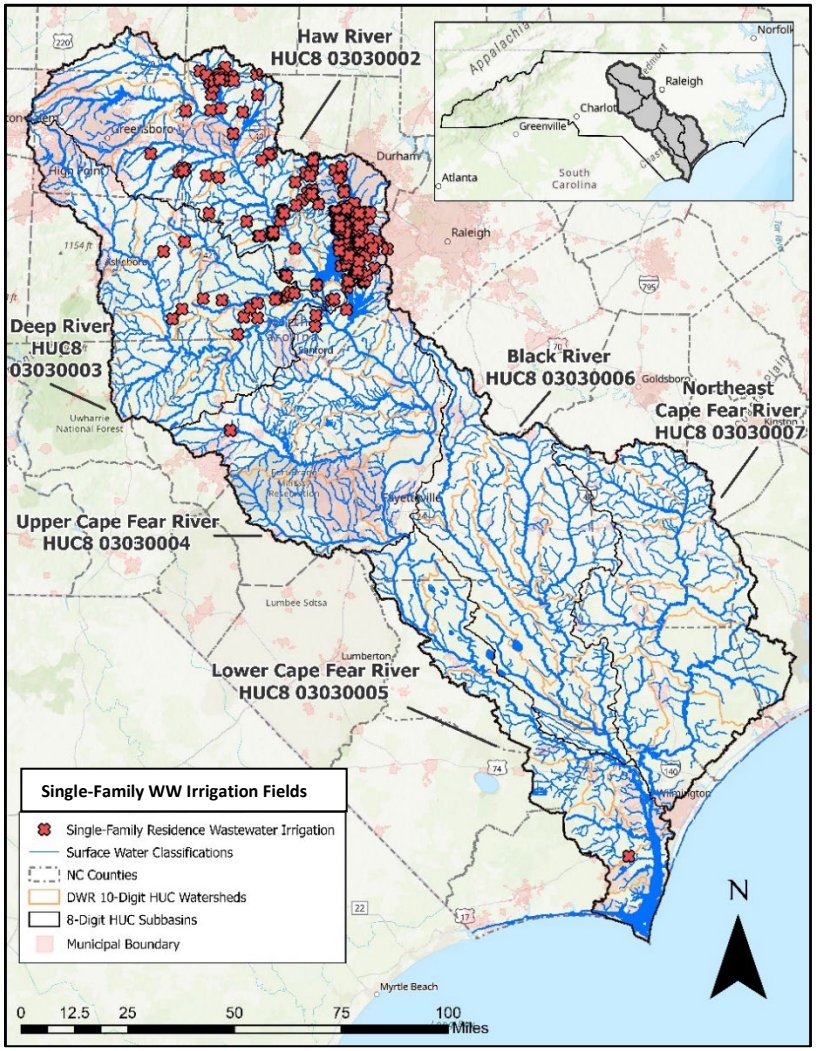


Figure 3-6: Non-Discharge Single Family Residence Wastewater Irrigation Fields



1.2.3 On-Site Wastewater Treatment Systems (Septic Systems)

On-site wastewater treatment systems are the primary means for wastewater treatment and disposal for almost 50% of North Carolinians. Instead of being sent to a wastewater treatment facility, wastewater effluent from many households is treated on-site using a subsurface wastewater treatment system, more commonly referred to as a septic system. Aging, poorly planned and/or maintained septic systems can fail and contribute to nonpoint source pollution. Wastewater from failing septic systems can contaminate groundwater and surface water. Failing septic systems can also pose a health hazard and may be considered illegal discharges when surface water is impacted.

On-site wastewater systems discharging to subsurface in North Carolina fall under the regulatory jurisdiction of the North Carolina Department of Health and Humans Services (NCDHHS) under rules adopted by the Commission for Public Health (CPH). The rules for on-site wastewater systems are administered by local health departments throughout the state, under the supervision of the On-Site Water Protection (OSWP) Branch in NCDHHS's Division of Public Health (DPH). The OSWP Branch is responsible for providing regulatory oversight and consultative services for sub-surface on-site wastewater and dispersal systems to local health departments, builders, developers, homeowners, system installers, well drillers, system operators, engineers, soil scientists, geologists and environmental health consultants. The Non-Point Source (NPS) Pollution Management Program in the OSWP Branch identifies ways to reduce or remove septic system-derived potential NPS pollution through the best management practices (BMPs) and education and outreach programs to ensure an on-site system is functioning properly.

For all septic systems discharging to subsurface that generate domestic to high-strength effluent with a daily design flow greater than 3,000 gallons per day (GPD) or any system serving a facility classified as an industrial process wastewater generator system layout, plans and specifications must be reviewed and approved by the state. Guidance for determining the minimum design daily flow for domestic sewage is provided in administrative code (15A NCAC 18A .1949). Information about the proper installation and maintenance of septic systems can be obtained by contacting OSWP Branch or county health departments. The OSWP Branch also has a Non-Point Source (NPS) Pollution Management Program that identifies potential NPS pollution from on-site systems as well as best management practices to ensure an on-site system is functioning properly. The program also has county statistics on the number of households using septic systems.

In order to protect human health and maintain water quality, failing septic systems should be repaired, older systems must be updated to meet current standard and straight pipes must be eliminated. Additional monitoring of targeted contaminants (e.g., fecal coliform, nitrate-nitrogen, phosphorus) throughout tributary watersheds will aid in identifying where straight pipes and failing septic systems are problems. County, town and city planners need to understand the economic and human health ramifications caused by improperly functioning septic systems and plan for long-term septic system sustainability. In areas where soils may prevent individual septic systems, a collective community septic system may allow for sustainable development where a centralized sewer system is not available.

Local health departments are responsible for ensuring that septic systems are properly sited, constructed, installed and maintained and for some sites that an adequate repair area is available. Local health departments in this watershed may also be responsible for septic systems inspection. Systems classified as Type I or Type II do not require inspection by local health departments (15A NCAC 18A .1961). For information on maintaining septic systems, see the DHHS Non-Point Source Pollution Program: System Management for Pollution Prevention website (https://ehs.dph.ncdhhs.gov/oswp/nps/prevention.htm).

1.2.4 Watershed Permitting Strategies

Many watersheds across NC are facing increasing pressures from population growth and land use changes, leading to impacts on both water quality and quantity. It is essential that DWR leverage all available tools—including the development of comprehensive watershed permitting strategies—to safeguard surface and groundwater resources. Doing so will help ensure that economic development remains sustainable while protecting these vital resources for both current and future uses.

Excess amounts of nutrients like nitrogen and phosphorus may cause problems throughout waters of the State, including low oxygen levels, extensive fish kills and harmful algal blooms. While the Division has developed nutrient management strategies in various specific waterbodies to regulate sources of nutrient pollution, baseline levels of nitrogen and phosphorous will continue to increase in other watersheds as point source dischargers continue to expand in response to population growth. To mitigate the increasing nutrient burden on these waterbodies, it is *recommended that technology-based design requirements be implemented through the NPDES program for new or expanding wastewater facilities.* Such technology-based design requirements would not supersede any other existing water quality-based requirements (e.g. TMDLs, nutrient management rules) or need for protection of downstream waterbodies where the technology-based design requirements would be insufficient to protect the waterbody's designated use.

This effort would allow for the sustainable long term growth without overburdening the resource and restricting uses in the future. Similar efforts are needed to address nonpoint source nutrients which contribute to the increasing nutrient burdens being experienced throughout many of our waterbodies. Strategic, forward-looking policy decisions made now will reduce long-term costs, protect public health, and preserve NC's natural assets and environmental resiliency.

Due to the complex nature of the Cape Fear River system and its estuary, water quality management must address both point and nonpoint sources beyond the direct receiving waterbody segment. *Permitted impact assessments should cover a sufficient downstream distance to account for potential impacts from new or expanding dischargers.* This distance typically extends to a natural or man-made feature that slows water flow, such as a dam, lake, or estuary. A comprehensive, basin-scale evaluation of water quality conditions is critical to inform permit decisions and ensure the protection of downstream uses and resources.

1.2.4.1 Cape Fear River Basin Plan Permitting Strategy History

Since 1983, North Carolina has used a river basinwide watershed-based approach for protecting and evaluating water quality. In an effort to improve efficiency, increase effectiveness and consistency, this approach includes addressing various discharge permits, modeling, evaluating wasteload allocations, conducting nonpoint source assessments, performing special intensive studies and routine monitoring on a river basin scale. The requirement to produce basinwide water resource plans was officially written into General Statute in 1997 under Session Law 1997-458.

The first two Cape Fear River Basin plans (1996 and 2000) focused mainly on the need to address oxygen-consuming wastewater throughout the basin. QUAL2E models were developed which confirmed the assimilative capacity had been reached or exceeded throughout much of the basin. Some areas were identified as needing discharge limits for existing dischargers and established a set of limits for new or expanding facilities. The 1996 plan recommended that a nutrient fate and transport model be developed for the Jordan Lake watershed to better identify point and nonpoint source impacts and to evaluate the NSW strategy. The 2000 basin plan discussed the development of a dynamic water quality model for the Cape Fear River estuary including portions of the Black and Northeast Cape Fear rivers. The model would be used as a tool for assessing the assimilative capacity for oxygen-consuming waste in the Cape Fear River Estuary.

In July 1998, the Middle Cape Fear Basin Association (MCFBA) began monitoring the central portion of the Cape Fear River from the confluence of the Haw and Deep rivers to Lock & Dam #1 near Wilmington. The increased instream water quality monitoring allowed for higher resolution and greater understanding of the instream water quality conditions along the mainstem Cape Fear River. However, chlorophyll *a* samples are only collected at 12 stations throughout the entire basin. (This does not include lakes assessments. A map of 2022 IR stations and percent exceedances for chlorophyll *a* can be found in chapter 2, section 2.5.8).

The mainstem Cape Fear River has a long history of algal blooms. The 2000 basin plan recognized that algal productivity influences dissolved oxygen (DO) dynamics in the Cape Fear River. Algal blooms were reported in the Cape Fear River during a severe drought in 2002. The data used for the 2005 basin plan (9/1/1998 to 8/31/2003) showed that algal blooms were forming in the surface waters during the critical summer growing period. The 2005 basin plan reported elevated chlorophyll *a* concentrations in the mainstem Cape Fear River from the confluence with the Haw and Deep rivers downstream to NC 42 (24% of samples exceeding the water quality standard), from Grays Creek to Lock & Dam #3 (27% exceedance), and from Lock & Dam #3 to NC 41 (57% exceedance). This resulted in several large segments of the Cape Fear River being added to the 2006 303(d) list. The lower segment was classified as not rated (NR) due to an insufficient number of samples collected to assign a use support rating.

As result of the 2005 water quality assessment where chlorophyll *a* was identified as an impairment and data showed that algal productivity influences the DO dynamics in the river, a nutrient related NPDES strategy was put in place to prevent the continued decline of instream water quality conditions. The strategy was included in the plan and noted that no additional total nitrogen (TN) or total phosphorus (TP) mass load were to be permitted upstream of Buckhorn Dam, below Carbonton Dam on the Deep River

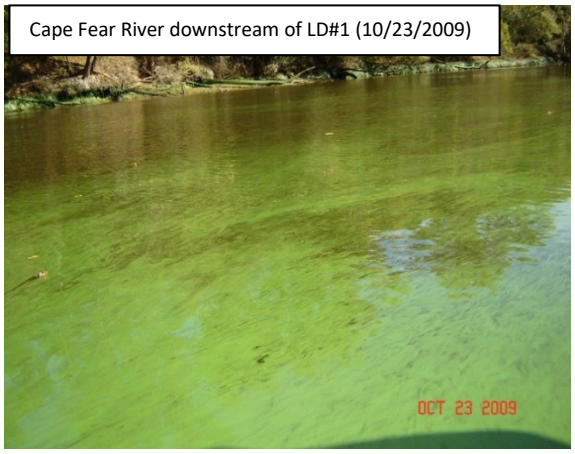
and below Jordan Dam on the Haw River. The strategy for the Cape Fear River from Buckhorn Dam to Lock & Dam #3 included freezing mass TN and TP loading for expanding dischargers and calculating seasonal summer mass nutrient loads for new dischargers. In 2006, the permitting strategy was modified to include wastewater effluent monitoring requirements to assist DWR with watershed model development and a potential total maximum daily load (TMDL), or management strategy, to address the impairments. Since 2005 basin plan, Carbonton Dam was removed to address low DO issues, but additional chlorophyll *a* impairments and periphyton issues have been identified further upstream in the Deep and Rocky rivers.

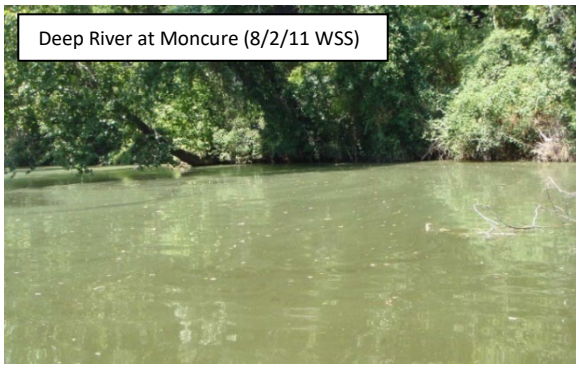
Algal growth continued to be a concern, especially in 2009 when a systemwide blue-green algal/ cyanobacteria bloom started in June and persisted well into November. The Cape Fear River system was responding to a persistent drought, low stream flow rates, increased instream clarity and nutrient enrichment, resulting in blooms which covered parts of the river from above Buckhorn Dam downstream below Riegelwood. At one point the bloom covered a 75-mile stretch of the river. The 2009 surface blue-green algal bloom was dominated by *Microcystis aeruginosa* and was found to produce the cyanotoxin Microcystis (DHHS public health advisory and Isaacs et al., 2014). Long-term drought conditions persisted along with algal blooms throughout much of the river through 2012 (*Figure 3-7*).

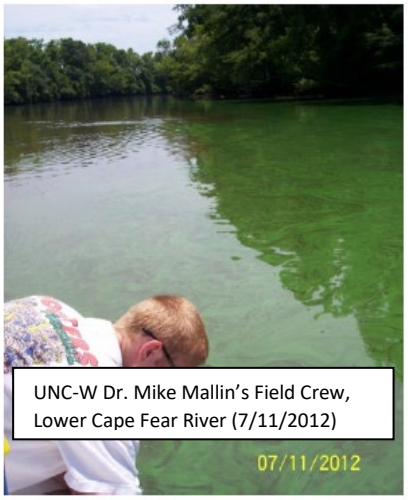
As a result of the consistent extreme blooms experienced at the time, DWR identified the need to modify the permitting strategy in the central portion of the Cape Fear River Basin to address NPDES permitting needs and to address the concern of nutrient enrichment driving algal bloom formations. In 2011, DWR's NPDES Permitting Branch, Modeling & Assessment Branch, Basin Planning Branch, and the Raleigh Regional Office (RRO) identified how best to address nutrient loading for expanding and new dischargers. It was recommended at that time there be no net increase in nitrogen and phosphorus loading in the central portion of the Cape Fear River above Buckhorn Dam and that a calibrated nutrient response model be required as part of an expansion and/or new discharge between Buckhorn and Lock and Dam #1. In addition, it was recommended that a re-opener clause be added to the permits. The re-opener clause read, "Pursuant to NC General Statute 143-215.1, the implementing rules found in Title 15A of the NC Administrative Code, Subchapters 2B and 2H, specifically 15A NCAC 02B .0505 and 15A NCAC 02H .0112(b)(1), and Part II, Section B, Condition 13 of this permit, the Director may reopen this permit to require supplemental monitoring of the Permittee's effluent discharge. The additional monitoring is necessary to support water quality modeling efforts within the Cape Fear River Basin and shall be consistent with a monitoring plan developed jointly by the Division [DWR] and affected stakeholders."

Coincidentally, in 2009, DWR also tried to establish a statewide chlorophyll *a* threshold rule and an associated management strategy as a proactive approach to address nutrient enriched waterbodies throughout the state. When proposed, this approach was not approved by the Environmental Management Commission (EMC), and as result DWR worked with EPA to develop an approved Nutrient Criteria Development Plan (NCDP) to fulfill the EPA requirement that all states adopt instream nutrient criteria. Due to the ongoing concern with nutrient over-enrichment and the severity of the algal blooms and downstream DO concerns in the estuary, the central portion of Cape Fear River Basin was chosen as the pilot waterbody for the development of instream nitrogen and/or phosphorus criteria to protect designated uses (see Chapter 2.14 for more information on NCDP in the central Cape Fear River).

Figure 3-7: Photographic Documentation of Severe Cape Fear River Basin Algal Blooms Between 2009-2012.







The need to understand what instream nutrient (N and P) concentrations can be assimilated in the central portion of the Cape Fear River Basin while being protective of all uses is critical for NPDES permitting needs and to support the NCDP process. DWR initiated a two year special study (2019-2020) to support the development of a watershed and receiving water models (calibrated nutrient response model). The wastewater dischargers collected additional effluent data, and the discharge monitoring coalition assisted with collecting additional instream water quality data. Great efforts were taken by both the coalition and DWR to prioritize this monitoring efforts in the midst of the COVID-19 pandemic. EPA Region IV's modeling team is collaborating with DWR's modeling staff to develop both models. These models will support permitting in the basin, inform the development of management strategies, provide information on conditions associated with algal bloom frequency and duration and provide information on the sources of nutrients and BOD-loading to the lower Cape Fear River. The model development should be completed in the near future. As of August 2025, EPA is still committed to completing these models. The need to reduce nitrogen and/or phosphorus loads will likely be necessary for dischargers in the near future. Until an EPA-approved TMDL or watershed nutrient management strategy is completed, DWR will continue to implement the central Cape Fear River watershed NPDES permitting procedure described in the section below. *It is recommended that dischargers work together to provide for wastewater capacity in this region with the understanding that this segment is likely over allocated and point and nonpoint source reductions may be needed to protect all instream and downstream uses.*

The current water quality conditions and the history behind the need for many of these permitting strategies and procedures are in the subbasin watershed chapters. A history of algal productivity and chlorophyll *a* concerns in the central Cape Fear River is located in Chapter 2, Water Quality Assessment and Monitoring in sections 2.5.8 and 2.7 and in each of the watershed chapters.

1.2.4.2 NPDES Permitting Procedures for Cape Fear River Basin Subwatersheds

Almost 60% of the waterways in the Cape Fear River Basin, excluding the Black River and Northeast Cape Fear River subbasins and the lower Cape Fear River Estuary, are classified as water supply waters or drain to water supply waters. The protection of these water supplies is vital for the health and safety of all users. They also support economic development in areas of the state that are growing rapidly. Across the Cape Fear River Basin, it is estimated that in 2020 more than 1.3 million people receive drinking water from public water supply (PWS) systems using surface water sources. This is based on proportioned service areas of PWS systems that submit local water supply plans (LWSP) (see Chapter 5 for more details). The most downstream of these PWS systems (Lower Cape Fear Water and Sewer Authority and Cape Fear Public Utility Authority) have water supply intakes behind USACE's Lock & Dam #1 near East Arcadia. Eight miles downstream at Riegelwood, International Paper has the last water supply intake on the mainstem Cape Fear River for a non-transient/non-community PWS system.

Measures to protect these critical surface water supplies include point source strategies to reduce nutrients which result in algal blooms that lead to taste and odor issues in drinking water sources. Cyanotoxins from harmful algal blooms (HABs) are also a concern that can impact drinking water and recreational uses. Strategies are also in place to protect shellfish harvesting waters (SA), fishing primary nursery areas (PNAs) and a coastal no discharge zone (NDZ). Point source strategies are also being

developed to address emerging contaminants to protect downstream drinking water users in the basin and statewide since emerging contaminants are being detected across the entire state.

As stated above, as of 2022 there are 218 NPDES wastewater permitted facilities that discharge to waterways in the Cape Fear River Basin, including 50 major (>1 MGD) and 168 minor facilities. The major facilities account for 95% of the permitted as-built flow (404.998 MGD) and the minor facilities account for 5% (20.3922 MGD). Single-Family Domestic Wastewater Treatment systems/permits (0.078305 MGD) are not included in this number. More than 33% of the permitted as-built discharge is from facilities in the Haw River subbasin (146.79 MGD), followed by the Upper Cape Fear River subbasin (104.92 MGD), which accounted for nearly 25% of the as-built flow (*Figure 3-1*).

Cape Fear River Basin NPDES Permit Strategies

One of the goals of a basin plan is to identify and support management needs within DEQ to help protect water resources. Understanding the impacts from point and nonpoint sources of pollution on a subwatershed and basin scale is important to increase the success of an action and to ensure equitable implementation measures are applied across all potential sources.

This section of the plan identifies watershed-scale permitting strategies utilized by the NPDES program to protect and/or improve waters in the Cape Fear River Basin that are negatively impacted by point source contributions to surface waters. The following watersheds are subject to certain rules and permitting conditions to address specific water quality issues in the receiving waters. More information on the specific water quality concern can be found in each of the subbasin chapters. A table summarizing all the permitting strategies in the basin can be found in *Table 3-5*.

Table 3-5: Cape Fear River NPDES Permitting Strategies and Requirements (May 2023)

Watershed	Subwatershed Location	Applicable Strategy or Rules	Parameter of Interest	Existing WWTP	Expanding WWP	New WWTP
Jordan Lake	Entire drainage area upstream of Jordan Lake Dam	Jordan Water Supply Nutrient Strategy: Wastewater Discharge Requirements Rule 15A NCAC 02B .0270	Nutrients (N&P)	**02B .0270 (6)** Implement Jordan Water Supply Nutrient Strategy Rules; meet permitted nutrient allocation	**02B .0270 (8)** Nutrient discharge limits shall not exceed the greater of its nutrient allocation or the mass equivalent to a concentration of 3.0 mg/L N or 0.18 mg/L P.	**.02B .0207 (7)** Must acquire N or P allocation. Shall not exceed the mass load equivalent to a concentration of 3.0 mg/L N or 0.18 mg/L P.
Randleman Lake	Entire drainage area upstream of the Randleman Lake Dam	Randleman Lake Water Supply Watershed: Wastewater Discharge Requirements Rule 15A NCAC 02B .0722	Nutrients (N & P), Dissolved Oxygen	No specific requirements for existing dischargers.	**02B .0722 (c)** No expanding discharger, except for City of High Point Eastside. Lake modeling must show concentrations/mass limits are protective of all designated uses.	**02B .0722 (c)** No new dischargers.
Central Cape Fear River Basin	Deep River watershed from Randleman Lake Dam & Haw/Cape Fear River watershed from Jordan Lake Dam to Lock & Dam #1 (near Acme NC)	Nutrient TMDL, nutrient strategy and/or instream nutrient criteria to be developed	Nutrients (N & P)	No specific requirements until management tools are complete, with exceptions for local watershed needs.	Actions taken to address nutrient enrichment include: Calibrated nutrient response model and Nutrient Criteria Development Plan (NCDP)	
Lower Cape Fear River	Below Lock & Dam #1 to a line across the river between Lilliput Creek and Snows Cut [AU#18-(71)]	Implementation strategy/site-specific criteria (to be developed); 15A NCAC 02B .0227 (2)	DO, Oxygen Consuming Waste, Nutrients (N & P), etc.	No specific requirements for existing dischargers	Shall be required to provide treatment for oxygen consuming waste. Includes effluent limits for BOD, NH_3 and DO.	Shall be required to provide treatment for oxygen consuming waste. Includes effluent limits for BOD, NH_3 and DO.
Cape Fear River Basin - Shellfish Harvesting Waters	All SA waters in the Lower Cape Fear River subbasin 03030005	15A NCAC 02B .0221 (3) 15A NCAC 02B .0404 (d) & (e)	All	No domestic sewage (regardless of the treatment) and DMF concurrence that no other wastes that could adversely affect shellfish or other waters in such close proximity as to adversely affect shellfish waters.		
Cape Fear River Basin - HQW	All HQW waters in the Cape Fear River Basin	15A NCAC 02B .0224 (c)	Flow, BOD, Ammonia, Dissolved Oxygen, TSS, Nutrients (N & P), Toxins	No specific requirements for existing dischargers	• Flow - the total volume of treated wastewater for all discharges combined shall not exceed 50% of the total instream flow under 7Q10 conditions. • BOD – effluent limit of 5 mg/L • Ammonia – effluent limit of 2 mg/L • DO – effluent minimum limit of 6mg/L • TSS – effluent limit of 20 mg/L or 10 mg/L for PNA and trout waters • Nutrients - where nutrient over enrichment is projected to be a concern, effluent limitations shall be set for phosphorus or nitrogen or both. • Toxins - the limit for a specific chemical constituent shall be allocated at one-half of the normal standard at design conditions and applied in RPA. Whole effluent toxicity shall be allocated to protect for chronic toxicity at an effluent concentration equal to twice that which is acceptable under design conditions. In all instances there may be no acute toxicity in an effluent concentration of 90%. • More stringent limits can be set depending on a DO assessment	

Watershed	Subwatershed Location	Applicable Strategy or Rules	Parameter of Interest	Existing WWTP	Expanding WWP	New WWTP
Cape Fear River Basin - ORW	All ORW waters in the Cape Fear River Basin	15A NCAC 02B .0225	Water quality conditions shall be maintained to protect the outstanding resource value.	See 15A NCAC 02B .0225 for strategy specific details	**Freshwater:** No new dischargers or expansion of existing discharges shall be permitted [.0225 (c)(1)] **Saltwater:** Water quality conditions shall be maintained to protect the outstanding resource value. Site-specific management strategies are developed during the reclassification process [.0225 (2)] **Site-Specific ORW Management Strategies** - See 15A NCAC 02B .0225 for strategy specific details and any new strategies added since 2024. 15A NCAC 02B .0255 (9)(B) Black River and South River ORW Area – New or expanded NPDES permitted wastewater discharges located one mile upstream of the stream segment designated ORW shall comply with the following discharge restrictions: • BOD – effluent limit of 5 mg/L • Ammonia – effluent limit of 2 mg/L • TSS – effluent limit of 20 mg/L • Nutrients - where nutrient over-enrichment is projected to be a concern, effluent limitations shall be set for phosphorus or nitrogen or both. • Toxins - the limit for a specific chemical constituent shall be allocated at one-half of the normal standard at design conditions and applied in RPA. Whole effluent toxicity shall be allocated to protect for chronic toxicity at an effluent concentration equal to twice that which is acceptable under design conditions. In all instances there may be no acute toxicity in an effluent concentration of 90%.	
Cape Fear River Basin - Primary Nursery Area Waters	All PNA waters in the Cape Fear River Basin	15A NCAC 02B .0220 (16) 15A NCAC 02B .0224 (c)(2)(B)	Salinity	Changes due to hydrological modification shall not result in removal of the PNA use.		
Cape Fear River Basin (Entire basin)	All waters in Cape Fear River basin	NCDEQ PFAS Strategic Plan EPA Dec. 5, 2022, Memo (Addressing PFAS Discharges in NPDES Permits and Through the Pretreatment Program and Monitoring Programs)	PFAS + others	Require PFAS monitoring and take action to restrict PFAS discharges	May need to implement PFAS pretreatment program requirements	May need to implement PFAS pretreatment program requirements

BAT – Best available technology; RPA – Reasonable potential analysis; Nutrients = Nitrogen and Phosphorus

1.2.4.2.1 Jordan Lake Water Supply Nutrient Strategy

A TMDL for the Jordan Lake watershed was approved by EPA in September 2007. The approved TMDL estimated the allowable pollutant load for total nitrogen (TN) and total phosphorus (TP), and it allocated the loads to known sources. A nutrient management strategy based on reductions in both total nitrogen and total phosphorus was developed. Portions of the Jordan Lake Nutrient Rules (Title 15A NCAC 02B .0263-.0273) went into effect in August 2009. The purpose of the rule is to "establish minimum nutrient control requirements for point source wastewater discharges in the Jordan Lake watershed in order to restore and maintain water quality in the reservoir and its tributaries and protect their designated uses, including water supply" [15A NCAC 02B .0270 (1)]. Subsequent legislative action delayed portions of rule implementation, but the *Jordan Water Supply Nutrient Strategy: Wastewater Discharge Requirements* rule (15A NCAC 02B .0270) has been implemented with wastewater facilities required to meet reductions in TN and TP loading. Information about the delayed rules can be found in Chapter 6.

The nutrient reduction goals for TN and TP loading (pounds per year) were developed for three separate management areas (arms) of the lake: Upper New Hope, Lower New Hope and Haw River (*Table 3-6* and *Figure 3-8*). The goals and load allocations were based on a 1997-2001 baseline.

A mass point source wastewater load allocation was determined for each arm, and the rule applies to all wastewater treatment facilities discharging in the Jordan watershed that receive nutrient-bearing wastewater and are subject to requirements for individual NPDES permits [15A NCAC 02B .0270 (2)]. *Table 3-7* and *Figure 3-9* shows the associated allowable load and the TN and TP loading from point sources as well as the annual loading as reported by the wastewater treatment facilities (See Chapter 3 appendix for individual facilities list with loading). DWR will continue to monitor the point source load allocations and work with wastewater treatment facilities to ensure that the total mass load allocations are met in each arm.

Table 3-6: Jordan Lake TN & TP Reduction Goals Based on 2007 TMDL

TMDL/strategy Management Area	Total Nitrogen Percent Reduction	Total Phosphorus Percent Reduction
Upper New Hope Arm	35%	5%
Lower New Hope Arm	0%*	0%*
Haw River Arm	8%	5%

*No increase in Load

Figure 3-8: Jordan Lake Management Areas.

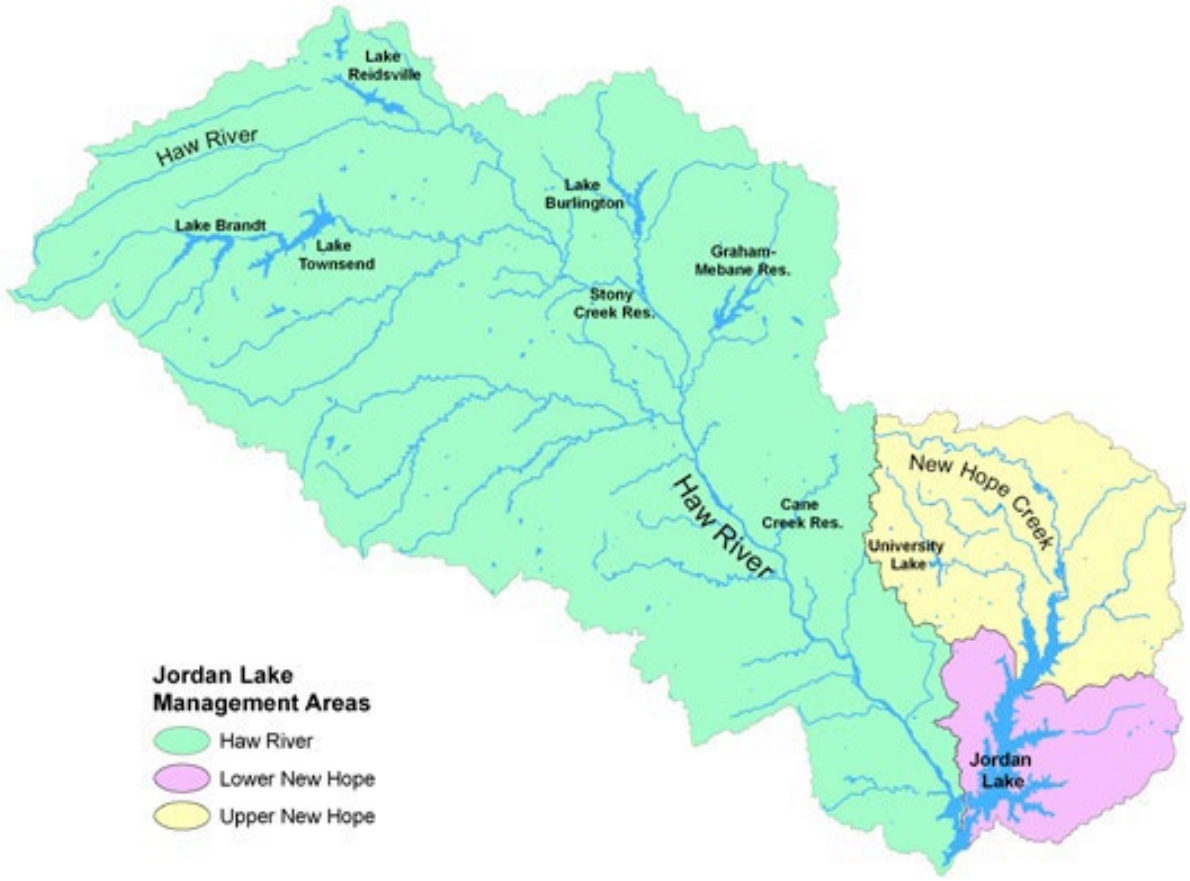
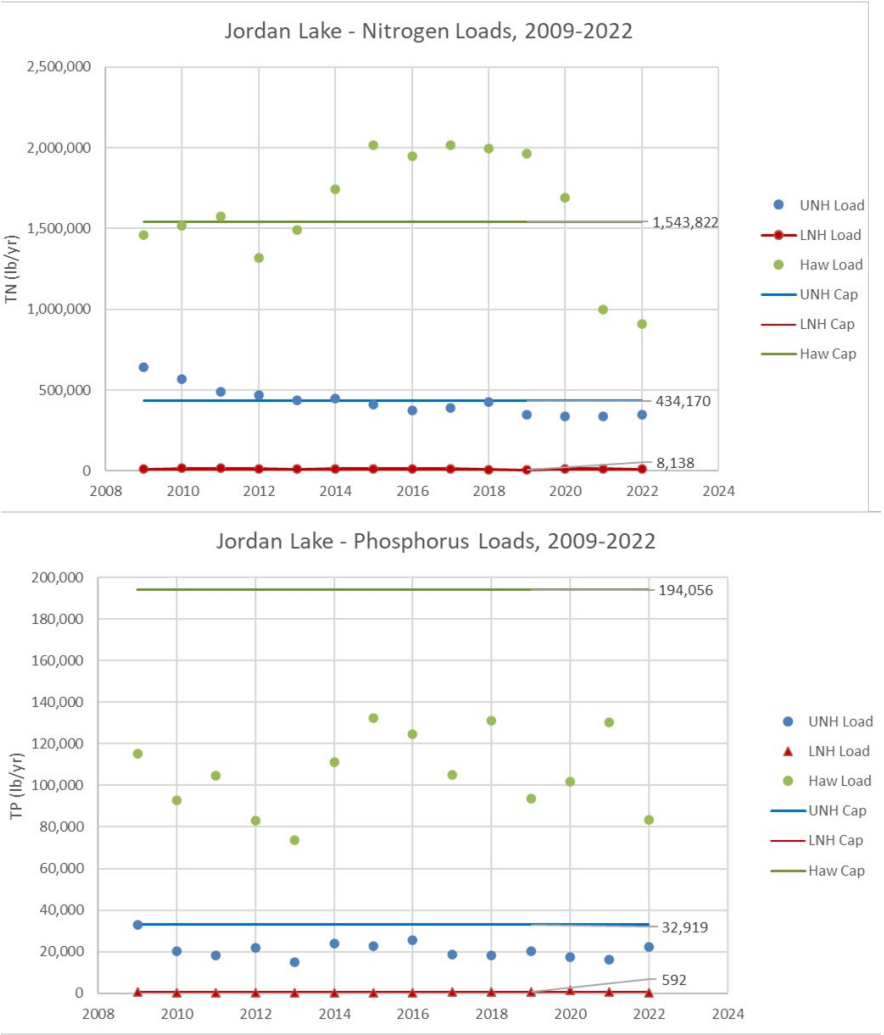


Table 3-7: Jordan Lake TN & TP point source annual loading by management area (2019-2022). Red text denotes loads greater than the nutrient cap for that specific management area.

Jordan Lake Management Areas	Nutrient	Area Nutrient Cap	2019 lb/yr	2020 lb/yr	2021 lb/yr	2022 lb/yr
Upper New Hope Arm	TN	**434,170**	348,553	335,445	336,350	349,701
	TP	**32,919**	20,424	17,331	16,096	22,245
Lower New Hope Arm	TN	**8,138**	6,959	**13,117**	**14,265**	**12,190**
	TP	**566**	**592**	**1,566**	521	281
Haw River Arm	TN	**1,543,822**	**1,962,781**	**1,688,956**	1,000,152	910,752
	TP	**194,056**	93,755	101,978	130,422	83,314
Total	TN	**1,986,130**	**2,318,273**	**2,037,518**	1,350,767	1,272,643
	TP	**227,541**	114,771	120,875	147,039	105,840

Figure 3-9: NPDES Point Source TN & TP Annual Loading to the Three Arms in the Jordan Lake Management Areas.



1.2.4.2.2 *Randleman Lake Water Supply Watershed Nutrient Strategy*

In April 1999, the *Randleman Lake Waters Supply Watershed: Nutrient Management Strategy* (15A NCAC 02B .0720-.0724) was put in place to protect this water supply reservoir from becoming impaired due to excess nutrient loading. Construction of the Randleman dam began in 2001, and the reservoir was filled in 2007. Located in Randolph and Guildford counties, this reservoir provides drinking water for North Carolina's Piedmont Triad Region and is managed by the Piedmont Triad Regional Water Authority (PTRWA). Per rule, "there shall be no new or expanding permitted wastewater discharges in the watershed with the exception that the City of High Point Eastside Wastewater Treatment Plant may be allowed to expand provided that any new permit contain concentrations and mass limits predicted through water quality modeling or other analysis that shows to the Director [of DEQ] that discharges will

provide a level of water quality in the Randleman Lake that meets all designated uses of those waters" [15A NCAC 02B .0722 (c)].

High Point Eastside WWTP (NC0024210) received an authorization to construct (ATC) permit in October 2003 to upgrade and increase their effluent discharge from 16 to 26 MGD. Construction was completed in April 2004. As required by the Randleman Lake strategy, improved effluent limits were based on a nutrient response model which allowed for a year-round TP limit of 0.5 mg/L (as a monthly average concentration) and a TN of 6 mg/L during the summer (April-October). The upgrade included Biological Nutrient Removal (BNR) to reduce nutrients in their effluent.

Randleman Lake was last assessed in 2018 and was found to exhibit eutrophic conditions. The chlorophyll *a* concentrations ranged between 10 and 36 µg/L in the upper four stations in the lake (CPFRD1 – CPFRD4). Data shows that dissolved oxygen (DO) may also be a parameter of concern. In 2022, High Point Eastside WWTP requested an expansion to 32 MGD and has submitted a Water Quality Analysis Simulation Program (WASP) model and report to NPDES. DWR's Modeling & Assessment Branch (MAB) is working with NPDES to review the model and the expansion request. MAB and NPDES are continuing to work with High Point to review and reevaluate the model. Because Randleman Lake continues to be impacted by excess nutrients, no additional loading from the High Point Eastside WWTP will be permitted without clear modeling results that show no degradation to Randleman Lake and to downstream designated uses.

1.2.4.2.3 *Central Cape Fear River Watershed*

(From below Jordan dam and Randleman dam down to Lock & Dam #1)

Several segments of the Cape Fear River were added to the 2006 303(d) list of impaired waters (Category 5) as a result of high levels of chlorophyll *a* (>40 µg/L). Samples were collected between 1998 and 2003. Chlorophyll *a* concentrations remain high during the summer periods at many stations throughout portions of the Cape Fear River, mainly in areas of low flow or behind the lock & dam impounded areas.

In 2009, major cyanobacteria blooms (bluegreen algal; harmful algal blooms [HABs]) started to occur along the mainstem of the Cape Fear River from upstream of Buckhorn Dam on the Cape Fear River and upstream into the Haw and Deep rivers. The blooms continued downstream to below Lock & Dam #1 (DWR photo below). Drought conditions persisted for several years before the large system wide blooms began. The drought conditions seem to have provided the physiochemical conditions needed for algal blooms to flourish throughout this system.


Algal bloom behind Lock & Dam #1
(DWR, 9/24/2009)

Lower riverine flows and lower instream turbidity concentrations allowed more light to penetrate the water column. Consequently, the less turbulent flow and an overabundance of nutrients provided the right conditions for systemwide algal blooms. Monitoring over the years has also shown an excess of periphytic growth in many of the smaller stream systems draining to the mainstem rivers. Periphyton is the material growing on submerged surfaces in freshwater. It is dominated by microalgae that can often form long filaments or sheets that cover the sediments, plants and other objects in water. The periphyton can become a complex community of algae, bacteria, fungi and invertebrates. Periphytic growth in the streams and rivers of the basin are likely driven by excessive instream nutrients. To reduce impacts to water quality, understanding how and what nutrient factors are driving biological productivity (algal blooms/HABs and periphytic growth) in this section of the basin is needed.

Because water quality monitoring has continued to show evidence of excess nutrients in the mainstem of the Cape Fear River and several of its tributaries, DWR identified the need for modeling tools to assist with permitting for nutrients discharged from wastewater and industrial facilities. The initiative to monitor and model this portion of the Cape Fear River Basin began in 2017 (*Figure 3-10*). The goals of the model are to:

- Support NPDES permitting for nutrients.
- Provide information on conditions associated with algal bloom frequency and duration.
- Provide additional information on existing impaired waters.
- Provide additional information for public water supplies.
- Potentially support numeric nutrient criteria as described in the NC Nutrient Criteria Development Plan (NCDP) (DWR, November 2017).

Between 2019-2020, many of the NPDES permitted facilities and the monitoring coalitions in the basin assisted DWR with additional monitoring needs to support the modeling effort. Data collected will allow DWR to develop modeling tools to characterize water quality dynamics more accurately in the basin. The goal is to collect enough site-specific information to reduce uncertainties of estimating model parameters which will increase the confidence in model predictions, and hopefully, avoid the need for additional modeling (DWR, May 2018). EPA is currently working with DWR on developing the model for this section of the basin, the expected completion date is unavailable at this time (May 2025).

Figure 3-10: Cape Fear River Basin Model from Randleman and Jordan Dams to Lock & Dam #1 (DWR, November 2017)

Because many of these same issues were identified in the 2005 Cape Fear River Basin plan, an interim permitting strategy was put into place to protect water quality and designated uses in the basin. The interim permitting strategy is intended to limit additional loading of nitrogen and phosphorus, with the understanding that a reduction in nutrient loading will likely be needed throughout this section of the basin until modeling can show otherwise. Knowing that this system is already nutrient over-enriched, there may be a need for instream nitrogen and/or phosphorus water quality standards before permits can be modified by NPDES to address the issue. North Carolina's Nutrient Criteria Development Plan (NCDP) lays out the approach North Carolina will take to achieve the development of nutrient criteria for nutrient over-enriched waters like those in this portion of the Cape Fear River Basin. Identifying designated uses for protection, determining the response variables affected by the parameter of interest, and identifying the most sensitive species impacted by high concentrations or loadings are just a few steps needed to develop an instream water quality standard for nitrogen and phosphorus. North Carolina mainly relies on the statewide chlorophyll *a* water quality standard of 40 μg/L as a response variable from nutrient over-enrichment, but it is not the best response variable for fast-moving rivers and streams like those found in this section of the Cape Fear River Basin.

To help protect designed uses in this portion of the basin, the interim permitting strategy has the following conditions:

- *Existing dischargers*: No specific requirements for existing dischargers until the completion of a TMDL or management strategy is developed based on the outcome of the watershed nutrient response model and/or NCDP process. There could be exceptions based on local watershed needs (example is Siler City WWTP (NC0026441)). For purposes of understanding dischargers load to the system, current and future load allocations are calculated by using the average TN and TP loadings from 2016 to 2020. This time period is being used in the modeling effort and matches the last five years of data presented in the basin plan. It also aligns with the most recent 2022 IR. Additionally, a five-year data period was selected to cover both seasonal variation and low/high flow events to get a sound representative estimate of loading. See Chapter 3 appendix for a table/list of all dischargers to the Central Cape Fear River watershed as of 2022.

- *New and Expanding dischargers:* No net increase in nitrogen (N) and phosphorus (P) loading in the Central Cape Fear River watershed*. Tools to assist with NPDES management decision are underway and include a watershed nutrient response model and a NCDP process which will be followed by a TMDL and/or nutrient management strategy to control nitrogen and phosphorus loading.* The model currently being developed for this portion of the basin will play a critical role in supporting future permitting and management strategies to protect not only this portion of the basin but also those areas below Lock & Dam #1.

1.2.4.2.4 *Lower Cape Fear River Watershed*

(From below Lock & Dam #1 to a line across the river between Lilliput Creek and Snows Cut [AU# 18-(71)])

Stream Name	Stream AU#	Saltwater Acres	Ambient Station	2022 IR % DO Samples < 5 mg/L
Brunswick River	18-77a 18-77b	736.7	B9790000	29.3
Cape Fear River Estuary	18-(71)a1	10.6	B9050000	28.6
	18-(71)a2a	290	B9050025 B9050100	38.9 37.5
	18-(71)a2b	149.8		
	18-(71)a3	1,274.9	B9800000	35.9
	18-(71)a4	372.9	B9820000	25.0
	18-(71)a5	2,183.7	B9795000	26.0
Total Saltwater Acres		**5,026**	**Average % < 5 mg/L**	**30.6%**

In 2022, 5,026 saltwater acres in the Cape Fear River Estuary was listed as impaired due to low dissolved oxygen (DO) concentrations (DO < 5 mg/L) (2022 IR). The Cape Fear River [AU# 18-(71)] was added to the NC Impaired Waters list in 1998 and the Brunswick River (AU# 18-77) was listed in 2006.

A three-dimensional Environmental Fluid Dynamics Code (EFDC) water quality model was applied to simulate hydrodynamic and water conditions for the lower Cape Fear River Estuary (EFDC model report, Bowen *et al*., 2009). The model found that reducing wastewater loads generally had a small (relative to the other sources) but noticeable impact on dissolved oxygen concentrations. Of the constituents that contribute to oxygen depletion, ammonia load was primarily contributed from wastewater sources. Researchers have shown that inputs of dissolved nitrogen (nitrate, ammonium, and urea) significantly stimulate algal growth, which in turn significantly stimulates BOD (Mallin et al., 2004). The larger, organic matter load was contributed by the incoming river, tidal creeks and wetlands discharging directly to the estuary. The model could not distinguish between the effect caused by the riverine sources and that from the wetlands and tidal creeks.

The Northeast Cape Fear River SWAT (Soil & Water Assessment Tool) watershed model was used to understand source loading contribution for input into the EFDC model. The SWAT model identified the load contributions in the watershed from point and nonpoint sources and suggested that nonpoint sources contributed more than 90% of the nutrient loads to the Lower Cape Fear River. Among the nonpoint sources, agricultural land and forested wetlands contributed a major portion of the load. They contributed approximately 30% and 40%, respectively, of the total nitrogen load, and 60% and 20% of the total phosphorus load during normal and dry years (SWAT model report). More detailed information is available on the lower Cape Fear River modeling projects DWR Modeling & Assessment Special Studies webpage.

The current rule for *Water Quality Management Plans* [15A NCAC 02B .0227(2)] requires all new or expanding NPDES dischargers into Cape Fear River Estuarine stream index number 18-(71), from upstream of the mouth of Toomers Creek to a line across the river between Lilliput Creek and Snows Cut, be protected for all Class SC standards as well as the following site-specific action: "All new individual NPDES wastewater dischargers and expansions of existing individual NPDES wastewater discharges shall be required to provide treatment of oxygen consuming wastes." This includes effluent limits of:

- BOD_5 = 5 mg/L,
- NH_3-N = 1 mg/L,
- DO = 6 mg/L, or
- Utilize site-specific best available technology on a case-by-case basis for industrial discharges in accordance with rule 15A NCAC 02B .0406(b).

The rule also allowed for the consideration of seasonal effluent limits for oxygen consuming wastes in accordance with rule 15A NCAC 02B .0404.

In 2022, Session Law 2022-43 (HB219) was passed which amended General Statute 143-215.1 to include subsection (c7) which states, "for surface waters of the State that have naturally occurring low dissolved oxygen levels, as determined by the Department, permitted wastewater discharges to such surface waters shall not cause a reduction in the dissolved oxygen levels of such surface waters of more than 0.10 mg/L below the approved modeled in-stream dissolved oxygen level for the surface waters at total permitted capacity for all discharges to such surface waters." This applies to new or expanding wastewater discharge facilities.

It is likely both point and nonpoint sources as well as naturally occurring conditions contribute to the low dissolved oxygen levels during the critical summer period.

1.2.4.2.5 Black River and Northeast Cape Fear River Watersheds

The Black and Northeast Cape Fear rivers are both blackwater river systems and present a unique challenge in understanding how contributing nutrients interact with these waterways. Mallin et al. 2004 concluded that additions of nitrogen and phosphorus (organic and inorganic fractions) into blackwater systems increases biological oxygen demand by photosynthetic and heterotrophic activity that can subsequently reduce dissolved oxygen concentrations within these systems and further downstream in the estuary.

Given the hydrologic and ecological complexity of the Cape Fear River system and its associated estuary, water quality protection efforts shall not be confined solely to segments currently classified as impaired. Accordingly, any proposed new or expanded discharge that may result in an increased load of oxygen-demanding substances—whether directly or through nutrient-induced biological activity leading to elevated biochemical oxygen demand (BOD)—shall be subject to rigorous, case-by-case evaluation. Issuance of such permits will require technically defensible documentation demonstrating that the assimilative capacity of the receiving waters is sufficient to prevent adverse impacts and that all oxygen-demanding constituents, including nutrients contributing to BOD through stimulating biological processes, will be fully assimilated prior to reaching any impaired segment in the watershed such as the Cape Fear River Estuary.

1.2.4.2.6 Shellfish Harvesting Waters (Class SA)

Nearly 8,910 acres of Class SA waters are protected under rule 15A NCAC 02B .0221 *Tidal Salt Water Quality Standards for Class SA Waters* in the lower Cape Fear River Basin. All SA waters carry the protections associated with Class SC and SB waters. They also carry the supplemental classification of High Quality Waters (HQW) (see *section 3.2.4.2.6*).

The Division of Marine Fisheries (DMF) monitors and regulates the state's shellfish growing areas and designates growing areas as prohibited, conditionally approved (open or closed) and approved. Per the rule, SA waters "shall meet the current sanitary and bacteriological standards," which include standards for public health and shellfish culture. Bacteriological water quality standards for approved shellfish growing areas can be found in 15A NCAC 18A .0904. Per rule, no domestic sewage (regardless of the treatment proposed) and no other wastes that could adversely affect the taking of shellfish for market purposes shall be discharged into waters classified as SA, into unnamed tributaries classified C or SC to SA waters, or into other waters in such close proximity as to adversely affect the SA waters (15A NCAC 02B .0404). The rule also states that waste discharged into tributaries to waters classified SA shall be treated in such manner as to assure that no impairment of water quality in the SA segments occur, and no permits shall be issued for discharges into waters classified SA unless DMF provides written concurrence that the discharge would not adversely affect shellfish water quality or the propagation of shellfish.

1.2.4.2.7 High Quality Waters (HQW)

The High Quality Waters (HQW) supplemental classification is intended to protect waters which are rated excellent based on biological and physical/chemical characteristics through monitoring or special studies. Waters classified as Class WS-I, WS-II, SA, ORW and some primary nursery areas (PNA) are designated as HQW. In the Cape Fear River Basin there are 325.3 FW miles, 2,479.9 FW acres and 8,930.4 S acres classified as HQW waters. HQW waters are protected under rule 15A NCAC 02B .0224 (*Water Quality Standards for High Quality Waters*).

The following water quality standards apply to expanding or new dischargers in areas designated as HQWs:

- The total volume of treated wastewater for all discharges combined shall not exceed 50% of the total instream flow under 7Q10 conditions.
- For oxygen consuming wastes effluent limits shall be 5 mg/L for BOD5, 2 mg/L for ammonia (NH3-N), and a minimum of 6 mg/L for DO. More stringent limits can be set, if necessary, to ensure that the cumulative pollutant discharge from oxygen-consuming wastes does not cause the DO of the receiving stream to drop more than 0.5 mg/L below background levels, and in no case below the standard. Where background information is not available, evaluations shall assume a percent saturation determined by staff to be applicable to that hydro-environment.
- Effluent limits for total suspended solids (TSS) is limited to 20 mg/L or 10 mg/L if also PNA or trout.
- In areas where nutrient over enrichment is projected to be a concern, effluent limits shall be set for nitrogen, phosphorus or both.

- In cases where complex wastes (those containing or potentially containing toxicants) may be present in a discharge, a safety factor shall be applied to any chemical or whole effluent toxicity (WET) allocation. The limit for a specific chemical constituent shall be allocated at one-half of the normal standard at design conditions. Whole effluent toxicity (WET) shall be allocated to protect for chronic toxicity at an effluent concentration equal to twice that which is acceptable under design conditions. In all instances there may be no acute toxicity in an effluent concentration of 90%.

1.2.4.2.8 Outstanding Resource Waters (ORW)

The Outstanding Resource Waters (ORW) supplemental classification is intended to protect waters of exceptional state or national recreational or ecological significance that require additional protection to maintain existing uses. ORW is a subset of HQW. In the Cape Fear River Basin there are just 129.5 FW miles classified as ORW, all located along the Black and South rivers in the Black River subbasin and equivalent to 13% the Black Rivers FW miles. ORW waters are protected under rule 15A NCAN 02B .0225 (*Water Quality Standards for Outstanding Resource Waters*), see this section for specific details of the rule.

No new or expanding discharge permits are allowed in Outstanding Resource Waters [subsection (c)(1)]. Subsection (9)(B) identifies the specific Black River and South River ORW areas where new and expanding NPDES permitted wastewater discharges located one mile upstream of the stream of segments designated ORW shall comply with the following discharge restrictions:

- For oxygen consuming wastes, effluent limits shall not exceed 5 mg/L for BOD and 2 mg/L for ammonia (NH3-N) [15A NCAN 02B .0225 (9)(B)(i)].
- Total Suspended Solids (TSS) shall be limited to effluent concentrations of 20 mg/L [15A NCAN 02B .0225 (9)(B)(ii)].
- If nutrient over-enrichment is projected to be a concern, effluent limits shall be set for phosphorus, nitrogen, or both [15A NCAN 02B .0225 (9)(B)(iv)]
- For discharges that potentially contain toxicants, a safety factor shall be applied and whole effluent toxicity shall protect for chronic toxicity at an effluent concentration equal to twice that is acceptable under flow design criteria in 15A NCAC O2B .0206 [15A NCAN 02B .0225 (9)(B)(v)].
- There are also treatment plant emergency design requirement listed under 15A NCAN 02B .0225 (9)(B)(iii).

1.2.4.2.9 Primary Nursery Areas (PNA) Classified Waters

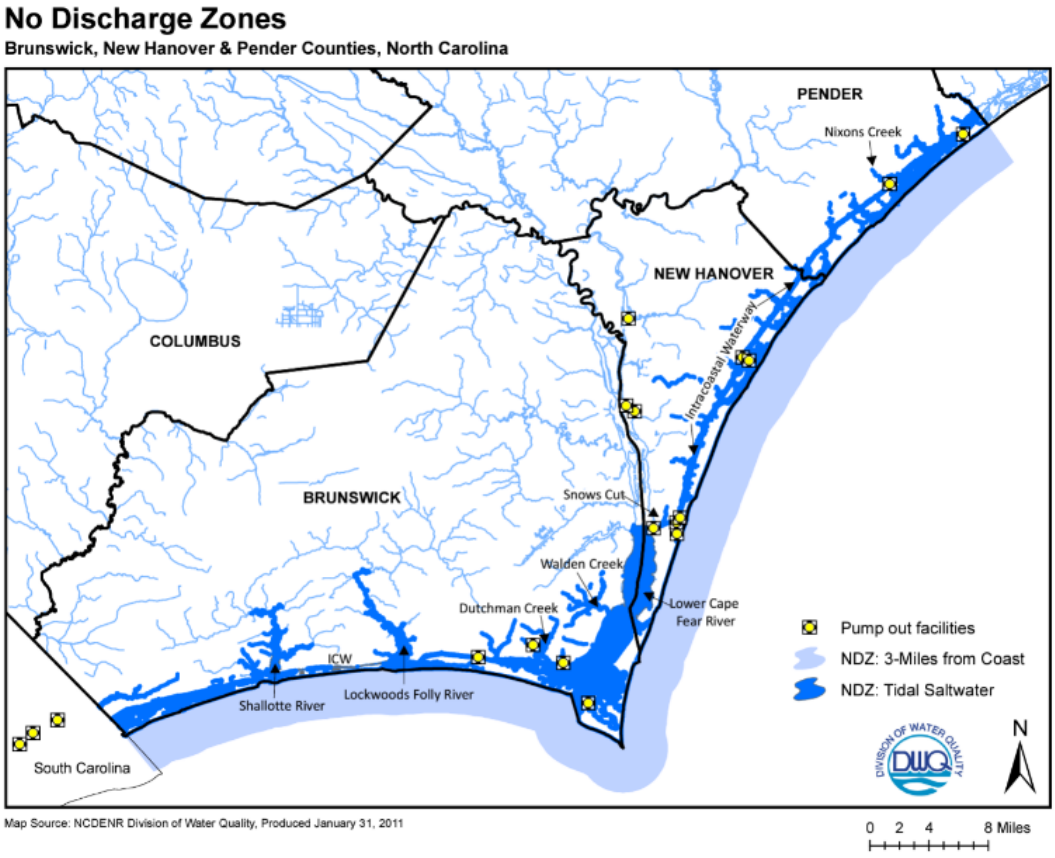
Primary Nursery Areas (PNA) "means tidal saltwaters that provide essential habitat for the early development of commercially important fish and shellfish and are so designated by the Marine Fisheries Commission" [15A NCAC 02B .0202(47)]. There are approximately 2,480 freshwater and 8,930 saltwater acres and 3.25 miles of waters identified as PNA in the Cape Fear River Basin and delineations can be found in 15A NCAC 03R .103 (19). An interactive map is available online to see where common marine fisheries rules may apply.

Waters classified PNA are protected under rule 15A NCAC 02B .0220 (*Tidal Salt Water Quality Standards for Class SC Waters*) and, if designated as High Quality Waters by the EMC, 15A NCAC 02B .0224 (*Water Quality Standards for High Quality Waters*). For existing, expanding or new discharges, changes in salinity "due to hydrological modifications shall not result in removal of the functions of a PNA." Projects that result in modifications to salinity "such that functions of a PNA are impaired shall employ water management practices to mitigate salinity impacts."

1.2.4.2.10 No Discharge Zone (NDZ)

While not a permitting strategy, there is a No Discharge Zone (NDZ) in the Cape Fear Estuary to protect shell fishing, PNAs, and recreational use of the water. A NDZ designation prohibits discharging of sewage from marine sanitation devices into coastal waters. In the Cape Fear River Estuary, this applies to all commercial and pleasure vessels operating in the waterways of New Hanover, Brunswick and Pender counties (*Figure 3-11*). Boaters must secure Type I, Type II and Type III marine sanitation devices when operating in a NDZ and must use a sewage pump out facility to empty their waste. This does not apply to gray water from showers or sinks and does not prohibit the use of porta-potties. For additional information please go to the NDZ webpage. New Hanover has a brochure on their program available here.

Figure 3-11: No Discharge Zones in the Cape Fear River Basin.



1.2.4.2.11 Emerging Contaminants

Emerging contaminants, or contaminants of emerging concern, include many different kinds of chemicals used in personal care products, pharmaceuticals, household cleaning products, pesticides, and industrial processes, products and by-products, among other uses. Emerging contaminants present unique issues and challenges to the environment. Each contaminant has unique physical and chemical properties, environmental and health impacts, existing Federal, State, and local guidelines, and detection and treatment methods. Regulators, operators and field personnel are faced with new challenges when addressing specific contaminants at sites.

Contaminants of Emerging Concern (CEC) have features that require additional consideration when applying existing ambient water quality criteria for the protection of aquatic life and human health. Some of these chemicals are known as "forever chemicals" because their bonds are very difficult to break down and destroy, making them persistent in the environment. Potential sources include industrial and chemical manufacturing facilities, landfills, military bases, airports and firefighting training facilities. They often go undetected and untreated at wastewater treatment plants because these facilities do not have the analytical tools, methods or treatment systems in place that can detect, eliminate or treat them.

Two compounds or groups of chemicals of emerging concern in the Cape Fear River Basin are 1,4-dioxane and per- and polyfluoroalkyl substances (PFAS). DEQ is working to address these contaminants by reducing or eliminating the presence of these compounds from known sources. This will reduce the amount of contaminants being passed through wastewater treatment facilities and discharged into surface waters or in sludge on application fields.

As of 2025, DEQ has been working with the Environmental Management Commission to develop monitoring and minimization rules for 1,4-dioxane and three PFAS compounds. The goal of these rules are intended to achieve two key objectives: (1) Characterize the presence of PFOS, PFOA, GenX and 1,4-dioxane in NPDES discharges (Publicly Owned Treatment Works (POTWs) with Significant Industrial Users (SIUs) and industrial direct dischargers to surface waters), and (2) require affected entities to develop minimization plans that identify approaches to reduce these emerging compounds discharged directly or indirectly to surface waters (Fiscal note, April 23, 2025). The PFOS, PFOA, and GenX Monitoring and Minimization plan rules (15A NCAC 02B .0512 and 15A NCAC 02H .0923) and the 1,4-Dioxane Monitoring and Minimization plan rules (15A NCAC 02B .0513 and 15A NCAC 02H .0924) along with their OSBM approved Minimization Rules Fiscal Notes were presented at the November 2025 Water Quality Committee meeting (November 2025 WQC) and approved by the WQC to move forward to the January 2026 EMC with amendments to the public notice request. The January 2026 EMC approved the proposed rules and fiscal note to go out for public comment (January 2026 EMC meeting link).

Permitting strategies addressing emerging contaminants will change as testing methods, monitoring and minimization plans, instream standards and discharge limits are developed. More specific information regarding emerging contaminants and the impacts in the Cape Fear River Basin can be found in Chapter 12 (PFAS), Chapter 13 (1,4-dioxane) and on NCDEQ Emerging Compounds webpage.

1,4-Dioxane

1,4-dioxane is a clear liquid that is highly miscible in water and is readily transported downstream because of a unique combination of physical and chemical properties. 1,4-Dioxane does not readily stick to soil particles, sludge/biosolids or sediments. As a result, when 1,4-dioxane enters a waterway, it remains dissolved and travels long distances, leading to widespread contamination of surface water resources. Conventional wastewater treatment processes and techniques typical of Publicly Owned Treatment Works (POTWs) do not remove 1,4-dioxane and generally pass through treatment plants and are discharged with wastewater effluent to receiving streams. 1,4-Dioxane is also not readily captured using granulated activated carbon commonly used to capture PFAS compounds (Wilbur et al., 2012 and Hogue, 2020).

During a Cape Fear River Basin study (described in chapter 13), elevated levels of 1,4-dioxane were identified mainly downstream of the City of Asheboro, Greensboro and Reidsville WWTPs. DWR continues to work with these and other facilities to decrease the concentration of 1,4-dioxane in their discharge and requires effluent monitoring to ensure compliance with the Clean Water Act. DWR is working closely with the EMC to develop rules which would require a monitoring and minimization plan for POTWs with SIUs and direct industrial users that have the potential to discharge 1,4-dioxane.

Unlike PFAS, 1,4-dioxane comes from a smaller number of sources and is not widespread across the state. Most of North Carolina's 1,4-dioxane pollution can be traced to specific industrial dischargers in the Cape Fear River Basin and are mainly detectable downstream of the cities of Asheboro, Greensboro and Reidsville. Setting enforceable discharge limits in NPDES permits would address most of the contamination problem.

DWR's NPDES Permitting Section currently (as of January 2026) adds 1,4 dioxane monitoring to industrial direct discharge permits as they are renewed, if they are known to discharge 1,4 dioxane, or if they have a Standard Industrial Classification (SIC) code or Toxics Release Inventory (TRI) information identifying that it could be a possible source of 1,4 dioxane. In addition, the permitting staff are adding 1,4 dioxane monitoring to Publicly Owned Treatment Works (POTWs) that have Significant Industrial Users (SIUs) that are possible sources based on SIC and TRI information as well. As of January 2026, approximately 82 NPDES permitted facilities are monitoring or have monitored for 1,4-dioxane (includes groundwater remediation permits and an "other" category that are likely to discharge 1,4-dioxane). To date, the most elevated levels of 1,4-dioxane discharged from direct or indirect (SIUs) industrial facilities have been from industries located in the Cape Fear River Basin.

PFAS

The emerging compounds known as per- and polyfluoroalkyl substances, or PFAS are a concern both in North Carolina and nationally. This is a group of manmade chemicals that includes PFOA, PFOS and GenX, and are found in a wide range of consumer, commercial and industrial products (DEQ Emerging Compounds website).

There are multiple sources of these compounds throughout the state and the Cape Fear River Basin. Unlike with 1,4-dioxane, the sources can come from industrial manufacturing, commercial uses and well as products in our homes and businesses that end up in wastewater, surface waters, groundwater and drinking water. In 2017, GenX, a PFAS compound, found in the Cape Fear River was traced back to the Chemours Company-Fayetteville Works, a major industrial manufacturing facility. PFAS compounds were found to have been discharged in their wastewater, stormwater and groundwater and also found in their air emissions. Since 2017, Chemours has been prohibited from discharging process wastewater into the Cape Fear River. In February 2019, Chemours entered into a Consent Order with DEQ and the Cape Fear River Watch and in October 2020, DEQ ordered additional significant actions by Chemours to prevent PFAS pollution from entering the Cape Fear River in the Addendum to the Consent Order. Updated information specific to Chemours is posted on the DEQ GenX Investigation and Consent Order webpages.

Since PFAS are found to be globally abundant, a wide range of PFAS compounds are found throughout the state and Cape Fear River Basin and are discharged by POTWs and SIU which are not eliminated using conventional wastewater treatment practices. The fact that many PFAS compounds are in many everyday products and manufacturing processes, identifying and controlling these sources throughout the basin is much more challenging. Many public water supply utilities in the Cape Fear River Basin have taken the initiative to upgrade their drinking water treatment processes to remove PFAS compounds in order to supply finished drink water to their customers below the National Primary Drinking Water Regulations MCLs (see section 12.3.9.2). Several water treatment facilities are installing granular activated carbon (GAC) or Low Pressure Reverse Osmosis (LPRO) to remove PFAS contaminants.

In June 2022, because of the ubiquitous nature of PFAS and the Cape Fear River Basin specific contamination due to Chemours, DEQ released the Action Strategy for PFAS, a comprehensive approach to address PFAS contamination statewide. Under the Action Strategy for PFAS, DEQ is taking a whole-of-department approach to protect communities by identifying, reducing, and remediating PFAS pollution. The DEQ strategy prioritizes protecting communities, protecting drinking water and cleaning up existing contamination.

In a December 5, 2022, memorandum entitled, "Addressing PFAS Discharges in NPDES Permits and Through the Pretreatment Program and Monitoring Programs," EPA provided approval authorities with recommended National Pollution Discharge Elimination System (NPDES) program actions for Publicly Owned Treatment Works (POTWs). EPA identified industrial categories known or suspected to discharge PFAS, including organic chemicals, plastics and synthetic fibers (OCPSF), metal finishing, electroplating, electric and electronic components, landfills, centralized waste treaters (CWTs), pulp, paper & paperboard, leather tanning & finishing, plastics molding and forming, textile mills, paint formulating and airports.

Since indirect industrial dischargers are identified as part of the controlled wastewater loading to the POTW [15A NCAC 02B .0202 (33)], to assess the industrial contribution of PFAS and assess levels of PFAS compounds in the facility's effluent, investigative monitoring for PFAS is required at the POTWs effluent and samples collected should be representative of the typical wastewater discharged from their facility. Such investigative actions can be required under 15A NCAC 02B .0508 (b)(2) and G.S. 143-215.66.

The 2022 EPA memo provided guidance to states and POTW pretreatment programs to help identify and locate each SIU in industry categories expected or suspected of PFAS discharges to their treatment works and begin sampling and/or modify Industrial User Permits (IUPs) for each SIU identified as suspected PFAS dischargers to ensure appropriate sampling occurs. The POTW should modify or reissue the IUP to include EPA PFAS Pollution Prevention Strategies, as necessary, or use other Pretreatment Program mechanisms to address PFAS discharges to POTWs.

Based on the 2022 EPA memo, DWR-NPDES permitting staff are adding PFAS monitoring requirements to industrial direct dischargers who are likely to have PFAS in their process wastewaters. Sampling requirements are being added during permit renewals, expansions, or when a new permit is requested.

DWR is working closely with the EMC to develop rules which would require a monitoring and minimization plan for POTWs with SIUs and direct industrial users that have the potential to discharge PFAS. In NC, there are approximately 126 POTWs with pretreatment programs, 595 significant industrial users (SIUs), and 216 industrial direct dischargers that will be required to perform baseline PFAS monitoring. SIUs and industrial direct dischargers will then determine if they need to develop a PFAS minimization plan based on their sampling results.

1.2.5 Instream Monitoring Requirements

The permitting process includes determining the quality and quantity of treated wastewater that the receiving water can assimilate, incorporating input from stream modeling, collaborating with DEQ regional offices and evaluating the location of the discharge. The goal is to work with permit-holders to monitor their effluent for parameters that may impact water quality, not only at the point of discharge, but also further downstream. DWR also works with permit holders to identify the potential sources of known and emerging compounds in their effluent to effectively capture and treat the pollutant before entering or leaving the treatment plant. *Best Available Technology (BAT) and pretreatment requirements may be recommended for preventing pollutants from entering waterbodies.*

Understanding the water quality impacts from the 218 NPDES permitted wastewater dischargers (50 major, 168 minor) to the surface waters of the Cape Fear River Basin is critically important. To do this, instream water quality monitoring is necessary upstream and downstream of permitted facilities. In 2020, DWR's Ambient Monitoring System (AMS) program collected samples from 75 surface water stations in the basin. In addition to the AMS stations, three monitoring coalitions collect data from 104 stations. The Monitoring Coalition Program is a voluntary, ambient monitoring program that provides an effective and efficient means for assessing water quality in a watershed context.

Total number of water quality monitoring stations in the Cape Fear River Basin as of 2020.

Surface Water Monitoring Program	Number of Stations
DWR – Ambient Monitoring System (AMS)	75
Upper Cape Fear River Basin Association	40
Middle Cape Fear Basin Association	33
Lower Cape Fear River Program	31
Total Water Quality Stations*	167

*There are 12 co-located stations

A monitoring coalition is a group of stakeholders that combine resources and expertise, to collectively fund and perform an instream monitoring program. If any members of the monitoring coalitions are NPDES wastewater or drinking water permit-holders, the monitoring performed by the coalition may be done in lieu of the instream monitoring required by their individual permits. By forming a coalition, members have a platform to gather more information about their watersheds, evaluate member-specific interests and collaborate on watershed issues. Coalition members work with DWR to develop a monitoring network that uses strategically selected, mutually agreeable sampling locations to evaluate water quality beyond the point-source outfall. The monitoring locations are coordinated with DWR's existing ambient and biological monitoring networks to provide a more comprehensive picture of watershed conditions without duplicating efforts. The monitoring coalitions collect data for several of the same parameters that DWR collects. Parameters like DO, pH, turbidity, TN, TP and fecal coliform bacteria are required, but others like, chlorophyll *a*, dissolved metals and emerging compounds are often optional but improves the overall understanding of the watershed condition and impacts from point source dischargers (*Table 3-8*).

Table 3-8: Typical Water Quality Parameters Monitored Upstream and Downstream of Most Wastewater Discharges to Surfaces Waters of the State.

Water Quality Parameters		
Physical	**Chemical**	**Biological**
Dissolved Oxygen (DO)	Total Nitrogen (TN)	Fecal Coliform Bacteria
pH	NO_2+NO_3 (NO_x)	*E. coli*
Specific Conductivity	NH_3	*Enterococci* (SB & SA)
Temperature	TKN	Chlorophyll *a*
Turbidity	Total Phosphorus	Algal Bloom
TSS	PO_4	Benthic Macroinvertebrate
Hardness	Toxics/Emerging Contaminants	Fish Community

Typical parameters monitored are shown in green boxes.
Parameters in orange boxes are suggested when the outfall is in areas with specific concerns.

Elevated instream nutrient and bacteria concentrations have been identified as water quality concerns throughout the Cape Fear River Basin, and the Jordan Lake watershed is officially classified as nutrient sensitive waters (NSW). For these reasons, *instream monitoring for several water quality parameters, including nutrients, should be included in all major NPDES permits*. By having a specified, consistent set of parameters monitored by the dischargers, DWR or monitoring coalitions, permit-holders will know what is expected of them when monitoring upstream and downstream of their discharge point. Watershed stakeholders will also understand what is expected of dischargers, and it will provide a consistent, transparent set of water quality data that can help verify that designated uses are not negatively impacted

by the discharged effluent. Additional parameters (those highlighted in orange in *Table 3-8*) may be needed in specific regions or specific receiving streams based on instream criteria or water quality impairments or other needs such as TMDL development.

Per rule 15A NCAC 02B .0508, minor NPDES facilities that discharge >50,000 GPD shall monitor for TN and TP. In the Piedmont and Coastal Plain, TN and TP shall be monitored quarterly. Minor facilities that discharge <50,000 GPD shall monitor for TN and TP when discharging to NSW waters. Many minor facilities were identified as a potential source of pollution contributing to either an impairment or area of concern in several waterbodies throughout the basin. The majority of the minor NPDES permits have limited instream monitoring requirements and may only collect instream data semi-annually or quarterly. More frequent monitoring of some of these minor facilities, especially in over-enriched waterbodies either designated as NSW or not, could help target best management practices (BMPs) and infrastructure needs to reduce the amount of nitrogen and phosphorus leaving a wastewater treatment plan. Determination of the type and frequency of tests and measurements can be found in 15A NCAC 02B .0508 *Tests and Measurements Applicable to SICS (Standard Industrial Codes)*.

Basin planners are continually working with permit writers to understand what additional monitoring may be needed to help determine if the discharge is contributing to an impairment or impacting water quality. As permits are renewed, NPDES permit writers determine what instream monitoring is needed on a case-by-case basis to protect surface water downstream of minor dischargers.

DEQ continues to gather data to support setting regulatory standards and to provide technical assistance to permittees to reduce future impacts from various pollutants. As required by Session Law 2018-5, Senate Bill 99, Section 13.1(r), every applicant shall submit documentation of any additional pollutants for which there are certified methods with the permit application if their discharge is anticipated. The list of pollutants may be found in 40 CFR Part 136, which is incorporated by reference. If there are additional pollutants with certified methods to be reported, the Chemical Addendum to NPDES Application table should be submitted with the NPDES application and, if applicable, the permittee should list the selected certified analytical method used to identify the compound or parameter of interest. If there are no additional pollutants to report, permittees shall inform DWR that no additional monitoring has been conducted, and therefore, no additional parameters have been identified as present in the discharge. This requirement applies to all NPDES facilities. The Chemical Addendum to NPDES Application will be required for any type of facility with an NPDES permit, depending on whether those types of pollutants are found in your wastewater.

1.3 Wetland and Buffer Permitting Programs

1.3.1 Federal Section 404 Permitting

Section 404 of the Clean Water Act (CWA) established a program to regulate the discharge of dredged or fill material into Waters of the United States (WOTUS). Activities such as damming a stream channel to create a pond or placing material in a stream, wetland or open water require a permit before dredged or fill material can be discharged into jurisdictional waters of the US. Permit applications must show that steps have been taken to avoid and minimize impacts to wetlands, streams and other aquatic resources

and in some cases, compensatory mitigation will be provided for unavoidable permanent losses (US EPA, 2017a). Many routine farming, ranching or silviculture activities that are part of an "ongoing" farming or forestry operation are considered exempt.

The Wilmington District of the U.S. Army Corps of Engineers (USACE) administers Section 404 in North Carolina. General Permits (GPs), also referred to as Nationwide Permits (NWPs) or Regional General Permits (RGPs), are issued for impacts that will have minimal adverse effects. Individual Permits (IPs, also known as standard permits, SPs) are issued for significant impacts. In most cases, permittees are required to submit a joint Pre-Construction Notification or an Individual Application Form to the USACE and/or DWR.

The Navigable Waters Protection Rule was enacted in June 2020. This rule removed federal protection from wetlands that do not have a direct surface hydrologic connection to traditionally navigable waters (USEPA, 2020). Many of North Carolina's wetlands (including wetlands found in the Cape Fear River Basin) such as pocosins, headwater forests, seeps, hardwood flats, pine flats and Carolina bays that do not have a surface hydrologic connection may fall into this non-jurisdictional federal category. On August 30, 2021, a federal judge in the district of Arizona issued an order to vacate the Navigable Waters Protection Rule. As a response to this vacatur, the EPA and USACE halted implementation of the Navigable Waters Protection Rule and began interpreting the "Waters of the United States" (WOTUS) consistent with the pre-2015 regulatory regime (USEPA 2021). On November 18, 2021, the EPA and USACE announced the signing of a proposed rule to revise the definition of WOTUS. The agencies proposed to put back into place the pre-2015 definition of WOTUS with updates that reflected consideration of Supreme Court decisions. The EPA and Army Corps of Engineers reviewed and considered extensive feedback and recommendations from states, tribes, local governments, and a large array of stakeholders to develop the proposed rule (USEPA, 2022). The Revised Definition of "Waters of the United States" was finalized on January 18, 2023. "This final rule advances the objectives of the Clean Water Act and ensures critical protections for the nation's vital water resources, which support public health, environmental protection, agriculture activity, and economic growth across the United States."

Federal compensatory mitigation requirement is generally triggered for permanent losses to 0.10 acres of wetland but varies for perennial and intermittent streams (0.02 acres or 150 linear feet depending on the NWP). The loss of medium to high quality functioning streams and wetlands are typically assigned a compensatory mitigation ratio of 2:1 by the USACE (i.e., for every acre of wetland or foot of stream lost, two credit units must be provided). Lower quality permanent aquatic resource losses may be assigned a lower ratio. The assigned ratio accounts for both the condition of the impacted natural resource and the time-lag associated with mitigation (A. Williams, pers comm May 7, 2018; S. Homewood, pers comm, May 2018; E. Davis, pers comm, May 2018). Also see Chapter 4 for more information on compensatory mitigation or the Wilmington District's Regulatory In-Lieu Fee and Bank Information Tracking System (RIBITs) .

On May 25, 2023, the Supreme Court, ruling in *Sackett v. Environmental Protection Agency*, sharply limited the scope of the federal Clean Water Act's protection for the nation's waters by redefining WOTUS. The majority opinion decided that WOTUS include only those waters that are described "in ordinary parlance"

as “streams, oceans, rivers, and lakes,” and wetlands only if those wetlands have a “continuous surface connection” to such waters “making it difficult to determine where the water ends and the wetland begins” (Environmental Law Institute 2023). This decision once again leaves many of North Carolina’s wetlands (pocosins, headwater forests, seeps, hardwood flats, pine flats and Carolina bays) without federal protection. Even some riverine wetlands, like bottomland hardwoods or riverine swamp forests, that lack a direct surface water connection due to a natural or man-made barrier like a levee or berm, will no longer have federal protection. The *Sackett* ruling has left the responsibility of protecting these wetlands, no longer defined by WOTUS, to individual state authority. On June 27, 2023, the NCGA approved the annual Farm Act (Senate Bill 582/SL 2023-63) with provisions that “wetlands classified as waters of the State are restricted to waters of the United States…”, limiting existing protections (promulgated by the Environmental Management Commission in 1996) to apply only to wetlands that are defined by federal law as Waters of the United States. The *Sackett* ruling and Farm Bill combined have the potential to significantly reduce the benefit that wetlands have on water quality in North Carolina.

1.3.2 North Carolina Section 401 Permitting and Certification

Section 401 of the CWA requires states and recognized tribes to certify any federally permitted or licensed activity that results in a discharge to Waters of the United States. By issuing a water quality certification (WQC), the state certifies that the project will not degrade waters of the State or violate State water quality standards (USEPA, 2010; USEPA, 2017b). Mitigation is triggered at the state level for losses greater than or equal to 0.10 acre of wetland or 300 feet of perennial stream. A mitigation ratio of 1:1 is required for both wetlands and perennial streams (i.e., for every acre of wetland or foot of stream lost an equivalent amount must be replaced).

In addition to 401 regulation through the CWA, the state had a permitting program to authorize impacts to isolated wetlands for the timeframe of this plan (prior to the *Sackett* ruling) and currently maintains a regulatory program for riparian buffers. Riparian Buffer Authorizations or Variances are required in the Neuse River Basin, Tar-Pamlico River Basin, Catawba River Basin, Randleman Lake watershed, Jordan Lake watershed, and Goose Creek watershed. The state has delegated authority to administer the riparian buffer protection rules to more than 40 local municipalities in buffered basins.

There are two branches within DWR responsible for implementing North Carolina’s water, wetlands and riparian buffer regulatory programs: the 401 & Buffer Permitting Branch and Transportation Permitting Branch. DWR’s 401 & Buffer Permitting Branch, which get its name from Section 401 of the CWA, also assists with Compliance and Enforcement issues and manages DWR’s mitigation oversite programs: Stream & Wetland Mitigation Program and Nutrient Offset & Buffer Mitigation Program. DWR works with the USACE to provide regulatory oversight to North Carolina wetland and stream compensatory mitigation through participation in the Interagency Review Team (IRT). The Transportation Permitting Branch works with the NC Department of Transportation (DOT) and local municipalities on transportation- related projects. The branch reviews 401 certificate applications and on-site permittee-responsible wetland and stream mitigation plans associated with transportation projects. For larger, more complex DOT projects, DWR, the USACE, and other resources agencies work with DOT through the Merger process, which

streamlines the permitting process. Both branches maintain active and expired 401 certifications on an interactive projects map.

1.4 Division of Coastal Management

The Division of Coastal Management (DCM) protects, conserves and manages North Carolina's coastal resources through planning, permitting, education and research. DCM carries out the NC Coastal Area Management Act (CAMA), the NC Dredge and Fill Act and the Federal Coastal Zone Management Act of 1972 in the 20 coastal CAMA Counties. CAMA counties in the Cape Fear River Basin include Brunswick, New Hanover, Onslow and Pender counties. DCM protects coastal North Carolina resources designated as Areas of Environmental Concern (AECs) through their permitting program with rules established by the Coastal Resources Commission. There are four categories of AECs: (1) the Estuarine and Ocean System, (2) the Ocean Hazard Areas, (3) Public Water Supplies and (4) Fragile Natural Resource Areas.
Most of North Carolina's existing AECs fall into the first two categories. The DCM permitting program issues three types of permits to protect AECs. These include Major, Minor and General permits. Impacts to coastal wetlands as defined by 15A NCAC 07H. 0205 require a CAMA permit in addition to the 401 and 404 permits. So as not to duplicate efforts, DCM generally takes the lead for the state on determining impacts and compensatory mitigation requirements for impacts to coastal wetlands.

1.5 Stormwater Programs

The goal of the NC Division of Energy, Mineral, and Land Resources (DEMLR) stormwater program is to prevent pollution from entering the waters of the state via stormwater runoff. The Stormwater Permitting Program develops, plans and implements statewide stormwater control policies, strategies and rules designated to protect surface waters. The program handles permitting for industrial, municipal and post-construction (development) projects and provides technical assistance to communities, engineers, industry, residents and local governments. Stormwater control programs include those required under NPDES, Post-Construction and Water Supply Watersheds. DEMLR maintains an interactive web-based map to help the public determine whether development activities are subject to the post-construction permitting program or other stormwater permitting requirements. A tutorial and guidance documents are also available for interpreting the map.

North Carolina has 22 NPDES general permits that cover stormwater discharge associated with industrial and construction activities. Industries that are eligible for one of the general permits are issued a Certificate of Coverage (COC). Industries that are not eligible for a general permit are required to obtain an individual permit.

As of May 2022, there are 690 NPDES stormwater and 3,931 state stormwater permits issued in the Cape Fear River Basin (*Table 3-9* and *Table 3-10*). Many of the NPDES stormwater facilities are concentrated in urban areas. State stormwater post-constructed permitted projects are concentrated in the Upper Cape Fear subbasin near Fayetteville and in the lower part of the basin near Wilmington in the Lower Cape Fear and Northeast Cape Fear subbasins (*Figure 3-12* and *Figure 3-13*. Stormwater runoff is a primary carrier of nonpoint source pollution and is a particular concern in agricultural and urban areas. Manmade stormwater conveyances have been constructed throughout the basin to move water quickly off of the

land, bypassing wetlands and vegetative buffers. Consequently, untreated stormwater is entering waterbodies and bringing with it, nutrients, sediment, bacteria and heavy metals. These pollutants impact water quality and can have detrimental impacts on ecological integrity, recreational use and human health. In the case of shellfish growing areas, stormwater often results in closures ranging from days to weeks or, in some cases, permanent closure. A complete list of stormwater permits can be found in the Appendix.

Table 3-9: NPDES and State Stormwater Facility by HUC8 Subbasin in the Cape Fear River Basin

HUC8	NPDES stormwater[1]		State Stormwater[1]
	Permitted Facilities	Number of Outfalls	Permitted Projects
3030002	202	431	49
3030003	146	250	30
3030004	130	247	407
3030005	76	133	1,516
3030006	57	113	104
3030007	79	124	1,825
Total	**690**	**1,298**	**3,931**

[1]Active and expired permitted facilities and associated permit data were queried from the NC DWR Basinwide Information Management System (BIMS) in May 2022. Expired permits remain in effect until a renewed permit is issued by DWR.

Table 3-10: Permitted NPDES Stormwater Facilities in the Cape Fear River Basin

Permit Type	Permitted Facilities[1]	Number of Outfalls[1]
Air Transportation Stormwater Discharge COC	13	22
Apparel/Printing/Paper/Leather/Rubber Stormwater Discharge COC	24	51
Asphalt Paving Mixture Stormwater Discharge COC	31	39
Compost Operations Stormwater/Wastewater Discharge COC	6	10
Food/Tobacco/Soaps/Cosmetics/ Public Warehousing Stormwater Discharge COC	66	150
Furniture and Fixtures Stormwater Discharge COC	2	4
Landfill Stormwater Discharge COC	16	61
Metal Fabrication Stormwater Discharge COC	50	85
Mining Activities Stormwater Discharge COC	70	118
Municipal WWTP > 1MGD, Stormwater Discharge, COC	26	78
Paints, Varnishes, Lacquers Stormwater Discharge COC	3	8
Ready Mix Concrete Stormwater/Wastewater Discharge COC	68	84

Permit Type	Permitted Facilities[1]	Number of Outfalls[1]
Ship and Boat Building Stormwater Discharge COC	10	11
Stone, Clay, Glass, and Concrete Products Stormwater Discharge COC	23	54
Stormwater Discharge, Individual	41	146
Stormwater Discharge, Individual (MS4)	26	37
Textile Mill Products Stormwater Discharge COC	16	28
Timber Products Stormwater Discharge COC	46	91
Transportation w/Vehicle Maintenance/Petroleum Bulk/ Oil Water Separator Stormwater Discharge COC	101	138
Used Motor Vehicle Parts Stormwater Discharge COC	25	35
Wholesale Trade of Metal Waste and Scrap Stormwater Discharge COC	17	23
Wholesale Trade of Non-metal Waste and Scrap Stormwater Discharge COC	10	25
Total	**690**	**1,298**

[1]Active and expired permitted facilities and associated permit data were queried from the NC DWR Basinwide Information Management Systems (BIMS) in May 2022. Expired permits remain in effect until a renewed permit is issued by DWR.

The NPDES Municipal Separate Stormwater Sewer Systems (MS4s) include a system of conveyances used to collect and transport stormwater runoff. NPDES MS4 permits are applicable to discharges of stormwater to surface waters from publicly owned/operated stormwater collection systems and are mandated under the CWA. NPDES MS4 permits are required for every owner/operator of facilities in areas that the US Census Bureau has designated as an urbanized area. Federal urbanized areas are defined as municipalities with populations ≥ 10,000 and a density of 1,000 people per square mile (mi^2). New MS4 permittees are added to the program with each decennial census. This also applies to entities that are designated under state rules (15A NCAC 02H .0151). Per 15A NCAC 02H 0151, the state designation for the MS4 program considers various factors including proximity to urbanized areas, the potential for adverse water quality impacts, the population and/or housing unit density (i.e., population ≥ 10,000 or ≥ 4,000 housing units AND density ≥ 1,000 people per mi^2 or >400 housing units per mi^2), and waiver petitions. In the Cape Fear River Basin 32 MS4 permits have been issued as of May 2022 for 30 municipalities, one university and one Department of Defense (DOD) military installation that are entirely or partially within the basin boundaries. Additionally, the Department of Transportation has a MS4 permit for activities statewide including in the Cape Fear River Basin. During the next several years, the 2020 US Census data will be evaluated and new MS4 designations will likely be made. Subject municipalities will then need to apply for an NPDES MS4 stormwater permit. MS4 Permits in the Cape Fear River Basin include: Apex, Archdale, Benson, Burlington, Carolina Beach, Carrboro, Cary, Chapel Hill, Durham, Elon, Fayetteville, DOD - Fort Bragg, Fuquay-Varina, Gibsonville, Graham, Greensboro, Haw River, High Point, Holly Springs, Hope Mills, Jamestown, Kernersville, Kure Beach, Leland, Mebane, Morrisville, Navassa, Oak Island, Spring Lake, Swepsonville, University of North Carolina Chapel Hill and Wilmington. *Table 3-11* shows MS4 permits issued by HUC8 subbasin.

Table 3-11: Cape Fear MS4 Permits Issued by HUC8 (May 2022).

HUC8	Subbasin Name	Number of MS4 Permittees*	MS4 Permittee Names
03030002	Haw River	16	Apex, Burlington, Carrboro, Cary, Chapel Hill, Durham, Elon, Gibsonville, Graham, Greensboro, Haw River, Kernersville, Mebane, Morrisville, Swepsonville and University of North Carolina Chapel Hill.
03030003	Deep River	5	Archdale, Greensboro, High Point, Jamestown and Kernersville
03030004	Upper Cape Fear River	7	Apex, Fort Bragg, Fayetteville, Fuquay-Varina, Holly Springs, Hope Mills and Spring Lake.
03030005	Lower Cape Fear River	7	Carolina Beach, Hope Mills, Kure Beach, Leland, Navassa, Oak Island and Wilmington
03030006	Black River	1	Benson
03030007	Northeast Cape Fear River	1	Wilmington

*Some MS4 communities are located in more >1 subbasin. NCDOT has an MS4 permit that is active in every subbasin and not included in the subbasin MS4 permittee total.

Figure 3-12: NPDES Stormwater Facilities

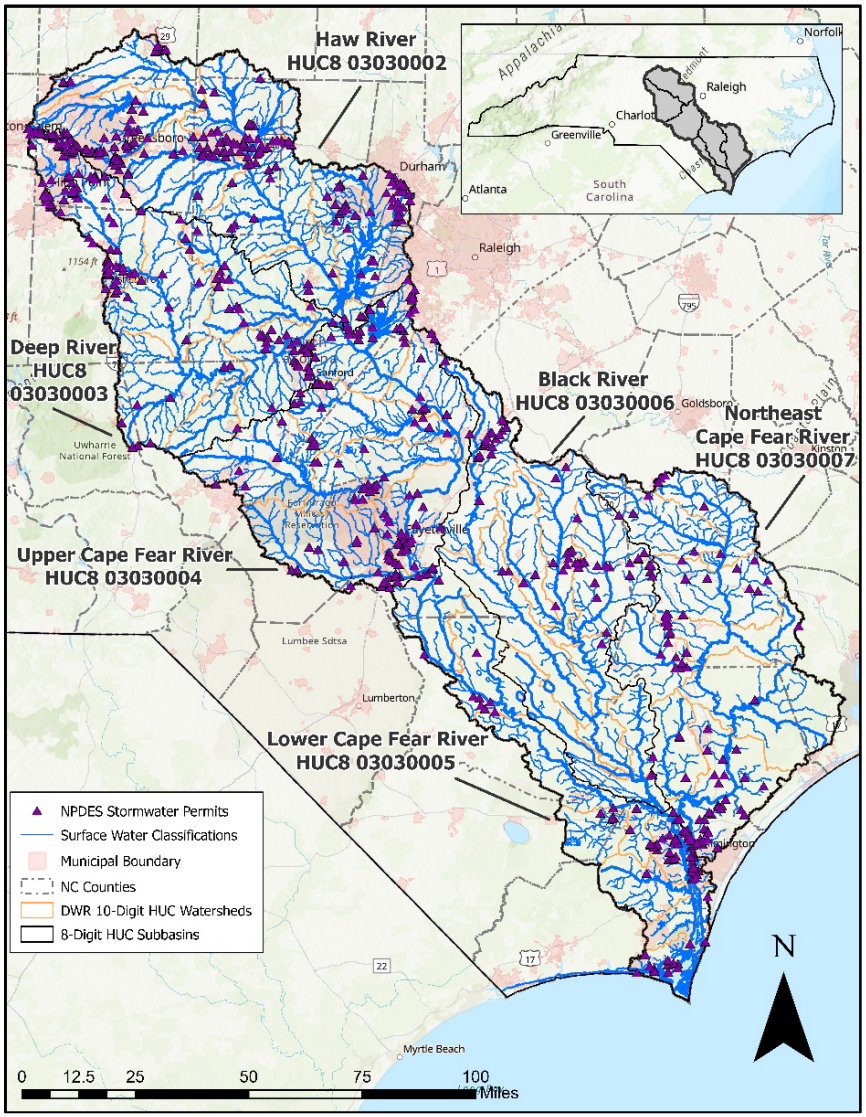
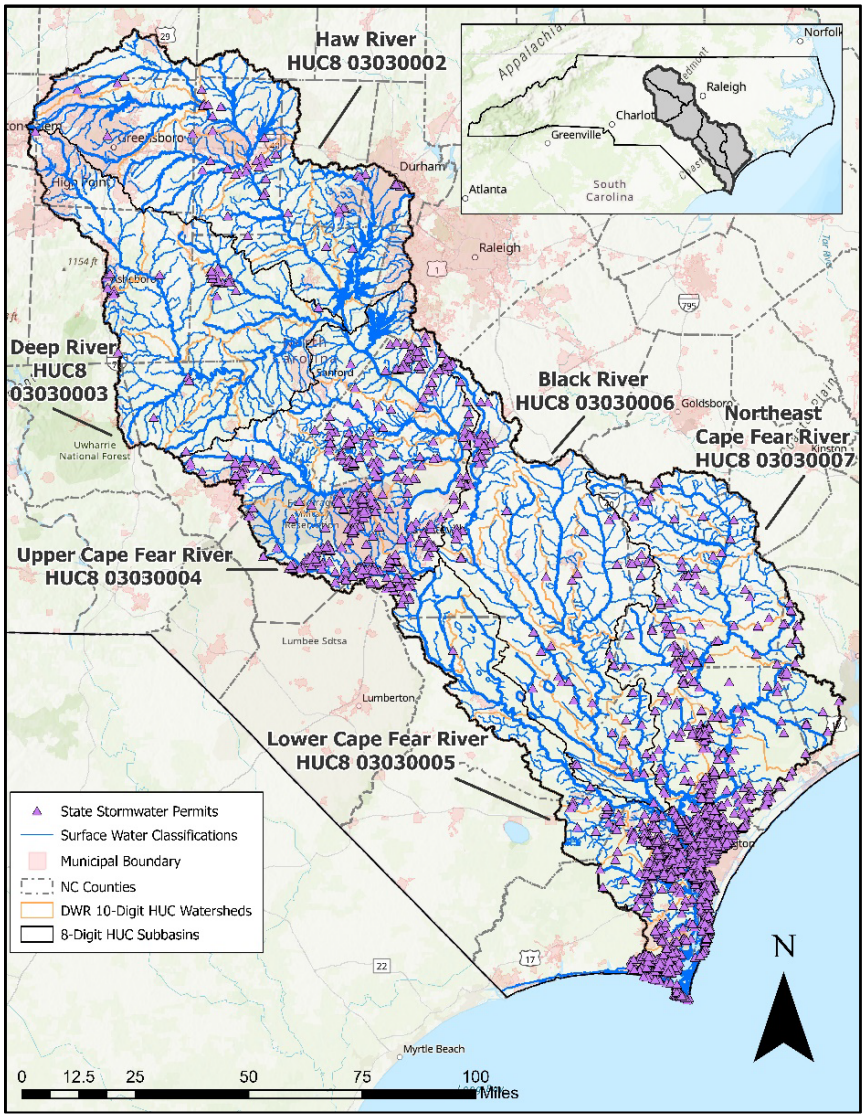


Figure 3-13: State Stormwater Facilities



1.6 Animal Operations

DWR's Animal Feeding Operations (AFO) Program is responsible for permitting and compliance activities of animal feeding operations across the state. Animal operations are defined under General Statute 143.215.10B as feedlots that have more than 250 swine, 100 confined cattle, 75 horses, 1,000 sheep or 30,000 confined poultry with a liquid waste management system. Most permitted animal operations in North Carolina are covered under a general permit. The general permit contains the required performance standards, operation and maintenance requirements, monitoring and reporting requirements, policy for inspections and entry to farms, general conditions, and penalty policy. Each general permit is issued with a Certificate of Coverage (COC) that is specific to the permittee and designates the permitted number and type of animals allowed.

All permitted animal operations are required to have a Certified Animal Waste Management Plan (CAWMP). The CAWMP is incorporated into the general permit issued by DWR by reference and defines the fields to which waste is land applied, crops to be grown, and other site-specific details about the operation. All waste must be applied at no greater than agronomic rates (an amount that can be used productively by the crops that are planted) (General Statute 143-215.10C). Permitted animal operations are inspected annually for compliance.

As of May 2022, there are 1,188 permitted animal operations in the Cape Fear River Basin (*Table 3-12*). Statewide, there are 2,247 permitted AFOs. The majority of the AFOs in the Cape Fear River Basin are located in the Black and the Northeast river subbasins and account for nearly half of all permitted AFOs statewide (*Figure 3-14*, *Figure 3-15*). A complete list of animal permits in the basin can be found in the appendix.

Table 3-12: Permitted Animal Feeding Operations in Cape Fear River Basin (May 2022)

Permit Type	Permitted Facilities[1]	Allowable Count[1]	Allowable Live Weight (lb) [1]	Number of Lagoons / Waste Ponds[1]
Haw River HUC8 03030002				
Animal Individual State	7	360	450,000	4
Cattle State COC	12	3,721	4,651,300	17
Swine State COC	4	5,976	903,510	8
Total	**23**	**10,057**	**6,004,810**	**29**
Deep River HUC8 03030003				
Animal Individual State	4	2,366	1,358,680	4
Cattle State COC	13	15,859	18,405,850	20
Swine State COC	18	66,425	10,638,646	42
Total	**35**	**84,650**	**30,403,176**	**66**

Permit Type	Permitted Facilities[1]	Allowable Count[1]	Allowable Live Weight (lb) [1]	Number of Lagoons / Waste Ponds[1]
Upper Cape Fear River HUC8 03030004				
Animal Individual State	2	9,750	1,316,250	3
Swine State COC	13	61,167	9,164,639	27
Total	**15**	**70,917**	**10,480,889**	**30**
Lower Cape Fear River HUC8 03030005				
Animal Individual State	4	19,142	3,422,132	3
Swine NPDES COC	1	5,880	793,800	1
Swine State COC	54	267,630	42,494,674	140
Total	**59**	**292,652**	**46,710,606**	**144**
Black River HUC8 03030006				
Animal Individual State	8	90,580	13,251,340	18
Cattle State COC	1	1,408	1,971,200	2
Swine NPDES COC	1	2,880	388,800	1
Swine State COC	488	2,516,616	324,391,521	1,073
Total	**498**	**2,611,484**	**340,002,861**	**1,094**
Northeast Cape Fear River HUC8 03030007				
Animal Individual State	14	101,921	12,672,755	18
Swine NPDES COC	3	13,464	1,817,640	4
Swine State COC	541	2,331,876	301,416,411	865
Total	**558**	**2,447,261**	**315,906,806**	**887**
Cape Fear River Basinwide Total				
Animal Individual State	39	224,119	32,471,157	50
Cattle State COC	26	20,988	25,028,350	39
Swine NPDES COC	5	22,224	3,000,240	6
Swine State COC	1,118	5,249,690	689,009,401	2,155
Basinwide Total	**1,188**	**5,517,021**	**749,509,148**	**2,250**

Certificate of Coverage (COC)

[1]Permit data were queried from the DWR Basinwide Information Management System (BIMS) in May 2022.

[2]Allowable Count is the maximum number of individual animals allowed in the facility/farm at any one time.

[3]Allowable Live Weight represents the total pounds of animal biomass present on the farm, calculated by applying a conversion factor to the number of animals based on USDA-NRCS guidelines based on animal type and life stage of the animals grown.

Figure 3-14: Permitted Animal Feeding Operations

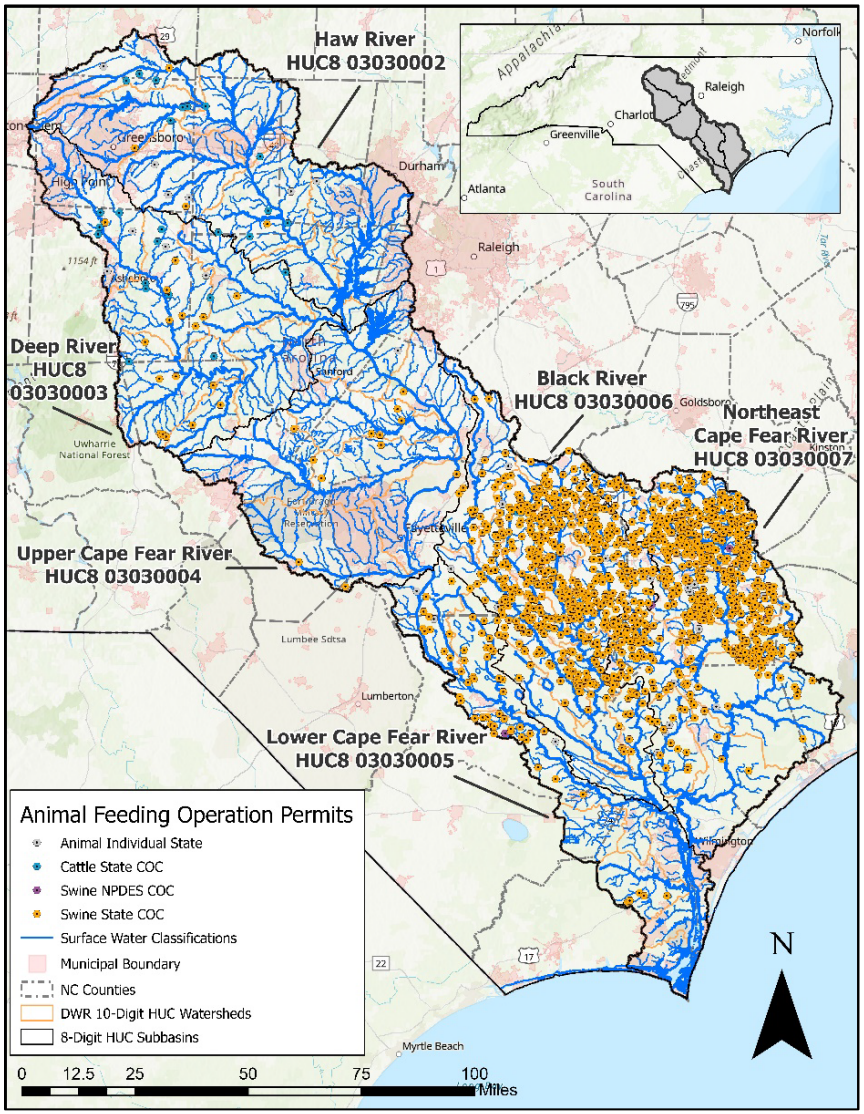
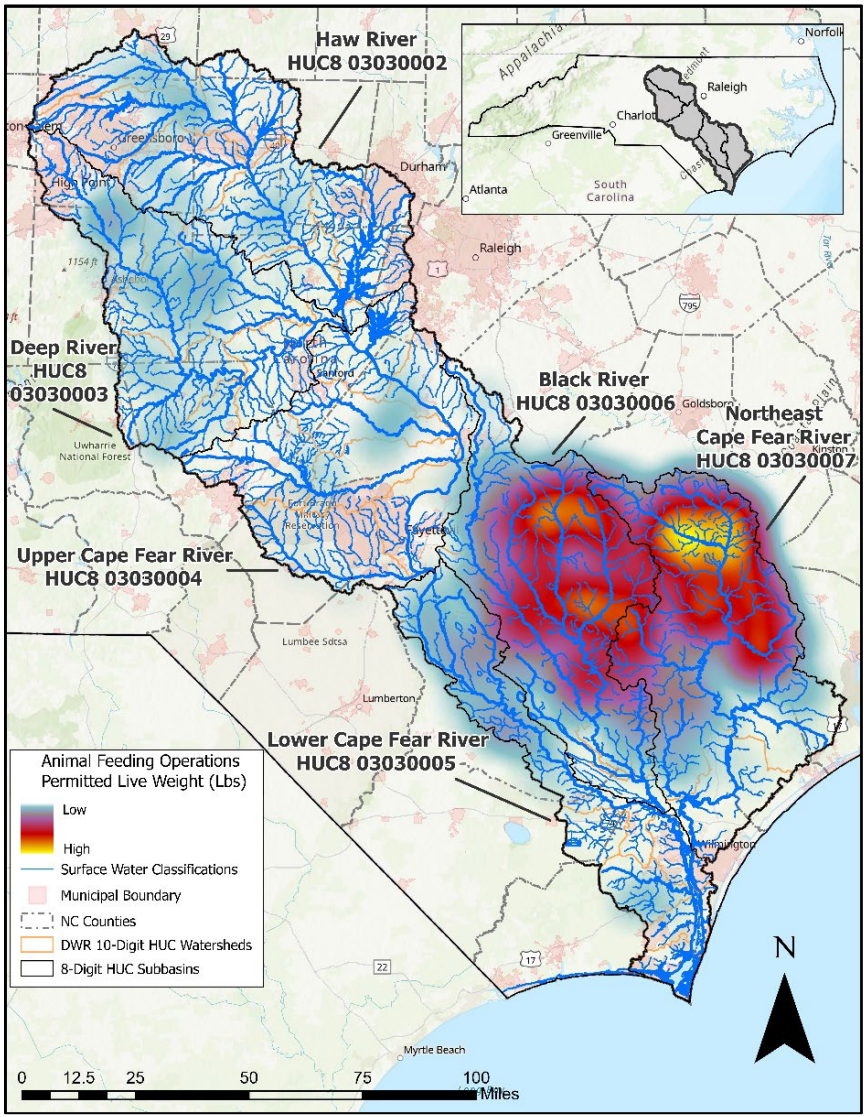


Figure 3-15: Permitted Allowable Weight



In July 2021, the North Carolina General Assembly passed the Farm Act of 2021 (Session Law 2021-78). Section 11 of the act required DEQ to develop a General Permit for facilities that construct and operate a farm digester system. The term "farm digester system" means “a system, including all associated equipment and lagoon covers, by which gases are collected and processed from an animal waste management system for the digestion of animal biomass for use as a renewable energy resource. A farm digester system shall be considered an agricultural feedlot activity within the meaning of "animal operation" and shall also be considered a part of an "animal waste management system" as those terms are defined in G.S. 143-215.10B” [G.S. 143-213(12a)]. The new general permit for digesters includes all of the existing and enforceable requirements of the 2019 State General Animal Waste Management Permits, including developing and maintaining a CAWMP and complying with setbacks, testing, inspections and reporting requirements. The specific provisions of the new general permits for digester systems were determined during permit development, which included a comprehensive public process. Information on the stakeholder sessions, public meetings and public engagement are available online. As of July 31, 2023, 11 digester permits have been issued in the Cape Fear River Basin. These 11 farm digester systems were permitted and installed on existing swine operations.

In addition to permitted animal operations, there are many animal operations that are considered deemed permitted. Operations that are deemed permitted have fewer animals than what the state requires to obtain a permit or they have a waste management system that does not require a state or federal permit. Under North Carolina Administrative Code (NCAC) 15A NCAC 02T .1303, “deemed permitted” is defined as “a facility that is considered to have a needed permit and to be in compliance with the permitting requirements of General Statute 143-215.1(a) even though it has not received an individual permit for its construction or operation.”

Most poultry operations in North Carolina use a dry waste management system. Because of this, they are considered deemed permitted under current statutes and are often referred to as dry litter poultry operations. Per agricultural statistics and the North Carolina Poultry Federation, poultry is one of the top agricultural industries in North Carolina, ranking second in the nation for total turkey production and third in the nation for total poultry production (Poultry Federation, 2021). According to the 2022 USDA Census of Agriculture, 2,464 chicken operations (broilers, layers, pullets and roosters) reported an inventory of 76 million birds and 284 turkey operations reported an inventory of 6.4 million birds in counties located the Cape Fear River Basin (inventories are measured as of December 31 of the Census year). Duplin, Sampson and Randolph counties reported the highest number of chickens (22 million, 19.2 million and 10.9 million, respectively) while Sampson County reported the highest number of turkeys (3.3 million) (USDA, 2022). More information about the USDA Census of Agriculture including total animal numbers reported for swine, cattle and row crops can be found in Appendix 1.

Owners or operators of dry litter poultry operations with 30,000 or more birds are required to adhere to rules set forth under 15A NCAC 02T .1303 and General Statute 143-215.10C (*Table 3-13*). These requirements include minimum stream setbacks, testing and land application rates. This information is included in a waste utilization plan (WUP) (also known as a nutrient management plan (NMP)). Per statute, records must be maintained on the farm for three years. Records must include the type, amount, soil and waste analysis and location of where waste is land applied. The WUPs (NMPs) are not submitted to DWR for review.

Table 3-13: Federal and State Rules and Regulations for Animal Feeding Operations

Federal	State	
	Animal Feeding Operations (AFO): Swine, Cattle, Wet Poultry	**Deemed Permitted Animal Operations: Dry Litter Poultry Operations**
Confined Animal Feeding Operations (CAFOs) are required to obtain NPDES permit if discharge to waters of the US (40 CFR 122.23).	**15A NCAC 02T .1305: NPDES Permitting Requirements.** Applies to animal waste management systems subject to regulations.	**15A NCAC 02T .1305: NPDES Permitting Requirements.** Applies to animal waste management systems subject to regulations.
States can be granted the authority to designate AFOs as CAFOs for permitting (40 CFR 123.25)	**143-215.10C: Applications and permits for animal waste management systems.** **15A NCAC 02T .1304: State Permitting Requirements.** Applies to animal waste management systems that meet the definition of an animal operation (more than 250 swine, 100 confined cattle, 75 horses, 1,000 sheep, or 30,000 confined poultry with a liquid waste management system). • Waste Utilization Plan (WUP) developed by a Certified Technical Specialist and submitted to DWR. • Apply waste at agronomic rates. • 25-foot setback from perennial waterbodies for land application. • Soil test every three years. • Manure storage has specific requirements and management measures. • Annual inspections by DWR.	**143-215.10C: Applications and permits for animal waste management systems.** **15A NCAC 02T .1303: Permitting by Regulation.** Applies to deemed permitted operations (animal operations that do not meet the criteria of an animal operation). Poultry operations with more than 30,000 birds and have dry litter waste must: • Develop and maintain a Waste Utilization Plan (WUP) (Nutrient Management Plan). Recommended but not required that the WUP be developed by a Certified Technical Specialist. Not submitted to DWR. • Apply waste at agronomic rates. • 25-foot setback from perennial waterbodies for land application. • Cannot be stockpiled within 100 feet of perennial waterbodies or wells. • Soil test every three years. • Stockpiled litter shall not be left uncovered for 15 days. • No routine inspections.

Regardless of permit status, there are statutes and rules in place that require that the application of animal waste be made at agronomic rates. Per statute, nitrogen shall be the rate-determining nutrient, but phosphorus shall also be evaluated according to the nutrient management measure approved by NCDA&CS and NRCS. In cases where phosphorus needs to be limited, phosphorus shall be the rate-determining nutrient (General Statute 143-215.10C). If not effectively utilized by vegetation, nutrients (nitrogen and phosphorus) can enter surface water by atmospheric deposition, groundwater transport and stormwater runoff. Fecal material or bacteria can also be transported to nearby waterbodies during rain events. Research from North Carolina State University (NCSU) estimates that the amount of nitrogen utilized by plants is generally between 30% and 75% of the applied nitrogen and will vary depending on the crop and soil types, as well as the season (Osmund, 2018). Excess nutrients and bacteria in surface water can impact aquatic ecosystems. It can also impact the type and amount of treatment required to

ensure that water is safe for human consumption. The same impacts can often be seen downstream of improperly managed non-discharge application sites.

Due to the cost of hauling liquid or solid waste long distances, cattle and swine wastes are mostly applied to fields near where the waste is generated. Consequently, growers supervising cattle or swine production typically oversee the application of waste generated from their operation on nearby agricultural land owned or leased for this purpose. Dry litter poultry waste, however, is less costly to haul, which makes it a popular organic fertilizer, especially during periods of high inorganic fertilizer cost. Dry litter poultry waste produced in North Carolina can be removed from the place of generation by third-party haulers. As a result, dry litter poultry waste may be applied further afield, possibly outside of the watershed where it is generated. Manure haulers that annually carry or land apply more than 100 tons of animal waste must register their manure hauling operation and submit annual reports to DWR. Manure haulers are defined in 15A NCAC 02T 1400 as "any person who accepts or purchases animal waste and land applies the animal waste on land not covered by the generator's permit." As of October 2022, there were a total of 75 manure hauler certificates (MHC) issued statewide by DWR, 19 are held by individual operators or companies in counties located in the Cape Fear River Basin.

Between 2015 and 2022, a total of sixty-four (64) permitted AFOs had violations that proceeded to enforcement cases in the Cape Fear River Basin. These enforcement cases included: three (3) in the Haw River subbasin, two (2) in the Deep River subbasin, eight (8) in the Lower Cape Fear River subbasin, thirty-seven (37) in the Black River subbasin, and fourteen (14) in the Northeast Cape Fear River subbasin. A full list of these enforcement cases is included in the appendix. Additional information about Agricultural Complaint Data can be found online. Individual enforcement cases can be found in Laserfiche. DEQ's enforcement process will be used to address ongoing violations.

Understanding the impacts from large-scale waste application on water quality, recreational opportunities and public health can be challenging due to minimal monitoring in the watersheds or counties in which the waste is generated and land applied. Information about and amount of animal and treated municipal (or biosolids) waste that is land applied could be mutually beneficial to several resource agencies. It could help DWR develop a meaningful stream-based monitoring program to assess nutrients, turbidity, and fecal coliform bacteria. It could also help local resource agencies target BMP implementation. To do this, however, more water quality monitoring and assessment is needed to determine the extent and source of the waste. More data could also help DEQ lead an interagency workgroup made up of water quality professionals, the agricultural community, database managers, and interested community members to

- Study the existing regulatory framework regarding deemed permitted animal operations
- Study potential technological solutions for addressing animal waste, especially dry litter poultry waste
- Review existing oversight and noncompliance issues
- Explore methods on how best to manage data collection (farm of origin, disposal method/movement, land application rates)
- Identify water quality monitoring stations to collect instream data

- Work with existing agricultural committees to review manure transport incentives and waste management BMPs
- Inform the rules readoption process that should begin during fiscal year 2024-2025. Rules related to AFOs and animal waste management are scheduled to be completed by 2028.

1.7 Water Use

1.7.1 Public Water Systems

It is the responsibility of DWR's Public Water Supply Section (PWSS) to regulate public water systems (PWS) within the state under the authority of General Statute 130A Article 10: North Carolina Drinking Water Act. Public water systems (PWS) are those that provide piped drinking water to 15 or more service connections or 25 or more people for 60 or more days per year (*Table 3-14*). A PWS is identified by the number of people served or number of connections and the number of days or months of the year that the population is served. There are 844 PWSs located in the Cape Fear River Basin with the majority using groundwater sources. (*Table 3-14*).

Table 3-14: Types of Public Water Supply Systems (PWS) (2021)

Public Water Supply (PWS) Type	Source Water	Number	Total	Description
Community	Groundwater	258	279	Regularly serves 25 or more year-round residents or has 15 or more connections. Examples include subdivisions, mobile home parks, prisons and assisted living centers.
	Surface Water	19		
	Groundwater and Surface Water	2		
Adjacent	Groundwater	27	27	Two or more water systems that are adjacent and are owned or operated by the same supplier of water and that together serve 15 or more service connections or 25 or more persons. An example of an adjacent water system is adjoining mobile home parks that together meet the community water system definition.
Transient Non-Community	Groundwater	453	453	Serves 25 or more people at any given time at least 60 days per year. Examples include restaurants, gas stations, rest areas and campgrounds.
Non-Transient, Non-Community	Groundwater	82	85	Serves at least 25 of the same persons, 6 or more months per year. Examples include schools, daycares and industries.
	Surface Water	3		
Total PWS		**844**		

1.7.2 Surface Water Protection Planning Rule and Surface Water Protection Program

On January 1, 2019, a new rule went into effect that mandates source water protection (SWP) planning for all public water supply systems that treat and supply water from surface sources. Prior to rule adoption, SWP planning in North Caroline was voluntary (additional information can be found in the SWP Planning Brochure). The new and expanded SWP planning model includes proactive activities to identify and reduce the risk of contamination, with additional emphasis on reactive emergency response mechanisms. Although SWP planning does not guarantee the absence of contamination, it is an important step for a utility to assess vulnerabilities and to identify strategies that could better protect public health.

- Source Water Protection Planning Rule (15A NCAC 18C .1305) - Effective April 1, 2020
- SWRRP Certification Form
- Information on Potential Contaminant Source (PCS) Data Sets

Surface water refers to the streams, rivers and lakes that are used as sources of public drinking water. In North Carolina, more than 4 million residents rely on surface water for safe and reliable drinking water. Our state's surface waters face a variety of threats, including agriculture pressures, stormwater runoff, development and emerging contaminants. The North Carolina Surface Water Protection Program serves the state by initiating proactive protection strategies to identify and mitigate these threats. DWR works in partnership with a variety of other agencies and programs to promote local drinking water protection in local communities all across North Carolina. As of 2023, the Cape Fear Public Utility Authority has an approved SWP plan.

1.7.3 Source Water Assessment Program (SWAP)

Pollution prevention is recognized as the most effective approach for ensuring a reliable, long-term and safe public drinking water supply. The Safe Drinking Water Act (SDWA) amendments of 1996 required that all states establish a Source Water Assessment Program (SWAP). SWAP allows the state to systematically identify potential contaminants and delineate source water protection areas by using existing data from established federal and state environmental programs.

The primary goal of SWAP is to protect public drinking water supplies. Detailed assessments of all public drinking water intakes are available for review and can be used as a planning tool to protect public drinking water sources. An interactive map is also available which provides general information about the water source and its susceptibility rating. The susceptibility rating is based on a contaminant rating and an inherent vulnerability rating and indicates the potential for a drinking water source to become contaminated. It should be noted that the susceptibility rating is not an indicator of water quality, but rather, the potential for a water source to be impacted by the identified contaminants within the assessment area.

1.7.4 Wellhead Protection (WHP) Program

In 1986, amendments to the Safe Drinking Water Act (SWDA) established requirements for states to develop Wellhead Protection (WHP) programs. WHP programs were intended by Congress to be a key part of a national groundwater protection strategy to prevent contamination of groundwater used for public drinking water supplies. In North Carolina, development of a local WHP plan is not mandatory but is encouraged and viewed as a valuable supplement to existing groundwater protection programs. North

Carolina's program is intended for city and county governments and water supply operators who wish to provide added protection to their local groundwater supplies. The WHP plan identifies the wellhead protection area (WHPA). A WHPA is defined as "the surface and subsurface area surrounding a water well or wellfield, supplying a public water system, through which contaminants are reasonable likely to move toward and reach such water well or wellfields." Once implemented, the WHP plan reduces, but does not eliminate, the susceptibility of wells to contaminants.

1.7.5 Local Water Supply Plans (LWSP)

Under General Statute 143-355(l), local governments that provide public water service are required to prepare Local Water Supply Plans (LWSP). All community water systems that have 1,000 or more service connections or serve more than 3,000 people on a regular basis are also required to prepare a LWSP. The LWSP is an assessment of a water system's current and future water needs and its ability to meet those needs. By understanding current and future needs, local governments and community systems will be better able to manage water supplies, plan for future growth, and prepare for system improvements. Data in the LWSP is entered by the Public Water Supply System (PWSS) and includes information about population, population projections, water supply and demand. The PWS reports water usage annually to DWR and updates the LWSP at least every five years. In 2020, 122 public water supply (PWS) systems are required to submit a local water supply plan (LWSP) to DWR in the Cape Fear River Basin Combined, these systems provided approximately 201.7 MGD to an estimated service population of 1,930,047 in 2020. More information about LWSPs can be found in Chapter 5.

1.7.6 Central Coastal Plain Capacity Use Area (CCPCUA)

In 2002, North Carolina designated 15 counties as the Central Coastal Plain Capacity Use Area (CCPCUA) to manage water withdrawals under the authority of the Water Use Act of 1967. The CCPCUA and associated rules were approved by the Environmental Management Commission (EMC) to closely monitor and manage water withdrawals in the designated 15-county area. Duplin and Onslow counties and the very small sections of Wayne, Jones and Lenoir counties located in the Cape Fear River Basin are subject to rules associated with CCPCUA. CCPCUA rules require groundwater users of more than 100,000 gallons per day (GPD) acquire a permit and report daily water usage monthly. Surface and groundwater users of over 10,000 GPD must be registered and must report water use annually. The CCPCUA program is managed by the Groundwater Resources Branch (GWRB) in DWR. More information about CCPCUA can be found in Chapter 5.

1.7.7 Water Withdrawal & Transfer Registration (WWATR)

General Statute 143-215.22H requires that any non-agriculture person or entity who withdraws 100,000 gallons or more of water per day from surface water or groundwater or who transfers 100,000 gallons or more of water per day from one river basin to another register the withdraw or transfer with the EMC. Any agricultural water users that withdraw or transfer 1,000,000 gallons or more of surface water or groundwater per day must also register the withdrawal or transfer. The withdrawal or transfer can be registered through the Water Withdrawal & Transfer Registration (WWATR) program administered through DWR. Under administrative rule (15A NCAC 02E .0604), registrants must report monthly average water use in million gallons per day (MGD) on an annual basis. In 2020, 169 facilities reported to the Water Withdrawal and Transfer Registration program in the Cape Fear River Basin. Combined, these facilities

withdraw an annual daily average of 1498.011 MGD from 346 different surface water (SW) and groundwater (GW) sources. More information about WWATR can be found in Chapter 5.

1.7.8 Interbasin Transfer (IBT) Certification

The North Carolina Legislature adopted the Regulation of Surface Water Transfers Act (NCGS §143-215.22L) in 1993. The intent of the law is to regulate large surface water transfers between river basins by requiring a certificate from the Environmental Management Commission (EMC). NCGS §143-215.22G established 38 interbasin transfer (IBT) basins. Due to updated NC Session Law 2025-77, the Haw River and Deep River have collapsed into the Cape Fear River Basin and the Contentnea Creek has collapsed into the Neuse River Basin. An IBT certificate is required for a transfer greater than 2.0 million gallons per day (MGD) between any of the defined IBT river basins. Across North Carolina, there are approximately 133 PWS systems known to transfer surface water across IBT river basins. There are approximately 38 systems that transfer less than 100,000 gallons per day (GPD), 68 systems that transfer between 100,000 GPD and 1.0 MGD, and 27 systems that transfer more than 1.0 MGD. Eleven of those 27 systems are regulated under the nine IBT certificates issued by the EMC. Ten water systems exceed the 2.0 MGD threshold that requires an IBT certificate, but have a pre-existing transfer (i.e., grandfathered) allowance for the surface water transfer because their system infrastructure existed or was under construction prior to July 1, 1993 (as established in NCGS §143-215.22L). Six systems are transferring between 1.0 and 2.0 MGD. Surface water movement between statutorily-defined IBT basins by water systems or other entities that do not meet the threshold for an IBT certificate are commonly referred to simply as a "surface water transfer."

Due to the time and effort required to obtain a certificate and the associated federal and state permits, water managers generally consider a long-range planning window (e.g., 30 years or more) for calculating projections for water demand and population. There can also be a significant cost investment to upgrade existing or new infrastructure needed to transfer and treat additional water supplies. IBT certificates must also include any conditions necessary to ensure that the detriments of a water transfer will be mitigated to the maximum degree practicable. There have been many revisions to the original statute; currently, the requirements and process for obtaining IBT certificates falls under G.S. 143-215.22L as per SL 2007-518 (House Bill 820). The process for obtaining an IBT certificate under G.S. 143-215.22L can take 3-5 years and provides a number of opportunities for public comment (K. Nimmer, pers. comm. 2018). The full process is described in the DWR's Regulation of Surface Water Transfers Statutory Guidance.

As of 2022 there are four IBT certificates regulating large surface water transfers in the Cape Fear River Basin. The first was issued in 1991 to the Piedmont Triad Regional Water Authority (PTRWA) under previous statutes (NCGS § 162A-7 and § 153A-285). Because the certificate was issued under previous statutes, PTRWA is not required to submit annual reports to DWR. Three IBT certificates have been issued under the current statutes and include Brunswick County (2013), Wake County (Cary, Apex, Morrisville) (2013) and Pender County (2018). More detailed information about IBTs in the Cape Fear River Basin can be found in the Water Quantity Assessment and Planning chapter (Chapter 5, Section 5.12; Figure 5-16, Figure 5-32 and Table 5-11). General IBT information and an IBT river basin map is available here.

1.8 Division of Waste Management

The NC Division of Waste Management (DWM), under DEQ, regulates solid and waste disposal, hazardous waste management, underground storage tanks and Superfund cleanups. The primary purpose of DWM is to protect public health and the environment by assuring that solid and hazardous wastes and underground storage tanks (UST) are managed properly, and that existing contamination is cleaned up. DMW has four programs that focus on the task of contamination clean-up: Hazardous Waste, Solid Waste, Superfund, and Underground Storage Tank. Additionally, DWM manages the Brownfields program, which focuses on the redevelopment of abandoned, idle and/or under-utilized sites (NCDWM n.d.). NC DWM has recently developed a Site Locator Tool to provide public access to the sites that DWM manages, permits and tracks. The Site Locater Tool maps DWM sites and provides querying capabilities. *Table 3-15* shows the waste management query results as of July 2022 for the Cape Fear River Basin and HUC8 subbasins (NC DWM, n.d.).

1.8.1 Brownfields

The Brownfields program is authorized by the state Brownfields Property Reuse Act and provides a mechanism to treat prospective developers of brownfield sites differently than the parties who were responsible for the contamination. At the heart of the program is the "brownfields agreement," prospective developers of a brownfield property agree to perform actions deemed essential by DEQ to make the property suitable for reuse. In return, DEQ agrees to limit the liability of the prospective developer to those described in the agreement. There are 221 Brownfield sites in the Cape Fear River Basin, and the majority appear to be near urban centers (NC DWM, n.d.).

1.8.2 Hazardous Waste

The primary purpose of the Hazardous Waste program is to ensure the safe management of hazardous waste in North Carolina through the prevention and reduction of released hazardous substances and clean-up of contaminated sites. There are 642 active hazardous waste sites in the Cape Fear River Basin, and like Brownfields, these sites tend to be located closer to urban areas (NC DWM, n.d.).

1.8.3 Solid Waste

The Solid Waste program regulates the safe management of solid waste through guidance, technical assistance, regulations, permitting, environmental monitoring, compliance evaluation and enforcement. Facilities in the Solid Waste program include municipal solid waste, industrial waste, construction and demolition waste, land-clearing waste, scrap ties, medical waste, compost and septage. Solid waste facilities are scattered throughout the basin, many are near urban centers. There are 1,048 solid waste facilities permitted in the Cape Fear River Basin (NC DWM, n.d.). This does not include Closed Coal Ash Structures.

1.8.4 Underground Storage Tanks

The Underground Storage Tanks (UST) program manages USTs as well as non-UST releases (including petroleum, aboveground storage tanks [AST] and other petroleum releases), and Ex Situ Petroleum Contaminated Soil Remediation Permits. This program issues permits, collects annual fees and handles requests for information on regulated and/or commercial USTs. Compliance with all relevant state and federal laws, policies, rules and regulations are maintained through assisting owners and operators in

complying with operational standards. This program also oversees the permanent closure activities of UST systems and corrective actions required to address spills and releases from USTs. There are 1,792 active UST facilities in the Cape Fear River Basin. Facilities are found both in rural and urban areas throughout the basin. There are 39 Petroleum Contaminated Soil Remediation sites scattered in the basin (NC DWM, n.d.).

1.8.5 Superfund

The purpose of the Superfund program is to investigate, prioritize, monitor and remediate uncontrolled and unregulated hazardous substance and waste disposal sites in North Carolina. The Superfund program deals with Inactive Hazardous Sites, special remediation sites that address contamination at dry cleaner sites, and federal remediation which is done through cooperative work with the EPA to implement the federal Superfund program. The Superfund program works with local governments to avoid redundancy, share resources, to encourage voluntary cleanups by responsible parties and to find the most timely and cost-effective cleanup approach. The Cape Fear River Basin had 442 inactive hazardous waste sites, 123 known contaminated dry cleaner sites, 133 dry cleaning remediation sites and 18 federal remediation sites. Superfund sites also tend to be concentrated near urban areas (NC DWM, n.d.).

Table 3-15: Division of Waste Management Sites in the Cape Fear River Basin (July 2022)

Section or Program	Program	Haw	Deep	Upper CPF	Lower CPF	Black	Northeast CPF	Cape Fear River Basin Totals
Brownfield	Brownfield Program Sites	117	26	18	30	4	26	**221**
Hazardous Waste	Active Hazardous Waste Sites	296	132	96	48	18	52	**642**
Solid Waste	Permitted Solid Waste Landfills	36	25	48	19	5	6	**139**
Solid Waste	Other Permitted Solid Waste Facilities	9	14	14	4	1	1	**43**
Solid Waste	Land Clearing and Inert Debris (LICD) Notification Facilities	43	23	31	11	4	10	**122**
Solid Waste	Yard Waste Notification (YWN) Facilities	14	3	13	8	2	11	**51**
Solid Waste	Permitted Solid Waste Septage Facilities (SLAS or SDTF)	11	3	7	1	12	17	**51**
Solid Waste	Coal Ash Structural Fills (Closed)	1	0	6	4	0	3	**14**
UST Section	UST Active Facilities	673	324	401	120	119	155	**1,792**
UST Section	UST Incidences	4,240	1,297	1,201	332	286	764	**8,120**
UST Section	AST Incidences	598	264	173	205	83	203	**1,526**
UST Section	Petroleum Contaminated Soil Remediation Permits	6	21	0	2	10	0	**39**
Superfund Section	Federal Remediation Branch Sites	3	0	4	6	0	5	**18**
Superfund Section	Inactive Hazardous Waste Sites	199	67	61	53	12	50	**442**
Superfund Section	Dry Cleaning Remediation Sites	84	14	21	5	2	7	**133**
Superfund Section	Contaminated Dry Cleaning Sites	80	13	18	5	2	5	**123**

1.9 Ambient Water Quality Station Drainage Area Permit Analysis

The proximity, type and amount of a pollutant relative to a waterbody's assimilative capacity will affect water quality. The density of permitted facilities and associated permit structures/fields in a watershed or specific permit conditions, like total NPDES as-built flow, can be used to evaluate potential pollutant sources affecting water quality monitoring results. Permitting information (as of May 2022) from four permit programs were queried and summarized for the drainage areas (DA) at ambient water quality stations located on five mainstem rivers: 1.) Haw River, 2.) Deep River, 3.) Cape Fear River, 4.) Northeast Cape Fear River, and 5.) the Great Coharie to the Black River system. In order to develop a suitable comparison between stations, the station drainage area (DA) (i.e., watershed size) was used to standardize the assessment allowing for a better comparison between permit metric totals for each mainstem station. Permitted as-built flow is the amount of wastewater the treatment plant is designed to discharge on average, not their current yearly average discharge rate. The four permitting program and their metrics are listed below, bolded metrics are graphed in *Figure 3-16* to *Figure 3-35*, and all metrics are available in tabular form in the Appendix.

1.) NPDES Discharge - **total as-built discharge (MGD)**, **total as-built discharge (MGD)/DA Mi^2**, total number of permits,
2.) NPDES stormwater - **total number of permits**, **total number of permits/DA Mi^2**, total number of outfalls,
3.) NPDES non-discharge wastewater and residual solids application - **total field acreage**, **total field acreage/DA Mi^2**, total number of fields,
4.) Permitted Animal Feeding Operations (does not include poultry) – **total allowable weight (lb)**, **total allowable weight (lb)/DA Mi^2**, total head count, total number of lagoons/waste ponds.

The Haw, Deep, Cape Fear, Northeast Cape Fear rivers and the Great Coharie to the Black River system mainstem analyses for the four permit programs are provided in the following sections. The permitting metric totals for each station's DA are cumulative from the upstream station to downstream, however, these totals do not usually increase consistently relative to the size of the drainage area.

1.9.1 Haw River

The Haw River mainstem permit analyses for 11 mainstem stations are displayed in *Figure 3-16* to *Figure 3-19*. NPDES permitted total as-built flow ranges from 0.06 MGD to 146.69 MGD from the upstream station (B0050000) to the downstream station (B4080000; *Figure 3-16*). The total permitted as-built flow has a substantial jump at the fourth station (B1020000), located below Reedy Fork, due to the city of Greensboro's T.Z. Osborne WWTP (NC0047384), permitted for 56 MGD as-built discharge to South Buffalo Creek, a tributary of Reedy Fork. There is also a notable jump at the 10th station (B2100000) below the Jordan Lake confluence. The Jordan Lake watershed includes the permitted as-built discharge flow of several major NPDES dischargers: the Orange County Water and Sewer Authority Mason Farm WWTP (NC0025241) with 14.5 MGD to Morgan Creek, the Durham County Triangle WWTP (NC0026051) with 12 MGD to Northeast Creek, and the City of Durham South Durham WRF (NC0047597) with 20 MGD discharge to New Hope Creek. Standardizing the total permitted as-built discharge flow by station drainage area (DA) results in a peak at that fourth station (B1020000) below the Reedy Fork confluence (0.13 MGD/Mi^2) and discharge from the T.Z. Osborne WWTP. The DA-standardized as-built flow then declines slightly to the eighth station (B1440000), above the Big Alamance Creek confluence, then drops

more notably, overall ranging from 0.04 to 0.13 MGD/ Mi^2 from the first to last station (*Figure 3-16*). *Standardizing the total permitted as-built flow by DA indicates the stations located between Reedy Fork and Big Alamance Creek receive the most influence from NPDES dischargers* (B1020000, B1140000, B1200000, and B1440000).

The NPDES stormwater permits increase from 2 to 198 permits from the upstream station (B0050000) to the downstream station (B4080000; *Figure 3-17*). The DA-standardized stormwater permit numbers have a similar graph pattern as the DA-standardized as-built with the *highest levels between Reedy Fork and Big Alamance Creek indicating those stations receive the most influence from stormwater facilities*. Additionally, half the MS4 communities, 16, are located in the Haw River subbasin.

The non-discharge and residual solids application field acreage ranged from 256 to 6,271 acres from the upstream station (B0050000) to the downstream station (B4080000; *Figure 3-18*). There is a sizeable increase in field acreage lower in the Haw River mainstem watershed at station B210000, located near Pittsboro between the Big Alamance Creek confluence and Jordan Lake. The DA-standardized field acreage ranged from 1.24 to 4.18 acres/Mi^2 and was highest at the last three stations, over 3.7 acres/Mi^2, (B2100000, B4050000, and B4080000) and nearly as high at the first three stations (B0050000, B0170000, and B1020000), above the Reedy Fork confluence. The DA-standardized field acreage indicated these six stations had the most influence from non-discharge and residual solid application field acreage. However, it should be noted that more than 95% of the field acreage are land application of residual solids fields for all stations except the first station (B0050000) and ninth station (B2100000) which had 9% reclaimed water acreage and last two stations (B4050000 and B4080000) which had 19% reclaimed water acreage. Reclaimed water is tertiary treated wastewater that meets specific effluent standards and is used in a beneficial manner for the purpose of conserving the state's water resources.

The AFO allowable weight ranged from seven thousand pounds at the first station (B0050000) to six million pounds at the last station (B4080000) along the Haw River mainstem (*Figure 3-19*). The DA-standardized allowable weight was highest at the first station (B0050000), 8,866 lb/Mi^2, decreased to 4,397 lb/Mi^2 at station B1140000, below the Stoney Creek confluence, then remained fairly consistent for the rest of the stations. The first few stations in the headwaters of the Haw River are influenced the most by AFOs; however, a relative comparison to the other Cape Fear River Basin mainstem station analyses for AFOs using the DA-standardized allowable weight, shows all stations in the Haw River have the least influence from AFOs.

Figure 3-16: Haw River Mainstem Station NPDES Discharge As-built Flow

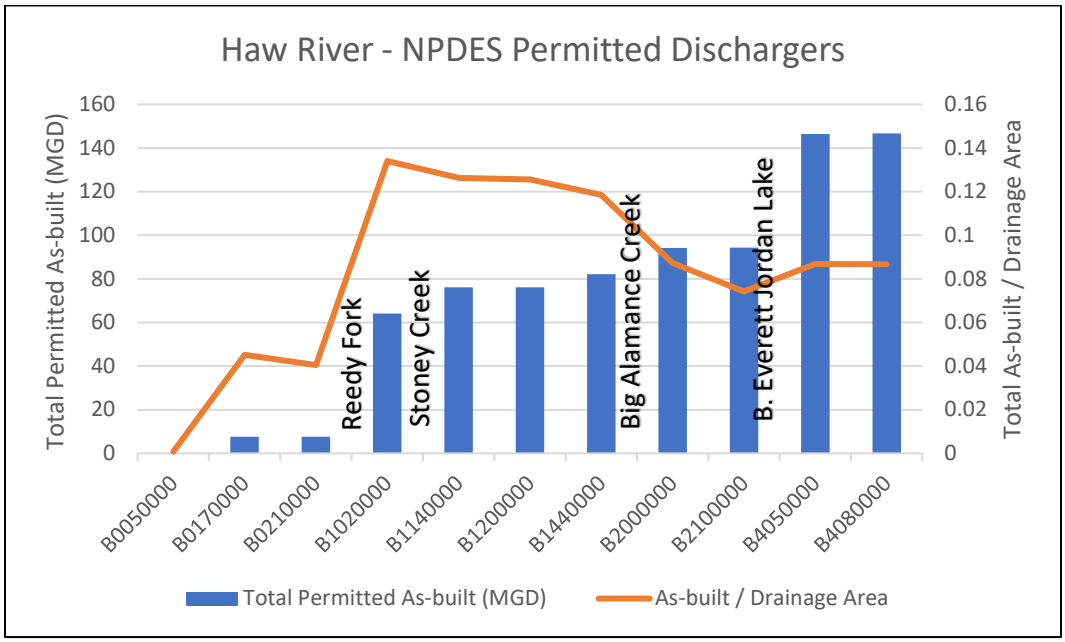


Figure 3-17: Haw River Mainstem Station NPDES Stormwater Permits

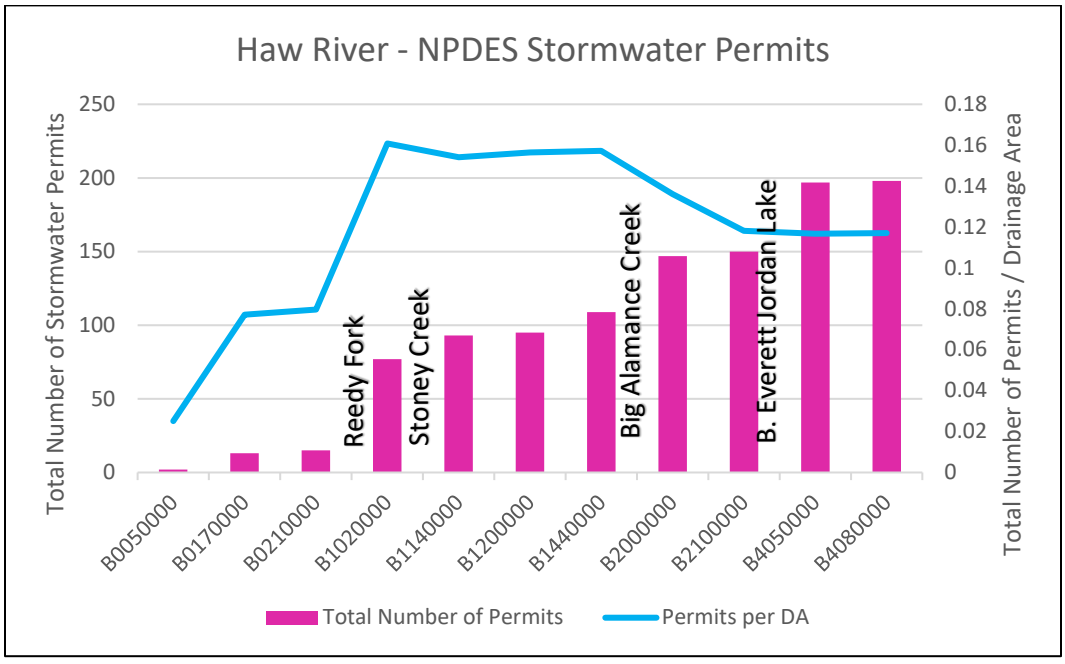


Figure 3-18: Haw River Mainstem Station NPDES Non-Discharge and Residual Solids Permitted Fields

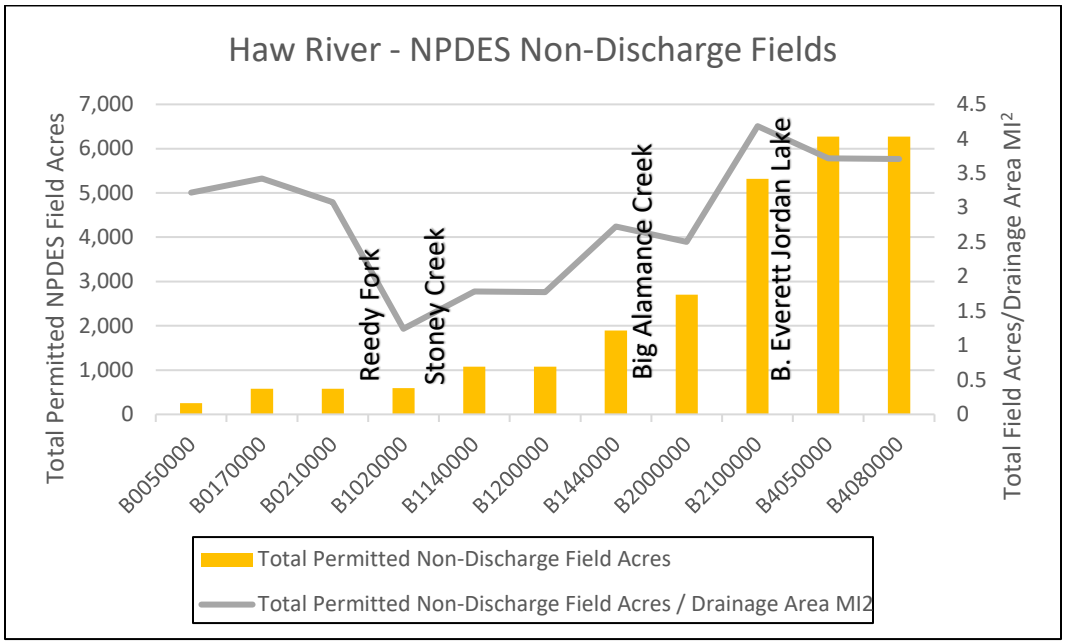
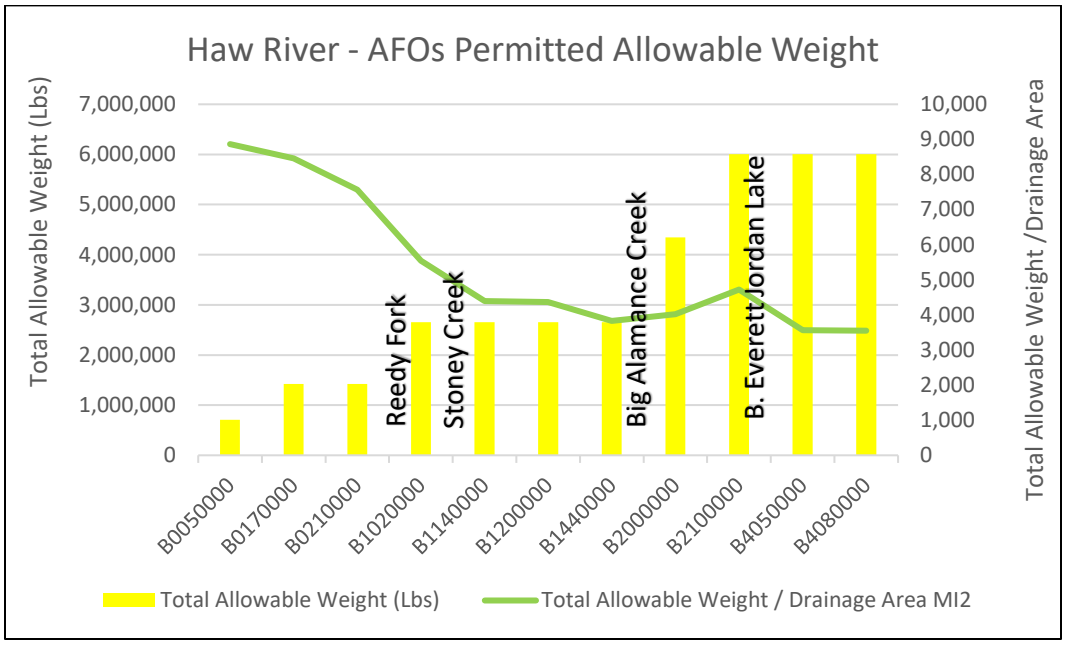


Figure 3-19: Haw River Mainstem Station Animal Feeding Operation Allowable Weight



1.9.2 Deep River

The Deep River permit analysis for 10 mainstem stations is shown in *Figure 3-20* to *Figure 3-23*. The total as-built flow ranged from 0 MGD to 56.52 MGD from the upstream to downstream stations (*Figure 3-20*).

The permitted as-built flow jumps from zero to 26 MGD at the second station (B47705000) located below the Richland Creek confluence and High Point East Side WWTP (NC0024210) which discharges directly to the Deep River (26 MGD as-built). Other larger major dischargers located in the Deep River mainstem station DAs include the City of Asheboro's WWTP (NC0026123) permitted to discharge 9.0 MGD as-built flow to Haskett Creek which is located above the fourth station (B4920000) and the City of Sanford's Big Buffalo WWTP (NC0024147) permitted to discharge 12.0 MGD as-built flow to the Deep River and is located above the eighth station (B5820000; *Figure 3-20*). The DA-standardized as-built peaks twice, 0.15 MGD/Mi^2; at the second station (B4770500), below Richland Creek, and fourth station (B4920000), below Haskett Creek (*Figure 3-20*). *These two stations have the highest DA-standardized as-built flow of all mainstem stations analyzed in the Cape Fear River Basin*.

Stormwater permit numbers increase fairly consistently from the upstream (B4350000) to downstream stations (B6040300) along the Deep River, ranging from 38 to 145 permits (*Figure 3-21*). Conversely, DA-standardized stormwater permit numbers generally decrease from the most upstream to the most downstream station indicating point source discharge from stormwater facilities has the most influence in the upper stations. A relative comparison to all mainstem stations analyzed, using the DA-standardized stormwater permits, shows Deep River's first station (B4350000) had the most influence from stormwater facilities (0.709 permits/Mi^2).

The total non-discharge and residual solids land-application field acreage ranged from near-zero in the urban headwaters of the Deep River to 4,437 at the most downstream station. Field acreage was low for the first several stations (*Figure 3-22*). Field acreage did increase more consistently relative to the size of the drainage area, with the most downstream station (B6040300) having the highest DA-standardized field acreage, 3.07 acres/Mi^2(*Figure 3-22*).

The total allowable weight ranged from 6.7 to 30 million lbs from upstream to downstream for the Deep River AFO analysis (*Figure 3-23*). The DA-standardized allowable weight was comparatively higher in the in the upper part of the Deep River than the lower part, particularly at the fourth and fifth stations, B5070000 and B5100000 (*Figure 3-23*). The DA-standardized allowable weight also suggests AFOs influence Deep River stations more than Haw River stations but have comparatively much less influence than the lower parts of the basin, the Black, Northeast Cape Fear and lower stations of the mainstem Cape Fear River.

Figure 3-20: Deep River Mainstem Station NPDES Discharge As-built

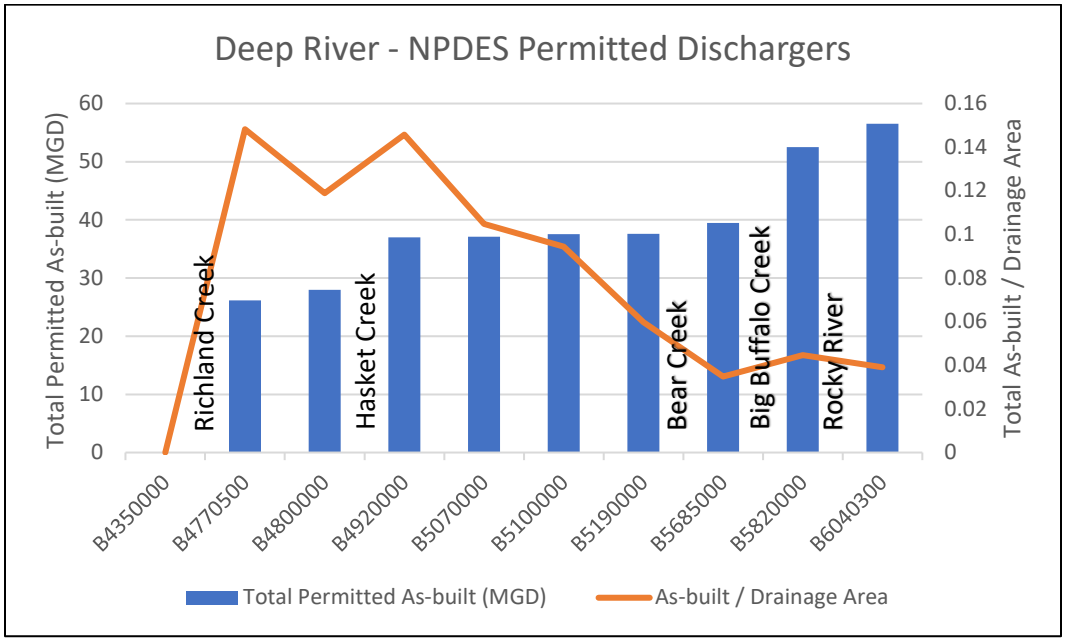


Figure 3-21: Deep River Mainstem Station NPDES Stormwater Permits

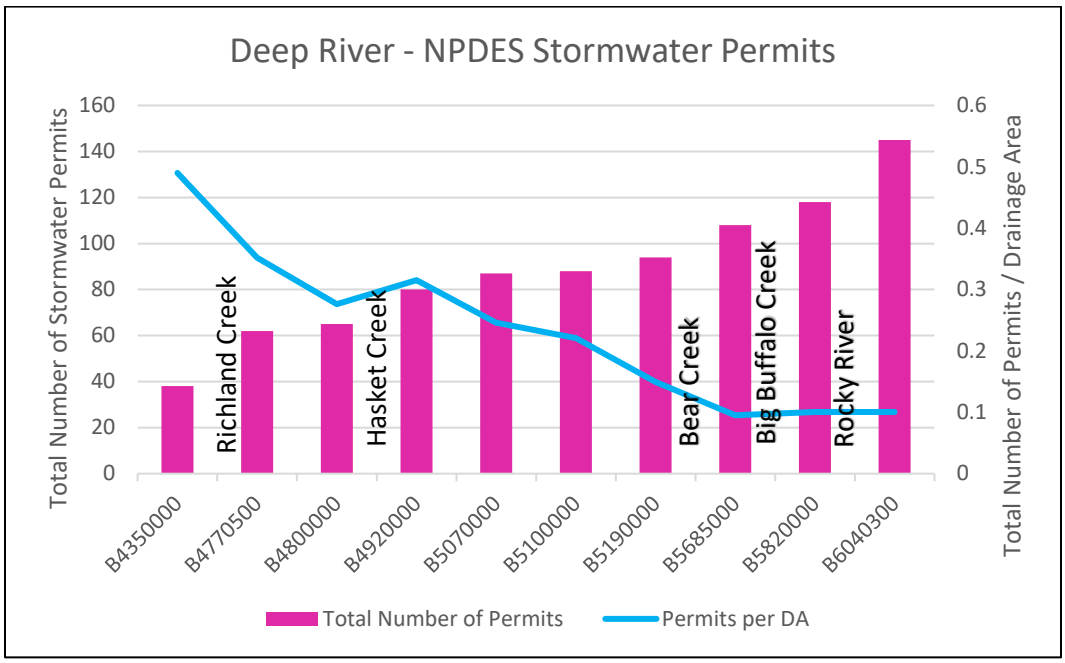


Figure 3-22: Deep River Mainstem Station NPDES Non-Discharge and Residual Solids Permitted Fields

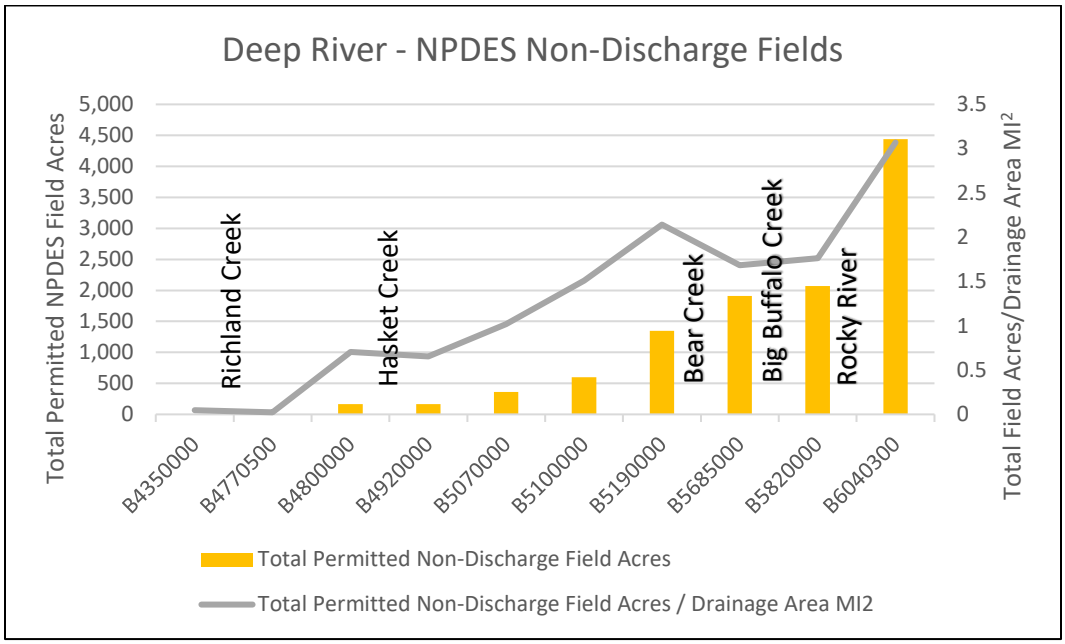
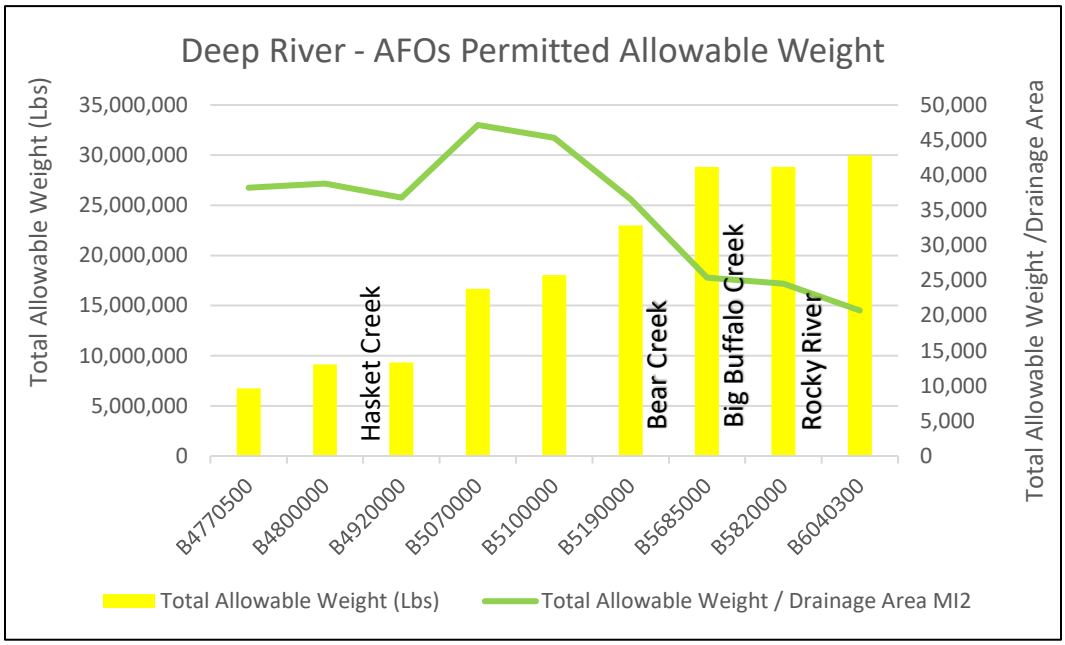


Figure 3-23: Deep River Mainstem Station Animal Feeding Operation Allowable Weight



1.9.3 Cape Fear River

The Cape Fear mainstem permit analysis was completed for the DA of 30 stations, seven stations in the Upper Cape Fear River subbasin (HUC8 03030004) and 23 stations in the Lower Cape Fear River subbasin (HUC8 03030005; *Figure 3-24* to *Figure 3-27*). The graphical pattern was comparable for the NPDES as-built discharge flow (*Figure 3-24*), NPDES stormwater permit number (*Figure 3-25*), and non-discharge and residual solids land-application field acreage (*Figure 3-26*) analyses. The Cape Fear River mainstem

figures indicate the numbers for as-built discharge flow (*Figure 3-24*), stormwater permits (*Figure 3-25*), and field acreage increased to the eighth station (B8290000), located below the Rockfish Creek confluence in the Lower Cape Fear River subbasin. After the Rockfish Creek confluence, the numbers for these three permit types remained consistent for many miles of the Lower Cape Fear River mainstem until Livingston Creek (B8450000) where the NPDES discharge as-built flow increased (*Figure 3-24*) and the Black River confluence (B9020000) where stormwater permit (*Figure 3-25*) and field acreage (*Figure 3-26*) numbers increased. All three permit program numbers increased again below the Northeast Cape Fear River confluence (B9800000). The Cape Fear River mainstem total numbers ranged from 203 to 419 MGD as-built flow for NPDES discharge, 699 to 1,268 for stormwater permits, and 10,760 to 21,280 acres for non-discharge and residual solids land-application.

The DA-adjusted as-built flow generally decreased from the upper to lower section of the Cape Fear River mainstem ranging from 0.46 to 0.68 MGD/Mi^2, although between several stations it increased. In the Upper Cape Fear River portion of the mainstem, there was an increase from the at the second station (B6215000), located below Buckhorn Creek and Harris Reservoir, due to added discharge from the Western Wake/Town of Cary (18 MGD, NC0088846) and Holly Springs (6 MGD, NC0063096) and at the sixth station (B7600000), located below Cross Creek, due to added discharge from Fayetteville's Cross Creek WWTP (25 MGD, NC0023957). In the Lower Cape Fear River portion of the mainstem there was an increase in NPDES discharge below Livingston Creek (B8450000) due to discharge from the International Paper Company owned Riegel Mill (NC0003298) for 50 MGD to the Cape Fear River, the second highest permitted as-built flow in the basin behind Greensboro's 56 MGD T.Z. Osborne WWTP (NC0047384, see Section 3.9.1). DA-adjusted as-built flow indicate the Upper Cape Fear River's second (B6215000) and sixth (B6370000) stations and the two stations directly below Livingston Creek (B8450000 and B8465000) in the Lower Cape Fear River are influenced the most by NPDES point source discharge along the Cape Fear River mainstem. The DA-adjusted stormwater permits, and non-discharge and residual solids land-application field acreage were highest at the first several stations of the Upper Cape Fear River mainstem (B6160000, B62150000, B6370000, and B6840000) indicating that these stations are potentially influenced the most by pollutants from these permit types.

The AFO permit analysis shows that the total permitted allowable weights within Cape Fear River mainstem station DAs are extremely varied from upstream to downstream (*Figure 3-27*). However, the DA-adjusted allowable weight increases consistently relative to the size of the drainage area for stations along the Cape Fear River mainstem. The total allowable weight for stations in the Upper Cape Fear River and Lower Cape Fear River, above the Black River confluence, range from 36 to 89 million lb, below the confluence they spike to over four times as high, to 422 million lb. Then several stations further down, below the Northeast Cape River confluence, the total allowable weight spikes again, to 738 million lb. The DA-standardized allowable weight ranges from 105 to 271 lb/Mi^2 above the Black River confluence, then spiking to 1,358 lb/Mi^2 below this confluence, then spikes again to 2,270 lb/Mi^2 below the Northeast Cape Fear River confluence. The Lower Cape Fear River stations below the Black and Northeast Cape Fear River confluences clearly receive the most influence from AFOs and the DA-standardized allowable weight also shows these stations receive more influence from AFOs then the Haw and Deep River mainstem stations. Based on USDA census data, the Black and Northeast Cape Fear river subbasins also have a high number deemed permitted animal operations that are not included in this analysis that could be contributing to the Cape Fear River.

Figure 3-24: Cape Fear River Mainstem Station NPDES Discharge As-built

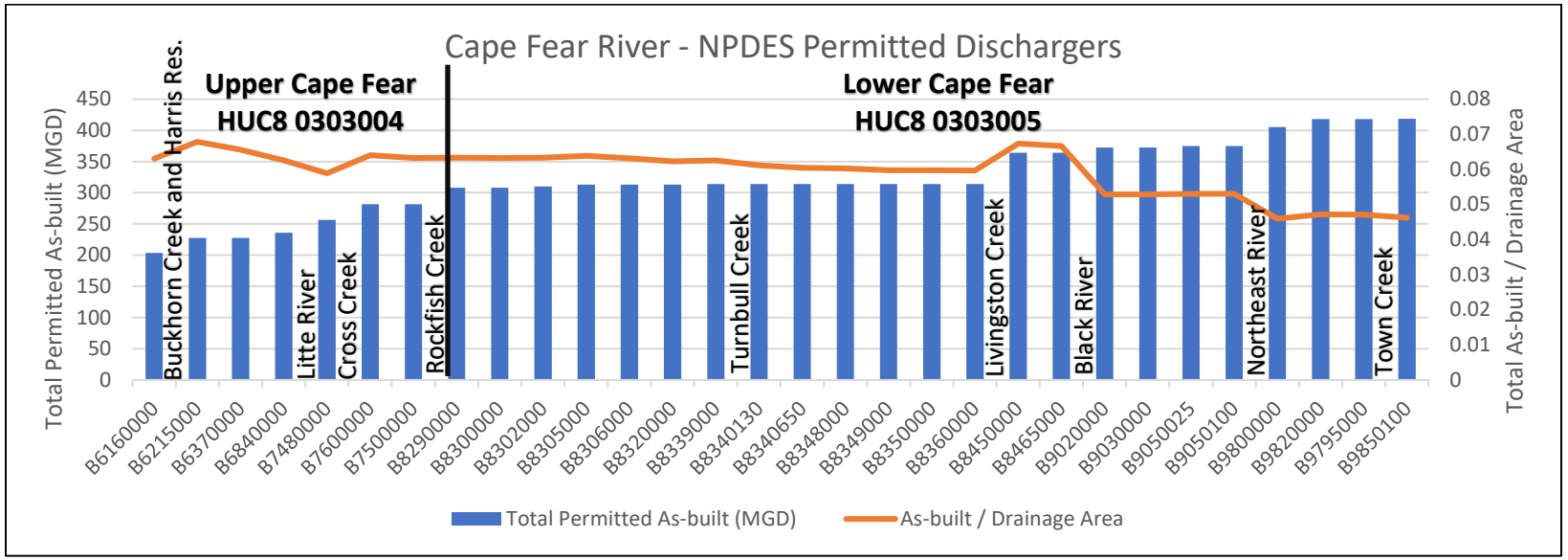


Figure 3-25: Cape Fear River Mainstem Station NPDES Stormwater Permits

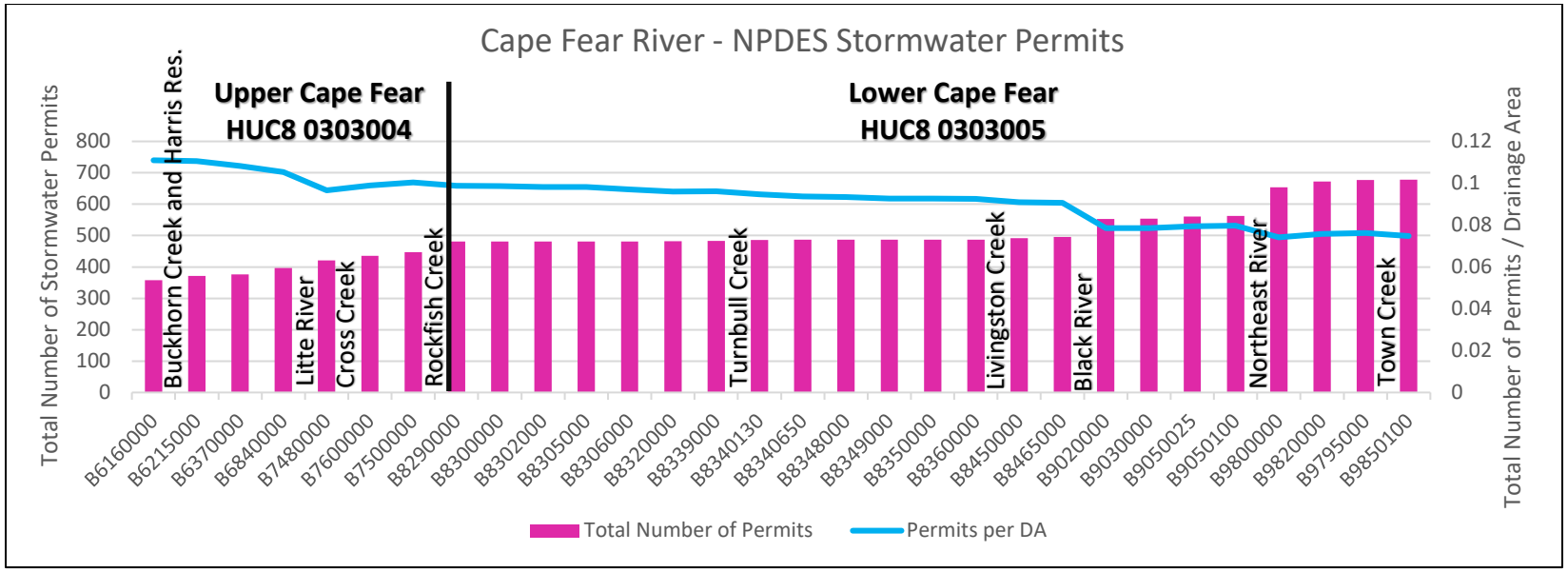


Figure 3-26: Cape Fear River Mainstem Station NPDES Non-Discharge and Residual Solids Permitted Fields

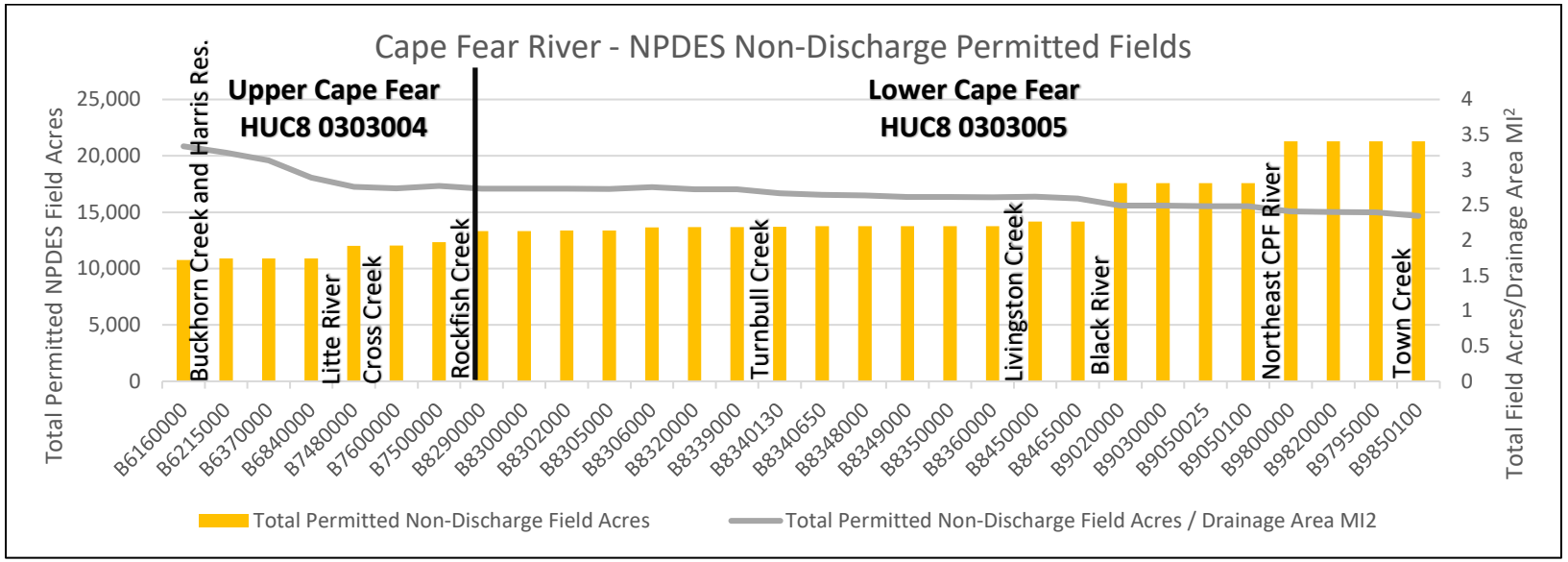
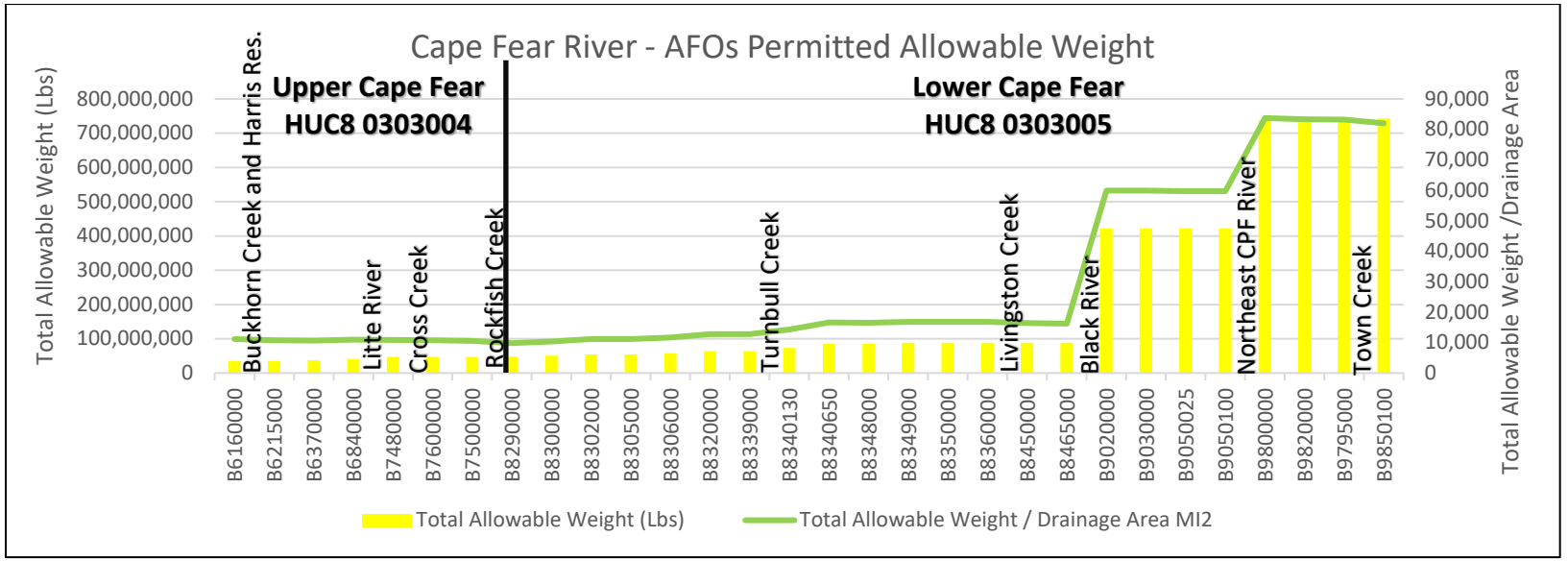


Figure 3-27: Cape Fear River Mainstem Station Animal Feeding Operation Allowable Weight



1.9.4 Great Coharie Creek to the Black River

The permit analyses for five stations along the Great Coharrie Creek to Black River mainstem system are shown in *Figure 3-28* to *Figure 3-31*. The first two stations (B8580000 and B8604000) are located on Great Coharie Creek and the last three stations (B8750000, B9000000, and B9013000) are located on the Black River. The NPDES permitted as-built flow and stormwater permit total and DA-standardized had similar graph patterns. The total numbers for the first station (B8580000) were much lower than the other stations in the river system and the DA-standardized numbers spiked at the second station (B8604000) which indicates this station receives the most influence from permitted as-built flow and stormwater facility point source discharges. From upstream to downstream, the total as-built discharge flow ranged from 0.2 MGD to 8 MGD (*Figure 3-28*) and the total stormwater permits ranged from 5 to 112 (*Figure 3-29*). The second station is located below the Williams Old Mill Branch confluence which receives discharge from the City of Clinton's Norman H. Larkins WWTP (NC0020117), permitted for 5.0 MGD as-built flow. The last three stations also receive discharge from several additional minor WWTPs. However, it should be noted that total numbers and DA-standardized numbers for the NPDES as-built flow and stormwater permits are comparatively much lower for this river system's mainstem station DAs than most other station DAs in the Cape Fear, Haw, and Deep River mainstems covered previously.

The total number of non-discharge and residual solids land-application field acreage ranged from 37 to 3,387 acres (*Figure 3-30*). The total number of acres increased substantially at the third station (B8750000) below the Black River confluence from 77 to 2,135 acres. DA-standardized field acreage was also highest at the third station, indicating this station received the most influence from NPDES non-discharge and residual solids land-application fields. The allowable weight for AFOs ranged from 39 to 333.1 million lb from the first station to the last, with numbers increasing nearly five-fold below the Black River confluence (*Figure 3-31*). The DA-standardized allowable weight ranged from 220 to 332 thousand lb/Mi^2 and also peaked at the third station. The DA-standardized allowable weight for the Great Coharie to Black River system is significantly higher than the Haw and Deep stations and most of the Cape Fear River stations, *which indicates AFOs have a much stronger influence on water quality in this river system*.

Figure 3-28: Great Coharie Creek to the Black River Mainstem Station NPDES Discharge As-built

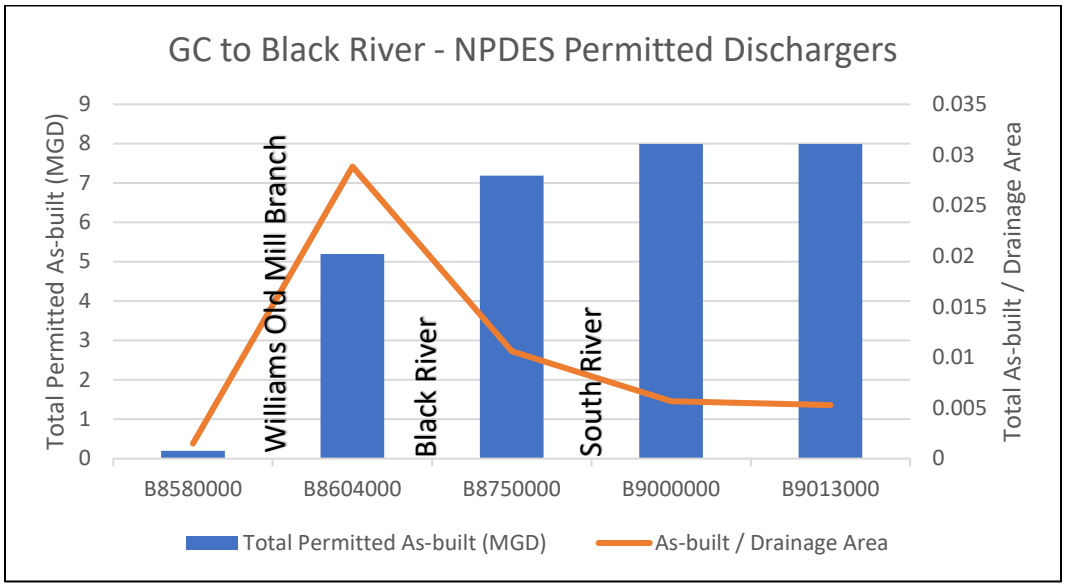


Figure 3-29: Great Coharie Creek to Black River Mainstem Station NPDES Stormwater Permits

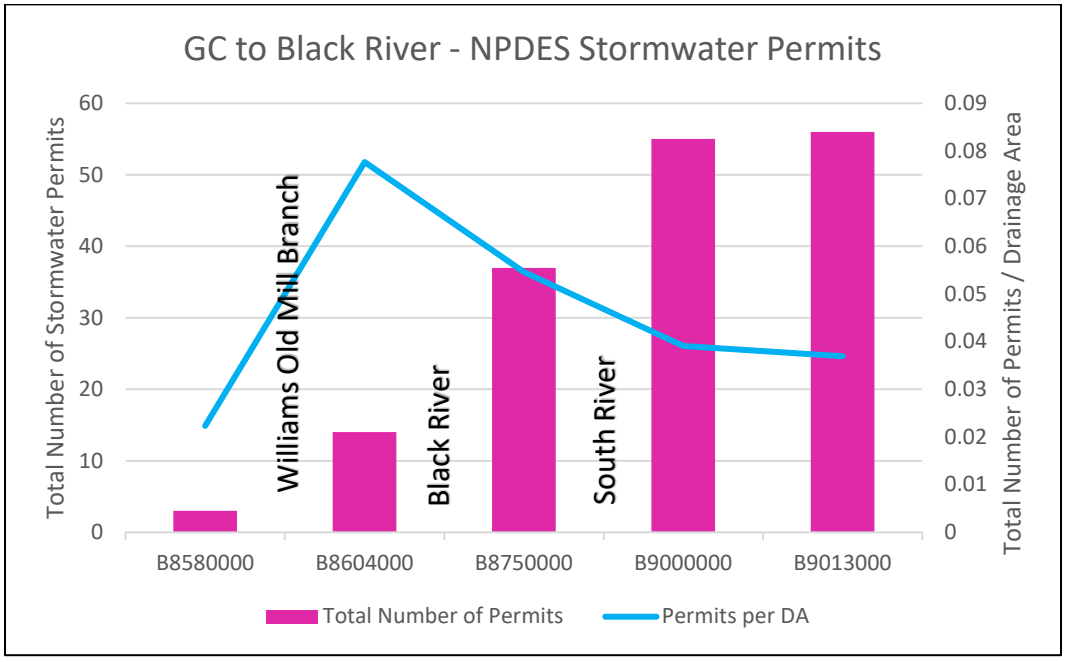


Figure 3-30: Great Coharie to Black River Mainstem Station NPDES Non-Discharge and Residual Solids Permitted Fields

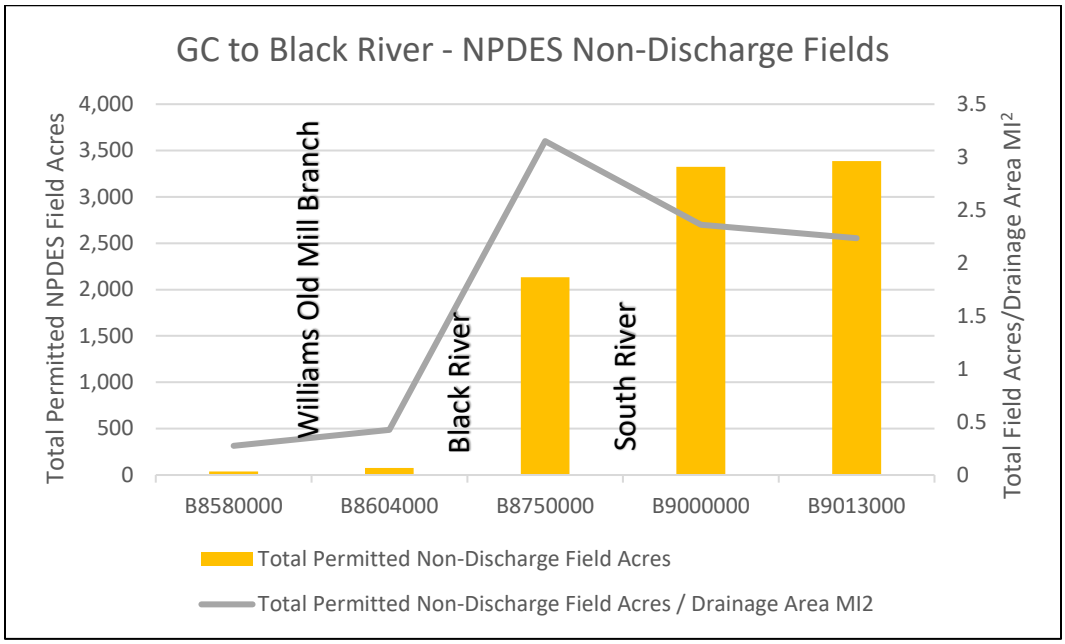
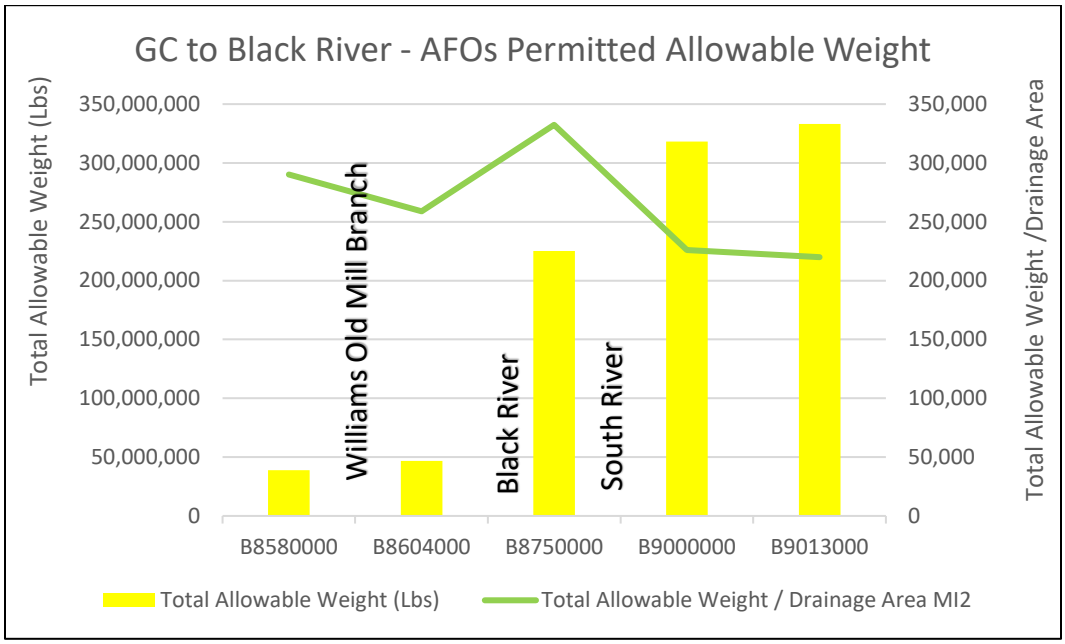


Figure 3-31: Great Coharie Creek to Black River Mainstem Station Animal Feeding Operation Allowable Weight



1.9.5 Northeast Cape Fear River

The Northeast Cape River mainstem permit analysis for six stations is shown in *Figure 3-28* to *Figure 3-35*. The permitted as-built discharge flow steadily increased from 1.4 to 30.4 MGD from the upstream to the downstream station (*Figure 3-28*). Most major NPDES dischargers along the Northeast Cape Fear River mainstem are permitted for less than 3.7 MGD as-built flow, except for the Cape Fear Public Utility Authority's Northside WWTP, which is permitted for 16 MGD as-built discharge flow to the Northeast Cape Fear River right at the confluence with the Cape Fear River. The DA-standardized as-built flow was highest at the first station (B9090000; 0.59 MGD/Mi^2) located above Goshen River with a very small 23 Mi^2 DA. Other than the first station, which receives the most influence from NPDES discharge, the Northeast Cape Fear River mainstem stations have relatively low DA-standardized as-built flow and were comparable to the Great Coharie to Black River system.

The NPDES total and DA-standardized stormwater permit numbers had a similar graph pattern as the NPDES as-built discharge flow (*Figure 3-33*). Total stormwater permit numbers ranged from four to 123 from upstream to downstream. The DA-standardized stormwater permit numbers were highest at the first station (B9090000) also indicating this station receives the most influence from stormwater facilities along the Northeast Cape Fear River. Both the total and DA-standardized stormwater permit numbers were comparable to the Great Coharie Creek to Black River system but were relatively less than the other mainstems.

Field acreage for the non-discharge and residual solids land-application program ranged from 146 to 3,712 acres with a sizeable increase at the second station (B9191500) below the Goshen River confluence and fourth station (B9480000) below the Rockfish Creek confluence (*Figure 3-34*). The DA-standardized field acreage was highest at the second station, indicating this station receives the most influence along the Northeast Cape Fear River from non-discharge and residual solids application field acres.

The AFO allowable weight ranged from 2.8 to 316.4 million lb from the upstream station to the downstream station, and similar to the non-discharge and residual solids field acreage, there was a notable increase at the second station (B9191500) below Goshen River and fourth station (B9480000), below Rockfish Creek (*Figure 3-35*). The DA-standardized allowable weight ranged from 117 to 394 thousand lb/Mi^2 and peaked at the second station. Similar to the Great Coharie to Black River system, these DA-standardized allowable weights were extremely high in comparison to most station DAs for the Haw, Deep, and Cape Fear River mainstems, which indicates AFOs have a significant influence on water quality in the Northeast Cape Fear River. USDA census data in 2022 indicated Duplin County, located in Northeast Cape Fear River, had the most inventory and production contracts for poultry in the basin, and in the entire state, 22 million for inventory and 96 million for contract production (chickens only). Most of these are likely deemed permitted under current statutes.

Figure 3-32: Northeast Cape Fear River Mainstem Station NPDES Discharge As-built

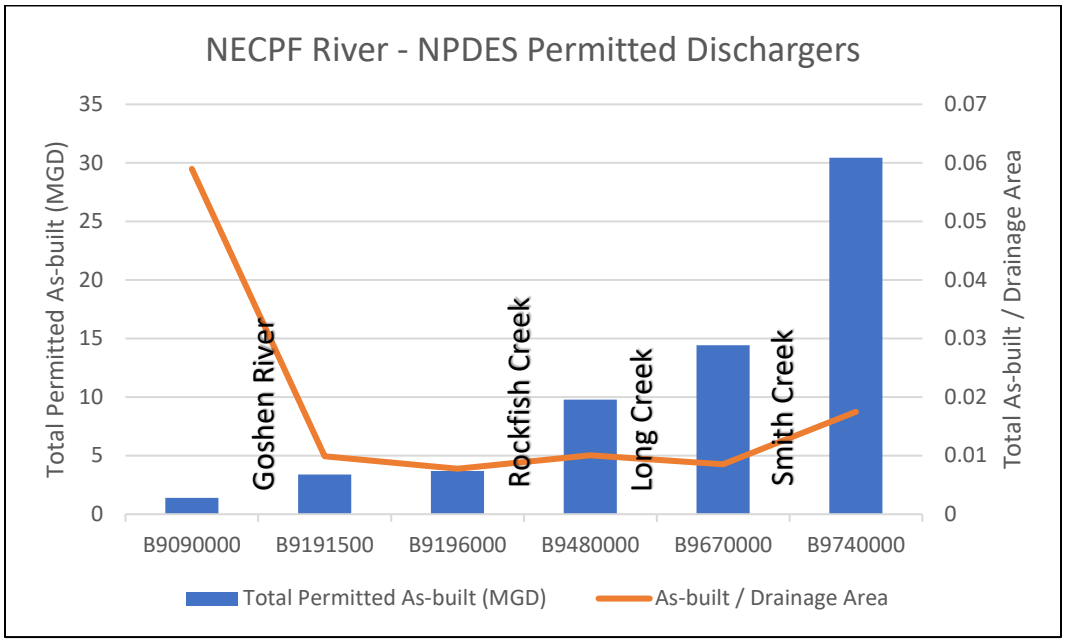


Figure 3-33: Northeast Cape Fear River Mainstem Station NPDES Stormwater Permits

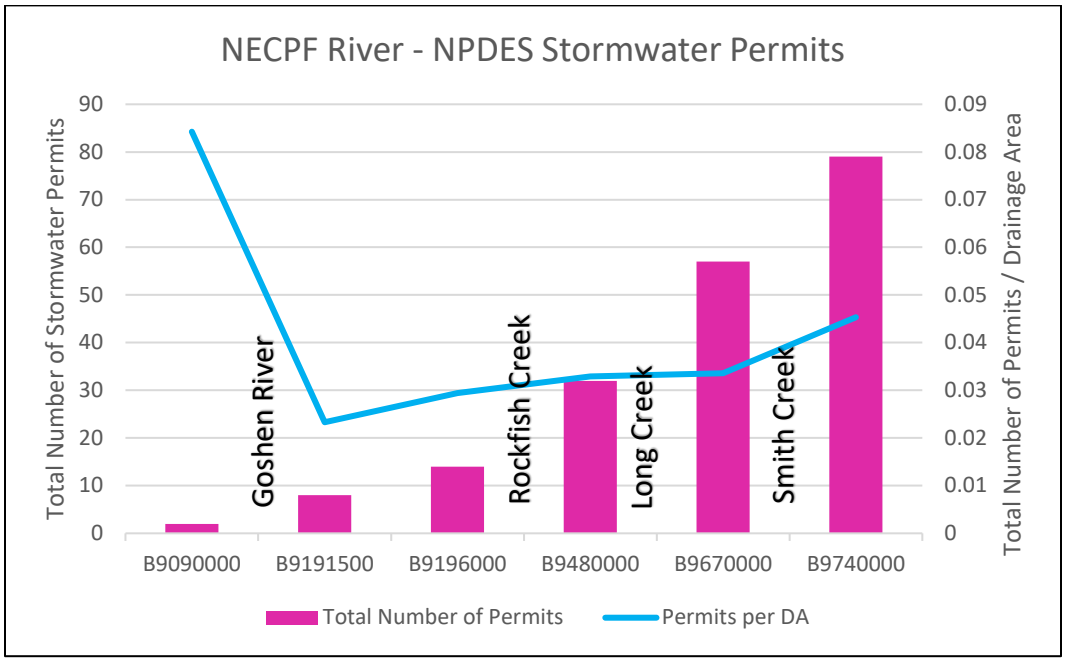


Figure 3-34: Northeast Cape Fear River Mainstem Station NPDES Non-Discharge and Residual Solids Permitted Fields

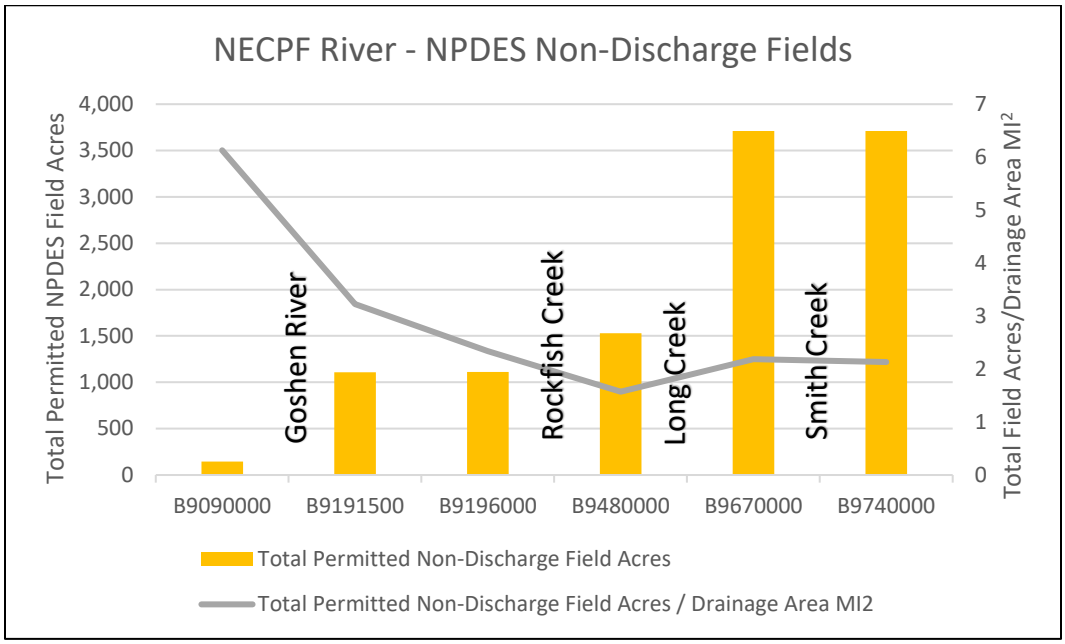
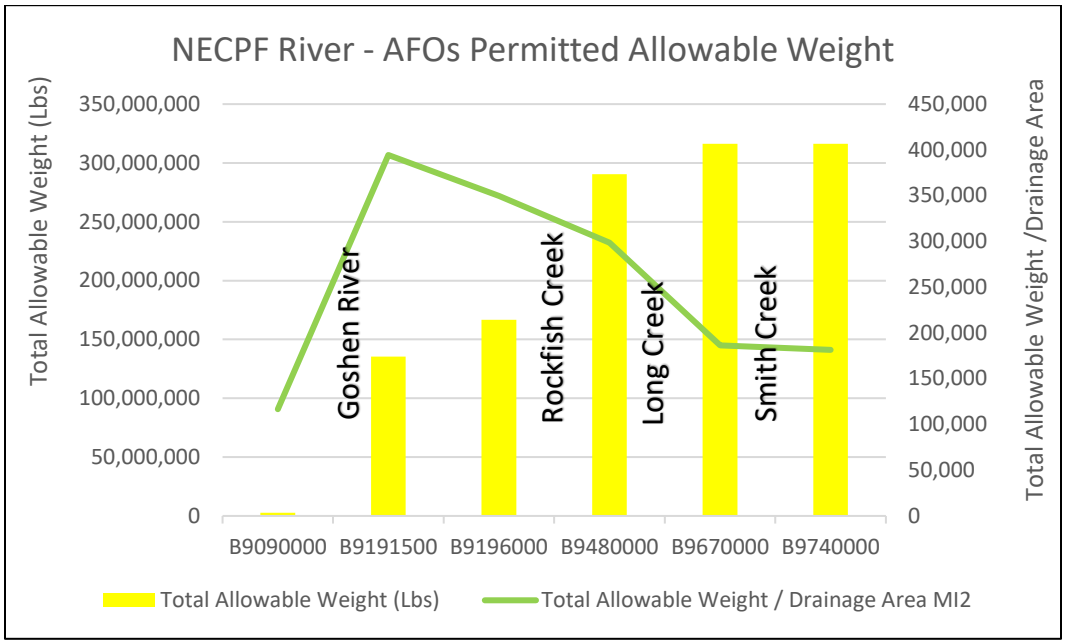


Figure 3-35: Northeast Cape Fear River Mainstem Station Animal Feeding Operation Allowable Weight



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